The response of short-term bank lending rates to policy rates: a cross-country perspective[1]

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I. INTRODUCTION

The issue of the size and speed of the response of bank lending rates to changes in policy-controlled interest rates represents an important dimension of the transmission mechanism of monetary policy. Bank lending rates are a key, if not the best, indicator of the *marginal* cost of short-term external funding in an economy. Moreover, they can also provide useful information about developments in the *average* cost of borrowing, to a degree that depends on agents' reliance on short-term or adjustable rate financing at those rates. Such opportunity cost and cash-flow effects are two of the main channels through which monetary policy impulses are transmitted to the rest of the economy. This explains concerns related to the widening of lending spreads in those countries experiencing extensive balance-sheet restructuring in the financial and non-financial sectors during the latest recession, especially in some Anglo-Saxon and Nordic countries as well as in Japan. It is also part of the reason for the short-term difficulties in defending external parities in the face of rapid adjustments of lending rates to policy-controlled rates brought to light by the ERM crisis in the autumn of 1992.

The following study compares the response of key short-term bank lending rates to policy rates in all the countries covered by the project on the transmission mechanism for which appropriate data were available; Austria and Switzerland are excluded. It does not address the question of the determination of long-term lending rates, which in some countries apply to a sizable proportion of bank lending.[2] Nor does it address the issue of how representative short-term rates are of average funding costs, an aspect examined in Borio (1995). The study builds on earlier work carried out at the BIS (1994).

Section II presents a summary of the main findings. Section III discusses briefly the conceptual underpinnings of the analysis; it highlights the insights that the theory of bank behaviour can provide as a guide to empirical work. Section IV describes the basic data used. It focuses on the extent to which the lending rates available differ across countries and are representative of short-term funding costs and on differences in the characteristics of the policy rates chosen. The section also provides simple summary statistics of the behaviour of lending, money market and policy rates and of the relationship between them. Plots of the original series and related spreads are reproduced in Annex I. Section V contains the core econometric results on the short and long-run determination of lending rates, considering in some detail the time path of the response of these rates to changes in money market and policy rates. Possible changes in the relationships over time are also examined. Section VI turns to three specific questions: whether there is evidence of asymmetric adjustments in the upward and downward direction; whether movements in certain less frequently changed official rates, such as discount rates, can help to speed up adjustment in loan rates, possibly by strengthening signals of the direction of policy; and whether the average rather than the marginal cost of funds is more relevant in determining loan rates.

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1 We are grateful to Stephan Arthur for graphical assistance.

2 A preliminary cross-country analysis of the setting of long-term lending rates, with special attention to the mortgage market, can be found in the introduction to BIS (1994).

II. OVERVIEW AND SUMMARY

Economic theory suggests that the *minimum* specification of a loan rate setting equation for a bank should consider money market rates and policy rates as potential proximate determinants. The money market rate acts as the basic proxy for the *marginal* opportunity cost of extending a loan. The rationale for the policy rate is threefold: under certain conditions it can represent the marginal cost of funds; where it is less volatile than money market rates, it can be a better guide to underlying market conditions; and in oligopolistic markets, partly for the above reasons, it could be used by banks as the key reference rate for loan rate setting.

Given this "benchmark" minimum specification, the response of the loan rate to the policy rate has been examined through two different simulation exercises. In the first, *all* the rates that appear as proximate determinants in the loan rate setting equation are shocked simultaneously by 100 basis points (permanently). In the second, only the policy rate is changed and a separate equation is used to endogenise the response of the money market rate to the policy rate. A comparison of the two exercises can help to disentangle the effects that result from loan rate setting procedures of banks from those that reflect differences in the pass-through of policy to market rates.

Graph 1 summarises the main results. It plots countries on the basis of two parameters, viz. the point estimates of the loan rate response after one month and one year respectively when *all* proximate determinants are changed simultaneously. One year is chosen because in most countries the pass-through is complete and the difference between one and two years - the benchmark period for the central bank econometric model simulations - is minor.

Panel A describes the results when the equations are estimated since the mid-1980s (the "whole period"). In a first group, comprising the United Kingdom, the Netherlands, Canada and Belgium, the responsiveness is comparatively high. It is full and immediate in the United Kingdom and the Netherlands but considerably lower, at least in the short run, in Belgium. Responsiveness is comparatively low in the remaining countries, especially within the first month; the differences are far less pronounced at one year.[3,4]

The general picture is largely unchanged if only policy rates are shocked: policy rates survive the specification search to remain proximate determinants in several loan rate setting equations and, even where they do not, the relationship between policy and market rates is typically quite close. The adjustment is now considerably smaller only in the case of Japan, where the overnight rate was chosen as policy rate.

The above findings generally survive the re-estimation of the regressions over the more recent period, typically since around 1990 (Panel B).[5] In most cases the changes in point estimates are remarkably small, well below 10 basis points. The two countries for which the largest differences are apparent are Spain and Japan, where the response is increased almost throughout the time horizon;[6] it remains, however, comparatively low, at least at very short horizons. In Australia and the United States, the response around one month is considerably faster, bringing the countries within the faster adjustment group. By contrast, the one-month response is somewhat lower in the Netherlands. There is some evidence that the change in the loan rate is slower in Germany too.

Economic theory points to a number of factors that can influence the responsiveness of loan rates to market and policy rates. The degree of stickiness is likely to depend positively on several

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3 Sweden is not shown in the graph because the equation is estimated only on quarterly data. After one year the adjustment is around 0.85 (average of two rates used). After one quarter it is around 70%, similar to Italy and Australia.

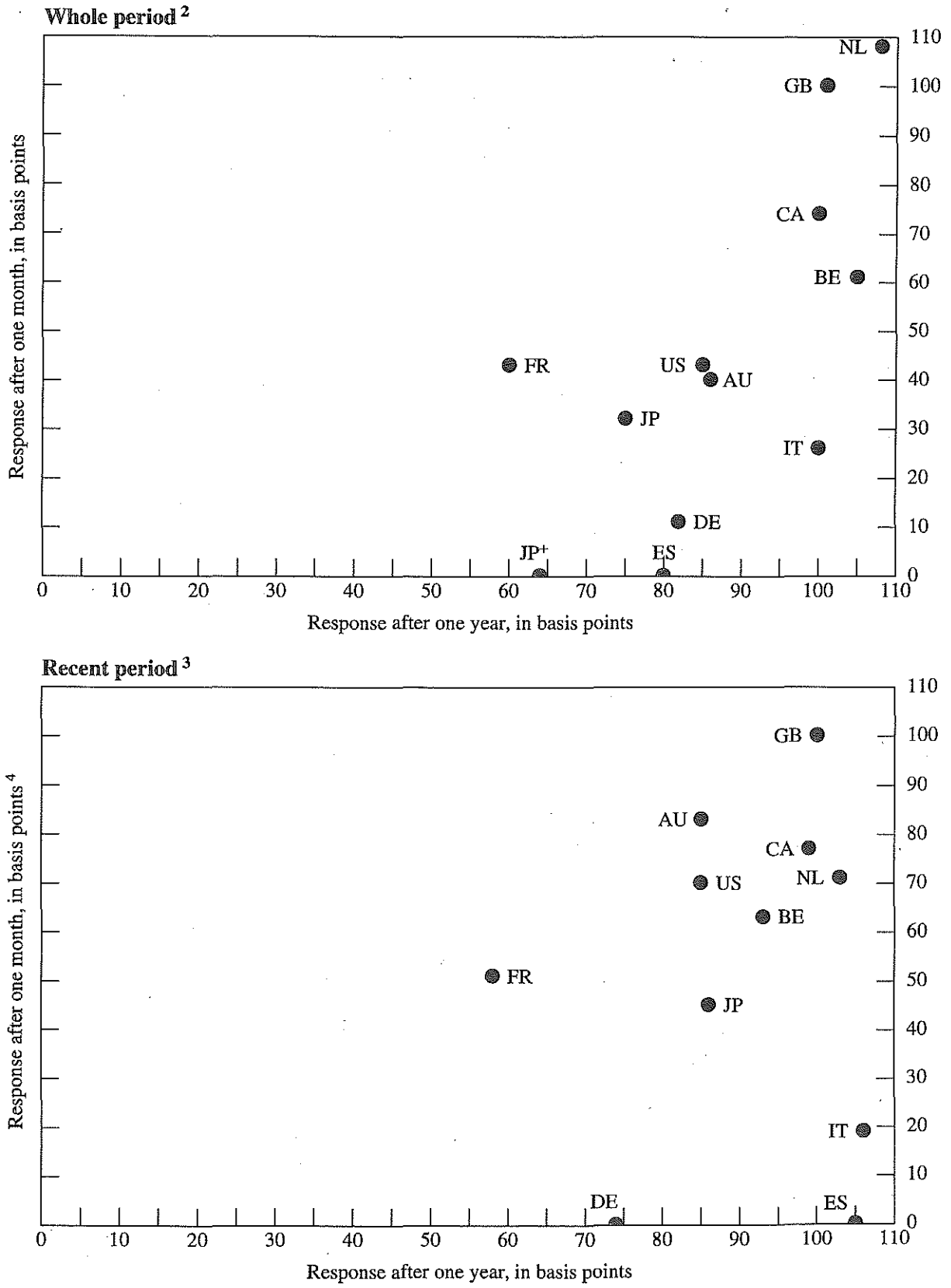
4 In Australia, the second-month response is considerably higher.

5 The exact periods differ somewhat internationally to take country-specific factors into account.

6 The graph understates the increase in the speed of adjustment for Spain, where after one quarter the response is already 100 basis points.

Graph 1

Responsiveness of the loan rate [1]



[1] Response to a 100 basis point simultaneous increase in policy and money market rates. JP+ refers to a 100 basis point increase in the policy rate only (money market rate endogenous). [2] The period is country-specific but is generally 1984:1 – 1994:7. [3] The period is country-specific but is mostly since around 1990. [4] For Australia, average of first two months owing to overshooting.

elements: (a) the degree of monopoly power[7] in the loan market segment covered; (b) customers' aversion to variable interest rate payments; (c) when average, rather than marginal, cost pricing prevails, the degree of stickiness in *overall* funding costs; and (d) the volatility of market and policy rates. In addition, in any empirical analysis based solely on interest rate variables, the correlation between these and other relevant omitted factors may be important. In particular, procyclical movements in market rates would lead to slow responses if credit risk premia are counter-cyclical or banks' appetite for risk is procyclical. For instance, if a fall in market rates coincides with a recession, a rise in credit risk premia and bank retrenchment are likely to follow, tending to raise the loan spread with respect to the market rate.

This study has not looked in any depth into the issue of interpretation. Nevertheless, certain informed conjectures may be made. While no doubt relevant, the stability of the estimates over different samples suggests that cyclical influences are not dominant.[8] By contrast, the degree of monopoly power in the loan market segment is likely to be important. Formal statistical evidence and casual observation indicate that the largest, typically highest-quality customers tend to borrow at money market related rates, either from the banks themselves or, where possible, directly from the markets. Since these customers are also those that can more easily offset any undesired variability in interest charges, it is possible that aversion to excessive loan rate variability plays a role. Low responsiveness of average funding costs to market rates is likely to be the second important determinant. Though not formally tested, there does appear to be a reasonable correlation between this factor and the cross-country pattern of responses: the United Kingdom (at one end) and Japan and Germany (at the other) are just three such examples. Moreover, confirming previous evidence, the weighted average cost of deposits is indeed significant when added to the benchmark specifications in the only three countries for which such an exercise was possible (Germany, Italy and Spain). Finally, the variability of policy or market rates may also play some role. The faster one-month response of the loan rate to the policy rate in Australia and the United States in the more recent period is at least consistent with this hypothesis. In both countries it has coincided with the adoption of operating procedures designed to provide markets with clearer signals about the authorities' operating objectives for the overnight rate, a strategy which has reduced the "noise" present in its movements.

The dependence of the degree of stickiness on the monopoly power of banks within a specific loan market segment raises the issue of the extent to which the cross-country differences detected may be influenced by the lack of homogeneity in the loan rates used. The available information is not sufficient to form a definite view. Nevertheless, the overall picture is probably not misleading. There does not appear to be a systematic relationship between country classification and potential bias. Admittedly, in some cases the loan rate used may exacerbate differences. For instance, in the case of the Netherlands and Belgium, two fast-adjusting countries, the loan rates appear to apply to the best, largest customers. For other countries, however, the available loan rates may actually mitigate international differences. For example, by comparison with some countries in the slow adjustment group, notably Germany and Japan,[9] the rates used for the United Kingdom and the United States (the "base" and "prime" rate respectively) nowadays appear to be more representative of the "retail" loan segment. In fact, a more broadly based rate for the United States, available only on a quarterly basis, exhibits a considerably higher adjustment speed than the prime.

The tests for asymmetric responses of loan rates generally failed to detect their presence. The only two significant exceptions are Japan and Germany. In Japan the finding seems to reflect primarily the unprecedented widening of the spread in the recent period in the wake of widespread balance-sheet restructuring among financial and non-financial businesses. In Germany, too, the phenomenon can only be detected statistically in the latest interest rate cycle; the impact of reunification may be partly responsible.

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7 In the sense of an imperfectly elastic demand curve for loans.

8 A more definite conclusion would require the inclusion of appropriate variables in the equations.

9 In Japan, the rate covers all short-term loans but price differentiation is very limited.

There is evidence that revisions in infrequently changed rates on official standing facilities[10] generally speed up the adjustment of loan rates. Over the whole sample period, when added to the benchmark specification, the rates are statistically significant and raise the response of the loan rate in all the countries for which they could be tried, viz. Belgium, France, Germany, Italy, the Netherlands, Japan and the United States. In the more recent period their influence only be traced in Belgium and France; in the remaining countries the response remains broadly unchanged.

In the case of the Netherlands, the additional explanatory power of the official rate reflects the variable but administered mark-up linking the discount rate to the loan rate (the minimum rate on unsecured current account credits).[11] For the remaining countries the best interpretation of the statistical finding is not clear. The fact that in several cases the effect is limited to the contemporaneous change in the official rate is consistent with a "signalling" role: the rate can be used to underline the persistence of a specific policy move and thus help to crystallise expectations about future interest rates. In Japan and Italy, for instance, this role has been explicitly recognised. In Germany and Japan, however, lagged changes are also present. One possible explanation is that the rates act as proxy for slow-adjusting deposit rates relevant in the loan rate setting decision. This hypothesis, however, was not formally tested.

III. THE CONCEPTUAL FRAMEWORK

A useful starting-point to organise the various insights that economic theory can yield on the determination of loan rates is to think of "the" contractual loan rate (RL) as being some function of another observable rate or combination of rates (RC). There are at least four questions that deserve attention:

(i) What is the most relevant set of rates RC that can be thought to determine the loan rate?

(ii) What factors affect the relationship between RL and RC, a question that can also be rephrased as: what determines the spread between the two?

(iii) What factors impinge on the response of RL to RC in equilibrium? In particular, is the spread invariant with respect to changes in RC?

(iv) What factors shape the adjustment path of RL to changes in RC?

The variable RC is best thought of as the rate determining the opportunity cost of the lending decisions made by the bank. When banks strive to maximise a particular objective, such as asset size or profits, this is inevitably a *marginal* rate, beyond the banks' control. The most widely used benchmark is a money market rate, seen as the key variable that determines the marginal cost of funds or the revenue forgone by extending a loan.[12] Other rates, however, may also be relevant. One example, especially significant in the present context, is a policy rate, beyond the control of the intermediary. Under certain conditions, it can represent the marginal cost of funds for the institution.[13]

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10 With the exception of France, discount rates were used. For France, the rate chosen was that on five to ten-day repurchase agreements ("pensions").

11 This was true until the end of December 1993. Since then the loan rate has been linked to the rate on central bank advances.

12 The seminal articles by Klein (1971) and Monti (1971), modelling a bank by analogy with a two-product (loan and deposit) monopolistic firm given risk neutrality (or perfect certainty), stress the relevance of such an exogenous rate, to which the marginal revenue (costs) of the other assets are related. Empirically, a money market or equivalent rate is the one most often used in estimating loan equations.

13 In models that stress uncertainty regarding the withdrawal of deposits and the illiquidity costs of loans, penalty costs associated with, say, central bank borrowing play an important role. See, for instance, Hester and Pierce (1975) and subsequent articles.

In the presence of oligopolistic market arrangements, it can be a convenient reference for the setting of rates, as it reflects changes in objective, general market conditions rather than discretionary decisions on the part of individual institutions. And when money market rates are particularly volatile, it may be a better indicator of their persistent, rather than purely transitory, movements. A second such example is deposit rates. They may be particularly relevant if mark-up or full-cost pricing, not necessarily geared to maximising profits, is widespread; deposits often still represent the main portion of average funding costs.[14]

Several factors help to determine the spread between the loan rate and "the" opportunity cost rate. A first factor is the degree of competition in the loan market. In general, the more competitive the market, the smaller is the spread. The sources of market power range widely. They may, for instance, reflect legal and regulatory entry barriers. They may result, more generally, from the existence of set-up and other costs that segment markets. One significant example is the costs associated with limited information, whether on the part of lenders (regarding borrower characteristics and behaviour) or fund users (regarding alternative borrowing opportunities).[15] Differences in this respect are probably a key reason for the division between the retail and wholesale segments of the market. A second factor determining the size of the spread is the risk of loss on the loans: the higher the probability of default of (a given class of) borrowers and the loss in the event of default, the larger the wedge between the expected return on the loan, which drives decisions, and the loan rate. The vulnerability of the financial position of borrowers and whether and how loans are collateralised are particularly significant in this context. A third factor is the basic orientation of the banks' policy: if market share is given priority over profitability, margins will tend to be lower.[16,17]

The responsiveness of the loan rate to changes in the opportunity cost of funds *in equilibrium* is one of the two dimensions of stickiness considered in the literature. The degree of competition is likely to be relevant in this context too. For example, under perfectly competitive market conditions and assuming a constant credit risk premium, the loan rate would move one-for-one with marginal funding costs. One may generally expect the movement to be smaller in the presence of monopolistic power and oligopolistic structures.[18,19] In addition, mark-up pricing, typical of such situations, suggests that the composition of banks' sources of funds and their sensitivity to market

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14 In the basic Monti-Klein set-up the opportunity cost is independent of the characteristics of the deposit market; deposit rates, therefore, do not help to determine loan rates. Various ways have been explored to break down this separability, other than mark-up pricing in oligopolistic or non-profit maximisation structures. These include joint production costs (Baltensperger (1980)), allowing the bank to set the deposit rate to limit the risk of penalty liquidity costs by raising the expected deposit volume (Tobin (1982)) and others (see Bank of Spain (1992) for some references). None of them, however, has the realistic appeal of mark-up pricing.

15 "Search" and "switching" costs fall within this category. See, for instance, Diamond (1971) and Klemperer (1987).

16 This is true, for example, in Klein-Monti type models as long as loans enter into the measure of size, since they would be expanded beyond the profit-maximisation point (see, for example, Takeda (1985)).

17 In addition, in any empirical analysis, term structure effects may be significant. In principle, the loan and opportunity cost rates should refer to the same horizons; in practice, the empirical counterparts to the theoretical concepts may fall short of this requirement. This, however, is less likely to be a problem when short-term lending rates are examined.

18 Unless the demand curve has a constant semi-elasticity this is true in the textbook monopoly case; see also Klemperer (1987) for monopolistic power in the presence of switching costs. Similar arguments would apply to collusive oligopolistic markets. The famous "kinked" demand curve is probably the best-known example in the context of non-collusive behaviour (Stigler (1947)).

19 By analogy with models of firm behaviour, it is also possible to argue that the degree of response will partly depend on whether banks are more interested in size than in profits. The detailed results, however, depend crucially on the specifications of the model and few generalisations seem possible (e.g. Monti (1974) and Takeda (1985)).

rates may be important. A large share of deposits at relatively unresponsive interest rates, for instance, would tend to limit the change in loan rates.[20]

The relevance of the degree of competition in loan and deposit markets loses part of its force once a time dimension is explicitly considered. Demand curves are likely to be more inelastic in the short than in the medium run. Fixed search and switching costs, for instance, hardly seem to justify a *permanent* limited response to changes in the opportunity cost of funds. The forces of arbitrage between different banks or between banks and alternative sources of credit and uses of funds become more powerful as time elapses.

This also suggests that, while analytically correct, it may in practice be quite difficult to distinguish the first form of stickiness just described (adjustments in equilibrium) from the second, viz. non-instantaneous adjustment *between* equilibria. Unless adjustment is costless, banks may wish to smooth movements in the lending rates. There are administrative costs associated with such changes. In addition, borrowers may dislike the induced fluctuations in their incomes and cash flows.[21] Since for any given adjustment costs the profits forgone decrease with the degree of monopoly power, once again rates should be expected to be stickier in less competitive market segments.[22,23] Moreover, the speed of adjustment is likely to increase with the degree of anticipated *persistence* in the change in the opportunity cost of funds.

The aforementioned explanations of stickiness relate correctly to the response of the loan rate to market rates. In any empirical analysis, however, apparent stickiness may be detected if the influence of variables excluded from the analysis is not properly controlled for and their movements are correlated with the interest rates included in the specification. In particular, stickiness can emerge if money market rates move procyclically and default risk premia do so counter-cyclically or banks' appetite or ability to take risks and price agressiveness move in sentiment with economic activity. In this case, spreads would tend to narrow in upswings and widen in downswings.

A final question regarding the adjustment path is whether and, if so, under what conditions revisions in the loan rate are likely to be *asymmetric* with respect to increases and decreases in the rates measuring opportunity costs. Several arguments in fact suggest that the response may be faster when such rates rise. First, there may be a lag in the response of borrowers to changes in the price of credit; if so, revenue is temporarily forgone when rates are lowered but gained when they are raised. Second, in oligopolistic structures banks may expect their competitors to be more likely to follow rate reductions than increases, especially if mistaken for attempts at gaining market share;[24] as outlined above, the comparatively more responsive demand for loans in the event of rate increases

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20 Stickiness may also result from rationing (e.g. Stiglitz and Weiss (1981)). This rationale, however, is unlikely to be very relevant for the category of borrowers covered in the present study (see below).

21 Fried and Howitt (1980) develop a model in this spirit though with reference to real interest rates. Borrowers essentially pay in the form of a higher premium for the insurance provided by the bank.

22 Drawing on Rotemberg and Saloner (1987), Hannah and Berger (1989) generalise this argument to a variety of non-collusive oligopolistic structures and apply it to the deposit market. Their tests confirm the hypothesis that price stickiness increases with market concentration (for details of the empirical tests, see alternatively Hannah and Berger (1991)).

23 Moreover, the generalisation regarding the degree of competition relates only to stickiness with respect to changes in opportunity cost interest rates. In non-perfectly competitive environments, where objectives other than profit maximisation are more tenable, loan rates may actually be *more* responsive to *other* types of shocks. For example, in the case of full-cost pricing or when size is traded off against profits or pursued subject to minimum capital levels, any shock affecting *average* profitability could elicit a rise in the spread. The reason is that the bank would have a reserve of unexploited profit opportunities to tap. This is especially relevant in the context of the large loan losses experienced by banks in several countries in recent years. It implies that the spread would rise *over and above* any increase in perceptions of higher risks *at the margin*.

24 This is, of course, the basis of the "kinked" demand curve; for "small" changes in marginal costs, prices do not move; for larger changes, adjustment is stickier in the upward direction.

means that the costs of being away from equilibrium are larger when market rates are rising. Moreover, in the presence of collusive arrangements, the risk of triggering a price war through rate reductions may make downward revisions inherently costly. Third, as with stickiness, in any empirical analysis the asymmetry may emerge because of changes in variables correlated with interest rate movements and not properly controlled for. For example, the demand for bank funds may become more inelastic during recessions, as bank customer relationships are strengthened and borrowers become more "captive" of their traditional sources of funds. If market interest rates tend to fall during recessions, an asymmetric response would be detected in the data.[25]

The aforementioned discussion implies a number of points for the empirical analysis. First, the smallest set of variables in a general specification of a loan rate equation should contain a money market rate and a policy rate. Deposit rates or the average cost of funds may also be relevant, especially if mark-up pricing is widespread. Indicators of the riskiness of lending could also prove useful; owing to data limitations, however, they are not employed in what follows.

Second, the path followed by the loan rate in response to changes in rates that are its proximate determinants is a function of a number of factors: the degree of competition in the industry and the market segment concerned; the characteristics of the class of borrowers to which the rate applies; the structure of the financial institution's balance sheet, notably its sources of funds; the degree of anticipated persistence in the change of reference interest rates; and "cyclical" elements. Without a detailed analysis and adequate information, it may be quite difficult to disentangle empirically what factors may account for any country differences unveiled by the econometric evidence.[26]

Third, the response path may not be symmetric with respect to increases and decreases in the determining rates. It is worth testing for the presence of such asymmetries.[27]

Finally, whenever a money market rate turns out to be statistically significant in a loan rate setting relationship, its link to the policy rate needs to be explicitly modelled when considering the pass-through of changes in policy.[28] Nevertheless, it is also of interest to consider the reaction of the loan rate to its proximate determinants *separately*, i.e. assuming that money market rates respond fully and instantaneously to policy rate changes. This can help to distinguish cross-country differences reflecting the behaviour of the banks from those that originate in the link between policy and market rates themselves.[29]

IV. A PRELIMINARY LOOK AT THE BASIC VARIABLES

1. Lending rates

The first choice confronting any empirical research on bank lending rates is that of the specific rate variable. The loan market is far from homogeneous. The intended use of the funds lent,

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25 With reference to the credit card market in the United States, Ausubel (1991) puts forward the view that rates may be sticky downwards in part because customers behave irrationally. In contrast to the Stiglitz and Weiss (1981) scenario, where riskier customers are less sensitive to higher borrowing costs (because their probability of default is higher), he points out that the opposite may be true: safe customers systematically *underpredict* the likelihood of incurring charges. He provides some evidence to confirm this hypothesis.

26 Cottarelli and Kourelis (1994), considering a large sample of industrial and non-industrial countries, find evidence that the responsiveness of lending rates is indeed related to structural proxies of the degree of competition in markets.

27 Hannah and Berger (1991), for instance, find evidence of such asymmetries for US bank deposit rates.

28 Similar arguments would clearly apply to any other rate influencing the loan rate setting decision (e.g. deposit rates).

29 This, of course, does not apply when *only* policy rates turn out to be relevant in the loan rate setting relationship.

the sources of repayment and the characteristics of the borrowers, not least their ease of access to alternative external funding, differ widely. This implies considerable differences in contract terms on the loans, including maturity, covenants, collateral, fee structures and, of course, the interest rate charged. Such differences are only partly moderated by the widespread practice of setting relatively standard terms for broad classes of loans, a practice that probably reflects a mixture of factors, not least the information costs of a finer approach and broader institutional features. As the foregoing sketch of theoretical paradigms indicates, the response of interest rates may be quite sensitive to class-wide and contract-specific characteristics.

From the viewpoint of empirical work, the various types of rate have pros and cons. An average rate calculated over a broad set of classes of (new) loans is a better approximation to the (marginal) cost of borrowing from banks than narrower averages. It is, however, of more difficult interpretation, as it mixes the effect of a greater variety of elements. Actual rates are generally superior to reference rates to which varying spreads are applied. But reference rates may be less sensitive to certain factors (e.g. credit risk) which may be difficult to model separately owing to the limited availability of statistics at the relevant frequency.

Box 1: Bank lending rates[1]

Australia:	Rate on overdrafts and fully drawn loans; large business (≥ $100,000); minimum of a range reported by major banks. (Month-end.)
Belgium:	Rate on overdrafts; prime customers; major banks. (Month-end.)
Canada:	Rate on prime business loans; chartered banks. (Month-end.)
France:	Base rate. (Month-end.)
Germany:	Rate on current account credits; DM 1-5 million; average. (Survey 2nd-3rd week of the month.)
Italy:	Short-term loan rate; average of 89 banks. (Survey 10th, 20th and last day of the month; average.)[2]
Japan:	1. Loan rate on all new loans (*all maturities*); average of all banks. (Month-end.) 2. Loan rate on new short-term loans (over one month, less than one year); average of all banks. (Month-end.)
Netherlands:	Rate on current account credits (unsecured); minimum. (Month-end.)
Spain:	Rate on current accounts; 3 months - 1 year.
Sweden:	1. Rate on bank advances to businesses. (Monthly average at quarter-end.) 2. Rate on bank loans to businesses. Volume-weighted. Central bank survey. (Quarter-end.)
United Kingdom:	Prime ("blue chip") rate (base rate plus 100 b.p.); London clearing banks. (Month-end.)
United States:	1. Prime rate; short-term loans to businesses. (Monthly average.) 2. Rate on short-term loans to businesses; average. (Survey 1st week of mid-quarter month.)

[1] Month-end should be interpreted loosely; in some cases it refers to a day in the last week of the month. [2] Some values interpolated; two-month moving average used owing to very high volatility.

The ideal solution would be to consider the behaviour of rates for key classes of loans as well as some broader averages. In practice, especially in a cross-country context, such an analysis is heavily constrained by the availability of data. It is generally possible to distinguish short from longer-term rates and to identify those that apply to the business sector. Beyond this, however, large gaps and differences exist. Average rates for significant portions of the loan portfolio are almost invariably not available. Standard reference rates (e.g. "prime" rates) are sometimes the only ones for which a historical series exists at frequent observation intervals. Moreover, information about how representative the various rates are is typically limited.

Given these constraints, the following empirical tests will focus heavily on the set of short-term rates deemed to apply primarily to the business sector; where appropriate, more than one rate is used for each country. Given the emphasis on adjustment paths, monthly series (if possible measured at month-end) are used;[30] this was not feasible in the case of Sweden, however, for which only quarterly data were available. The list of variables is shown in Box 1. Unfortunately, in the case of Austria and Switzerland no suitable rates could be found. For five countries (Australia, Belgium, Germany, the Netherlands and Spain), the loan rate refers to current account/overdraft advances. For three of the Anglo-Saxon countries (Canada, the United Kingdom and the United States) as well as for France, the rates are "prime"/"base" reference rates. For Italy and Japan, they are averages for various classes of loans, in Japan including some long-term loans for part of the period. In the case of the United States, an actual rate on short-term loans to businesses, based on survey data and with quarterly frequency, was also chosen. The quarterly rates for Sweden are averages of all loans to businesses; they probably include a very small proportion of longer-term loans.

Box 2 provides some, albeit limited, information about the type of borrowers and percentage of bank lending for which the chosen rates can be regarded as representative. For the group of countries for which a prime/base rate is used, the available evidence suggests that the rate nowadays applies primarily to *small and medium-sized* businesses, with large corporations borrowing mainly at money market related rates; Canada appears to be a partial exception to this pattern. Over time, in the wake of a heightening of competitive pressures in financial systems, the prime rate has clearly lost its original function of basic reference rate for high-quality customers. Overdrafts/current account rates apply mainly to business sector lending. In the case of Australia, the Netherlands and probably Germany and Belgium,[31] the rates chosen relate mainly to large borrowers; the rate for Spain seems to have a broader coverage. The rate for Italy relates largely to the business sector, but clearly includes firms of all sizes, paying rates with possibly varying degrees of stickiness. In the case of Japan, the rate covers all borrowers; given the limited degree of price differentiation that appears to characterise the Japanese loan market, however, this should not give rise to ambiguous interpretations. What could potentially have more serious consequences is the fact that the series actually includes also medium and long-term loans until March 1990. Even so, inspection of the data indicated that this series has behaved remarkably like that for short-term loans in the more recent period: term structure effects do not appear to be significant, as a result of the behaviour of both the component rates and the corresponding shares in total loans.[32] All of these cross-country differences in the nature of the data should be borne in mind when assessing the statistical results.

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30 For the analysis of certain issues, such as the ability to defend exchange rate commitments against speculative attacks, even higher frequency would be desirable.

31 In Belgium, large companies actively use fixed-term loans with rates that are closely linked to market rates.

32 Splicing the two series was preferred to using a rate on all short-term loans outstanding. This in fact exhibited considerably slower adjustment because of "ageing" effects at the relevant frequencies.

Box 2: How representative are the lending rates?[1]	
Australia:	Some one-third of bank short-term and adjustable rate business loans are revolving credits (estimated to be around 20% of total short-term and adjustable rate business credit).
Belgium:	Some 30% of bank short-term business loans take the form of overdrafts (around the same proportion of total short-term business credit).
Canada:	The rate charged on the great majority of business loans is directly linked to the prime rate; practice of applying money market related discounts to highest quality borrowers is infrequent (Clinton and Howard (1994)).
France:	Base rate applicable mainly to small companies; larger companies borrow primarily at money market related rates (questionnaire). Some one-quarter of bank adjustable rate lending is base rate related; around two-thirds is money market related (survey of large banks; Bank of France (1993)).
Italy:	Some 60% of total bank lending (short-term credit) is short-term (up to 18 months) loans to businesses.[2] Only 5% of the institutions' lending is to households (narrowly defined) and 14% to the unincorporated sector.[3] Current account credits amount to over 50% of total short-term credit of these institutions.
Japan:	Probably over 90% of bank ("Zengin") short-term lending is to the business sector (including unincorporated enterprises). There are no significant differences in the rates applied to the household or business sector or to enterprises of different sizes (questionnaire).
Netherlands:	Some 2/3 of total short-term business lending takes the form of current account credits.
United Kingdom:	Some 80% of bank lending to small corporate firms (with a turnover of less than £10 million) is base rate related (survey); only around 40% of short-term borrowing of large corporates (75% of total net assets of the sector) takes the form of bank lending, mainly related to money market rates (Bank of England (1993)).
United States:	Over 40% of commercial and industrial (C&I) loans of commercial banks (including adjustable rate medium and long-term loans) are related to prime; probably around one-third of all prime-related loans are to households (including consumer and home-equity loans). The share of C&I loans related to prime has declined appreciably since the late 1980s, a process that began in the mid-1990s (Senior Loan Officer Survey (1993), Radecki and Reinhart (1994), Wolfson and McLaughlin (1989) and Brady (1985)).

[1] For the ratio of short-term to total bank credit, see also the accompanying paper on the structure of credit. [2] Excluding the unincorporated sector. [3] The remaining portion is mainly to financial institutions or holding companies.

2. Money market rates

The choice of money market rate as the key measure of the marginal opportunity cost of funds in part reflects the characteristics of the countries' financial systems (Box 3). In most cases an interbank loan rate was used. In Italy and Sweden, where for at least part of the period under consideration the interbank market was not well-developed, a government Treasury bill rate was preferred. In Canada and Australia, where private short-term securities markets are important, a commercial paper rate and bank bill rate respectively were selected; the rate on certificates of deposit was taken as benchmark for the United States. In general, the specific choice of rate is unlikely to be important, since market rates of similar maturities tend to move closely together, at least for the precision required for present purposes. The maturity was standardised at three months.

Box 3: Three-month money market rates	
Note:	Unless otherwise specified, interbank loan rates. (Month-end.)
Australia:	Bank bills (acceptable by the central bank). (Monthly average.)
Canada:	Prime corporate commercial paper. (Month-end.)
Italy:	Treasury bills (ordinary), tender rate; gross of tax. (Monthly average.)
Japan:	Call money (unsecured); (until 2/93) RP on bonds (Gensaki). (Monthly average.)
Sweden:	Treasury discount notes, market yield. (Monthly average at quarter-end.)
United States:	Certificates of deposit; secondary market rate. (Monthly average.)

3. Policy rates

At the level of operating procedures, all the central banks considered in this study gear their policy instruments towards influencing quite closely short-term interest rates ("operating objectives"). They do so primarily by determining the conditions that equilibrate demand and supply in the market for bank reserves, most notably by setting the terms at which the banks' marginal demand is met. Beyond this common element, approaches differ in respect of the precise instruments and strategies followed. Such differences have implications for the rate that may be deemed as the most appropriate indicator of policy choices.[33]

In a first group of countries, policy is essentially geared to influencing overnight rates. The United States, Australia, Sweden and Japan fall within this category. In all of them the central banks operate frequently in the markets (at least once a day). In the case of Sweden, central bank intentions are signalled more explicitly by the key rate through which the authorities provide marginal finance (Box 4). No such rates are available for the other countries in this group; the overnight rate may contain greater "noise". Nevertheless, in both Australia and the United States during the recent period of falling rates, the central banks have provided markets with clearer indications of their policy objectives for the rate, be it in the form of published standards (Australia, since 1990) or in a less formal fashion (United States, since about June 1989). As a result, the overnight rate has tended to follow even more smoothly the norms set by the authorities.

33 For a detailed analysis of the issues involved and a description of changes in operating procedures of central banks up to the late 1980s, see Kneeshaw and Van den Bergh (1989).

Box 4: Policy rates[1]	
Australia:	Call money (11 a.m. unofficial market). Overnight. (Month-average.)
Belgium:	RP tender rate (bills and government securities). One-week. (Month-end.)
Canada:	Official Bank Rate (average tender rate for 91-day Government of Canada Treasury bills + 25 b.p.). Generally overnight. (Month-end.)
France:	Tender rate. Generally one week. (Month-end.)
Germany:	RP tender rate. Generally two weeks to one month. (Month-end.)
Italy:	1. (Whole period) Effective rate on fixed-term advances; weighted average. 5-30 days. (Month-end.)[2]
	2. (Recent period, from 91:1) RP tender rate; purchases; average. (Month-average.)
Japan:	Call money (unsecured). Overnight. (Month-average.)
Netherlands:	Special loans rate (equivalent to RPs). Generally up to one week. (Month-end.)
Spain:	RP tender rate. 10-day (until 90:4)/overnight. (Month-average.)
Sweden:	Bank of Sweden's marginal loan rate. Generally overnight. (Quarter-end.)
United Kingdom:	Outright purchases (indicator of minimum ("stop") rate, Band 1 bills). 1 day to 2 weeks. (Month-end.)
United States:	Federal funds rate; average. Overnight. (Month or quarter-average, as appropriate.)

[1] Month-end refers to the last working day of the month or the last date on which the relevant transactions take place. [2] A two-month moving average was chosen given the extreme volatility in the rate.

In most of the remaining countries policy hinges on the central bank's provision of reserves at periodic tenders, generally through repurchase agreement transactions, at maturities that typically exceed one day. With the exception of Sweden, all the continental European countries may be classified in this group. The rates applied to the tender operations provide a useful indicator of policy intentions (Box 4). Overnight rates need not be such a good guide. Admittedly, standard facilities for supplying/absorbing reserves, averaging provisions for compulsory reserve holdings and other ad hoc operations are often employed to limit their volatility. Nonetheless, in some countries of this group policy has at times accepted or encouraged substantial fluctuations in the rates on a day-to-day basis. This has been especially true at times when exchange rate commitments have come under pressure.

Canada does not fall neatly within either group. Much of its policy strategy is geared to affecting the overnight rate, but with a clear view to influencing the three-month money market rate. Indeed, the rate at which banks are induced regularly to meet their marginal reserve needs (the Official Bank Rate) is itself set as a mark-up on the weekly three-month Treasury bill tender rate: the overnight rate tracks it relatively closely. Under these conditions, the Bank Rate appears to be a good policy indicator.

Another intermediate case is that of the United Kingdom. By comparison with most continental European countries, operations are much more frequent (more than once a day) and at shorter maturities. At the same time, the overnight rate is not such a good proxy; policy and central bank objectives are better captured by the rate at which its market operations are carried out.

Albeit to different degrees, since the mid-1980s - the basic period for estimation of the regressions - operating procedures have evolved considerably in several of the countries covered, the

continuation of a process dating back to at least the late 1970s or early 1980s. True, the fundamental orientation towards short-term interest rate objectives has, if anything, strengthened. Nonetheless, changes in instruments and tactics suggest that shifts in the relationship between policy and market rates may sometimes have taken place. These can in some cases complicate the precise choice of policy indicators for the whole period.

Two examples of possible shifts in the relationship between policy and money market rates have already been mentioned; they relate to the more explicit attitude towards interest rate objectives in Australia and the United States in more recent years. Another such example is the broad reform of operating procedures in Japan in late 1988 and early 1989 aimed at allowing market forces to exert somewhat greater influence on longer-term money market rates and at making it easier for market participants to read policy signals.[34] In none of these cases, however, is the choice of policy indicator affected. A more general trend has been the decreased reliance on standing facilities as a means of meeting banks' marginal reserve needs, yielding ground to more discretionary open market operations. Even so, the conspicuous changes in rates on official facilities often retain an important signalling role: they can help to crystallise expectations about changes in the policy stance. Inspection of the relationship between the various rates involved generally suggests that those on discretionary operations may be a useful indicator for the whole period; any residual influence of changes in those on standing facilities can be tested for separately.

For some countries, however, changes in operating procedures have been so profound as to make a unique choice of policy indicator rate problematic. This is true for Italy and Belgium. While operations have resembled fairly closely those of other continental European countries since the early 1990s, before then a key role was played by the Treasury bill tender rate;[35] in Italy, the penalty rate on fixed-term loan advances[36] was also significant, especially at times when banks were short of reserves. This suggests that, in addition to a standard equation for the whole period, a separate one should be tested for since the early 1990s, with tender rates used as the relevant policy rates. For Belgium, the equation for the whole period includes *only* the three-month interbank rate: this variable tracks the Treasury bill rate extremely closely, and it would make little sense to have both in the regression. For Italy, the rate on fixed-term advances is used as "the" policy rate and included alongside the three-month Treasury bill rate, the proxy for the money market rate. It is clear, however, that in both cases it is rather hard to distinguish meaningfully between "policy" and "market" rates over the period: the money market rate proxies will directly capture much of the policy effect.

Spain appears to be an intermediate case. Starting around 1989 and ending in May 1990, operating procedures were reformed in terms of both instruments and objectives so as to resemble closely those in other continental European countries. This implied considerably greater emphasis on smoothing fluctuations in short-term rates and on more market-oriented instruments of control. Here two different tender rates were spliced, but it is unclear whether that prior to May 1990 is a good approximation to policy influences.

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34 A key step in the reforms was to shorten the maturity of central bank open market operations while greatly increasing their frequency.

35 In Belgium, until the end of January 1991 the National Bank guided money market rates by fixing the rates on one to three-month Treasury certificates (Périlleux and Wouters (1994)). In Italy, until 1988-89 the Bank of Italy was under the obligation to set the minimum price at the weekly Treasury bill tenders. The fact that compulsory reserve holdings could not be used to meet settlement needs also meant that until October 1990 the overnight rate behaved very erratically (Gaiotti (1992)). On both countries, see also Kneeshaw and Van den Bergh (1989).

36 The penalty schedule was set in relation to the frequency with which individual banks had recourse to this form of credit.

Table 1

Characteristics of the relationship between the loan and money market rates

	Spread (RL-RM)						Loan rate ΔRL = 0 (% obs.)	Period
	Mean	Minimum	Maximum	Negative obs.	SD	Trend[1]		
Australia	2.59	- 0.35	4.55	2	1.25	0.03***	42.5	84:1-94:7
Belgium	2.95	1.50	4.12	-	0.69	0.01***	61.4	84:1-94:7
Canada	1.05	- 1.80	2.25	1	0.46	-	46.5	84:1-94:7
France	0.83	- 5.35	2.73	19	1.11	- 0.01***	78.7	84:1-94:7
Germany	2.42	0.54	4.55	-	0.94	0.01***	2.4	84:1-94:7
Italy	2.57	- 0.27	5.42	3	1.27	- 0.02***	3.4	84:7-94:6
Japan	0.46	- 1.37	1.70	29	0.64	0.02***	0.0	84:1-94:7
Netherlands	1.41	0.75	2.13	-	0.30	0.004***	63.8	84:1-94:7
Spain	2.65	- 5.60	5.82	8	1.68	-	0.8	84:1-94:7
Sweden (1)[2]	2.61	1.61	3.71	-	0.58	-	0.0	86:III-92:II (Q)
(2)[2]	2.88	- 0.72	4.62	1	1.15	0.09**	0.0	89:I-94:II (Q)
United Kingdom[2]	0.92	0.06	2.43	-	0.27	0.001**	63.0	84:I-94:7
United States (1)[2]	2.03	1.05	2.95	-	0.54	0.01***	54.3	84:1-94:7
(2)[2]	1.73	0.98	3.53	-	0.48	-	2.4	84:I-94:I (Q)

Note: For a list of symbols used here and in subsequent tables, refer to the Appendix at the end of this paper.

[1] Coefficient of a linear trend in a regression for the spread (including a constant). [2] Refers to the loan rates identified in Box 1.

4. Descriptive statistics

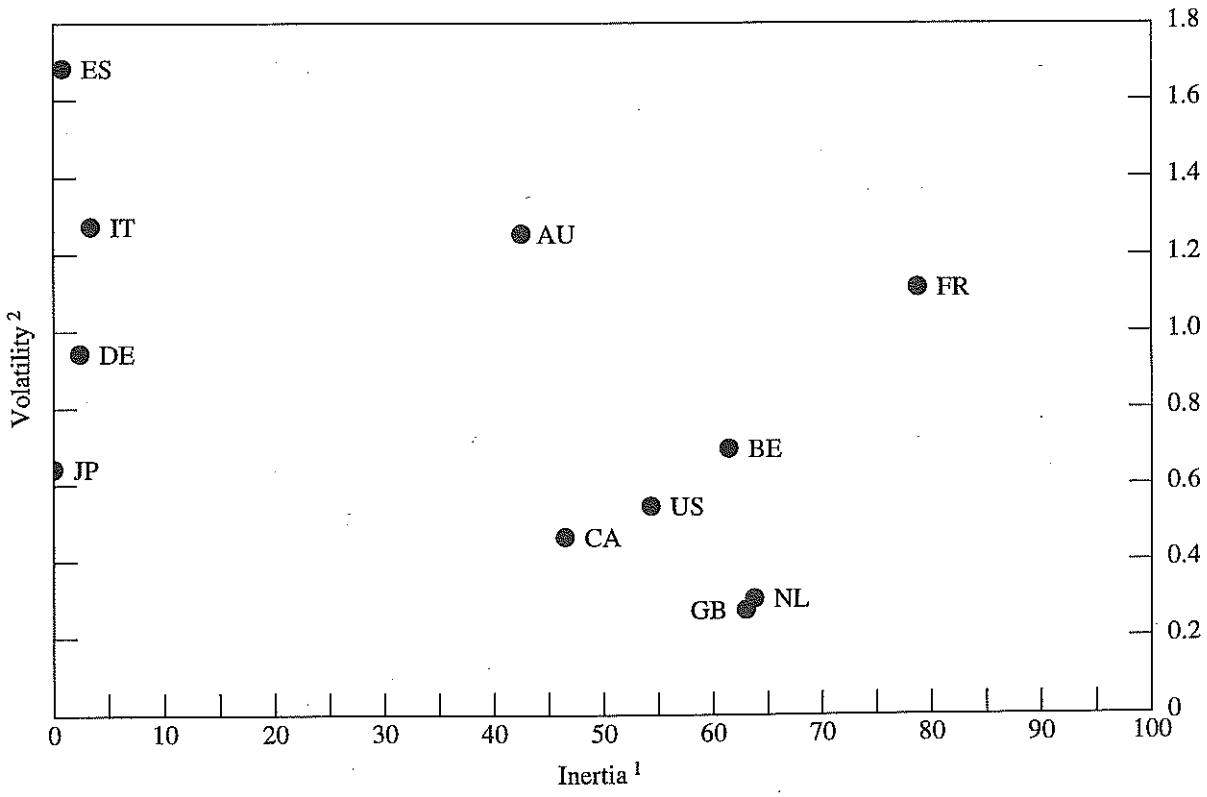
It may be useful to consider briefly some of the main time series characteristics of the data. In order to keep the treatment manageable, detailed plots of the individual series and corresponding spreads are shown in Annex I and what follows limits the attention to two bivariate relationships (loan rate/money market rate and money market rate/policy rate). This is done even though in several cases it is possible to trace a direct relationship between the loan and policy rates (see below).

Table 1 summarises some key features of the behaviour of the loan rate and the loan/money market spread. Several points stand out.

First, the mean of the spread, generally measured since the mid-1980s, while positive, varies greatly across countries. As argued above, however, cross-country differences in this respect are very hard to interpret. In a majority of countries, negative values can be observed. These have typically coincided with episodes of resistance to severe downward pressure on exchange rates, especially in more recent years (Canada and continental European countries); despite similar pressures, the monthly spread has never been negative in the United Kingdom. The only country for which the spread has been negative for protracted periods is Japan. No doubt this reflects at least in part the extensive regulation of deposit rates and the comparatively limited recourse to wholesale funding for much of the period under consideration.

Graph 2

Loan rate inertia and volatility in the spread



[1] Measured by the percentage of observations for which the change in the loan rate is zero. [2] Measured by the standard deviation of the spread between the loan and the money market rates.

Table 2

Characteristics of the spread between the policy and money market rates

	Correlation		Policy rate		Period
	Level	Changes	SD	ΔRP = 0 (% obs.)	
Australia	0.99	0.71	0.93	12.6	84:1-94:7
Belgium	0.97	0.79	0.47	16.7	91:1-94:7
Canada	0.99	0.76	0.59	1.6	84:1-94:7
France	0.90	0.24	0.25	59.1	84:1-94:7
Germany	0.99	0.68	0.23	33.9	84:1-94:7
Italy (1)*	0.85	0.32	0.51	9.5	84:7-94:6
(2)*	0.94	0.81	1.00	2.4	91:1-94:7
Japan	0.99	0.77	0.32	0.0	85:7-94:6
Netherlands	0.99	0.76	0.26	38.6	84:1-94:7
Spain	0.93	0.37	0.73	5.7	84:3-94:7
Sweden	0.84	0.91	6.61	26.8	84:I-94:I (Q)
	0.85	0.95	9.23	23.8	89:I-94:I (Q)
United Kingdom	0.99	0.87	0.70	61.4	84:1-94:7
United States	0.99	0.75	0.30	0.8	84:1-94:7
	0.99	0.90	0.67	0.0	84:I-94:II (Q)

* Refers to the policy rates identified in Box 4.

Second, the percentage of observations for which there is no change in the (monthly) loan rate is typically very high (at least 40% or over); the administered nature of the rate comes out quite clearly. The very low percentages for Italy and Japan are misleading, since the rates are averages of actual rates covering different classes of borrowers. The same is true for Germany, given the way the indicator is constructed.[37]

Third, there is, however, little correlation between the degree to which rates appear to be "administered" and measures of the volatility in the spread - a rough indicator of "stickiness" (Graph 2). Statistically, therefore, the results are unlikely to be fundamentally affected by this aspect of the loan rates chosen.

Finally, in a majority of countries there are signs of a positive "trend" in the spread (Table 1). Inspection of the plots indicates that this results primarily from a widening in the recent recession, especially in those countries where banks have suffered significant losses in the wake of comparatively large asset price movements, notably in real estate prices, and increases in the indebtedness of non-financial sectors (Australia, United States, Sweden and Japan). In the United Kingdom the widening is statistically significant but negligible.[38] Only in Italy and France[39] are there signs of a significant decline. On the whole, the evidence appears to indicate that in most countries the influence on the spread of the recent recession, heightened by the pattern of expansion that preceded it, swamps any downward long-term pressures associated with financial liberalisation.

Policy rates, while generally more flexible than loan rates, also appear not to change for a considerable number of observations in certain countries, notably the United Kingdom, the

37 The rate is an average of reported rates (excluding the observations falling within the top and bottom 5% range of the sample distribution). The rate corresponding to the lower bound, for instance, moves far less frequently: the percentage of observations for which there is no change is around 50%.

38 In Germany, by contrast, the initial part of the recent rise in the spread coincides with rapid credit expansion following the country's reunification.

39 In France, there is a marked narrowing of the spread in 1989; the spread widens again as from 1993 (see Annex I).

Netherlands, Germany and Sweden (Table 2).[40] Here again, however, there is little evidence that greater "inertia" in the above sense is associated with a lower correlation between policy and money market rates. Indeed, as might be expected, the correlation is very high (generally 95% or more) when measured in levels, somewhat lower in first differences. This confirms that econometric results which attempt to distinguish the influence of the two variables on the loan rate should be interpreted with some caution, at least as regards long-run relationships.

V. CORE ECONOMETRIC RESULTS

Following the clues derived from the theoretical discussion and the preliminary look at the data, this section considers the behaviour of loan rates on the basis of the *minimum* set of variables deemed a priori relevant for their determination (policy and money market rates). In identifying the most appropriate specification, a standard general-to-specific approach is followed within the set of equations parametrised in error-correction form, a popular set which allows considerable flexibility in capturing the dynamic interaction between the variables. The dependent variables, therefore, are always measured in first differences. All regressions were estimated by OLS.

1. Minimum specification: whole sample

Table 3 summarises the basic pattern of results for the proximate determinants of the loan rates over the whole sample, typically early 1984 to mid-1994; the detailed findings are contained in Annex I (Table AI.1). The equations describing the *average* behaviour of the rates over the whole period generally appear to be sufficiently well specified. In particular, there are virtually no signs of serial correlation. As a further test of the adequacy of the benchmark specification, the relationships were re-estimated to the end of 1993 and "out-of-sample" forecasts performed; an eye on the potential loss of degrees of freedom counselled against reserving observations *entirely* for such an exercise. In fact, the "best" specification proved to be very stable, both in terms of the size and significance of the coefficients. The post-sample forecasting performance is adequate, in the sense that the projected values lie within the respective confidence bands; Germany is the only exception (Annex I, Graph AI.2). There is, however, some tendency for the forecasts to overpredict, probably reflecting the cyclical position of the economies.

As regards the relevant rates in the set of explanatory variables, one interesting result is that the policy rate often enters *directly* into the equation. It does so not only in the short run but also in the long run. From this perspective, countries can arguably be divided into three groups. In the first, consisting of the United States and Sweden, it is the money market rate that dominates. In a second, comprising the United Kingdom, Canada, the Netherlands and, possibly, Japan, it is the policy rate that stands out more clearly. Elsewhere, no clear pattern emerges. In the case of Belgium and Italy, because at least one policy rate is equivalent to a three-month money market rate for much of the period, interpretation is more difficult.

Subject to the caveats that derive from the high correlation between the money market and policy rates (at least as regards the effect on long-run coefficients), these results point to a significant direct link in most countries. This is so even if the possible effects associated with changes in the rates on official standing facilities are disregarded and when central bank operations are limited to very short maturities (e.g. in the United Kingdom and the Netherlands). Whether the link arises from oligopolistic structures or signalling effects is generally more difficult to say, but not crucial for present purposes.

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40 In Germany, however, "inertia" is primarily concentrated in the initial observations of the sample period.

Table 3

Determination of the loan rate: basic pattern of results (whole period)*

	Short-run				Long-run		$\bar{R}^2$	SEE	DW	Sample period
	Δ_t		Δ_{t-i}		RP	RM				
	RP	RM	RP	RM						
AU	*	*		*	*		0.80	0.24	2.15	84:1-94:7
BE		*		*		*	0.71	0.24	1.97	84:1-94:7
CA	*	*(ws)	*	*	*		0.82	0.23	2.16	84:1-94:7
FR	*	*		*		*	0.45	0.13	1.99	84:1-94:7
DE		*		*	*		0.51	0.11	2.14	84:1-94:7
IT	*	*		*		*	0.77	0.16	2.10	84:10-94:6
JP		*			*		0.62	0.09	2.15	85:10-94:7
NL	*		*	*	*	*	0.80	0.15	1.97	84:1-94:7
ES			*			*	0.36	0.28	2.23	84:6-94:7
SE (1)		*				*	0.86	0.42	2.03	86:IV-92:II(Q)
(2)		*				*	0.96	0.39	1.95	89:II-94:II(Q)
UK	*	*		*	*		0.99	0.07	2.16	84:1-94:7
US (1)		*	*		*(ws)	*	0.76	0.13	2.09	84:1-94:7
(2)		*				*	0.78	0.42	1.87	84:I-94:I(Q)

* The estimation period is that shown in Table 1.

Table 4 describes the response of the loan rate to a simultaneous 100 basis point rise in *all* the rates that appear as relevant in the regression. It considers, that is, loan rate setting behaviour abstracting from cross-country differences in the relationship between policy and market rates. In order to capture different aspects of stickiness, the responses are shown both in absolute terms and as a percentage of the long-run adjustment. Plots of the response paths together with the corresponding confidence bands can be found in Annex I (Graph AI.3).

The point estimates of the long-run responses generally range between 0.80 and 1.10. They are considerably lower in France and considerably higher (suspiciously so) only in Italy, Belgium and Spain. Although formal tests indicate that a long-run response of equal size to the shock can be statistically rejected at traditional confidence levels in most countries, it is not with respect to long-run responses that cross-country differences are most apparent.

Differences are more pronounced with respect to the pattern of responses over time. In a first group of countries, comprising all those where policy rates are especially relevant (the United Kingdom, Canada[41] and the Netherlands) as well as Belgium, by the end of the first quarter the loan rate has already responded by around 100 basis points. Indeed, in the Netherlands and the United Kingdom a similar adjustment takes place within the first month. The finding is especially significant for the United Kingdom, given the large share of short-term lending in total lending and the large fraction of small borrowers' financing that is related to the loan rate chosen. It is less so for the Netherlands, given that the rate applies to large businesses. In a second group, comprising the remaining continental European countries and Japan, adjustment appears to be considerably slower, ranging from around 20% to no more than 70% within the first quarter. Finally, the United States and Australia seem to fall in between. Once the nature of the rates chosen is taken into account, however, the United States is probably better classified in the fast-adjustment group, while responses in Australia are more similar to those in some continental European countries (Box 2). In particular, for the United States, the rate based on survey evidence, covering only the business sector and including

41 The present estimates for Canada are considerably lower than those presented by Clinton and Howard (1994) based on *weekly* data, where adjustment is virtually complete within the first month. Moreover, they argue that their own estimates probably understate the true speed.

Table 4

Loan rate response to a simultaneous change in policy and money market rates (whole period)[1]

	Absolute change (in percentage points)						2 x SE	P-value[2] %	As % of long-run response				
	1 month	1 quarter	2 quarters	1 year	2 years	Long-run			1 month	1 quarter	2 quarters	1 year	2 years
AU	0.40	0.78	0.86	0.86	0.86	0.86	0.97	0.2***	46	90	99	100	100
BE	0.61	0.99	0.97	1.05	1.17	1.27	1.05	3.8**	47	76	74	80	90
CA	0.74	0.92	0.97	1.00	1.00	1.00	0.70	93.2	74	92	97	99	100
FR	0.43	0.45	0.51	0.60	0.69	0.74	0.69	2.0**	59	61	69	81	93
DE	0.11	0.45	0.61	0.82	0.99	1.05	0.53	32.3	10	42	58	78	94
IT	0.26	0.69	0.84	1.00	1.15	1.22	1.45	30.2	21	57	69	82	94
JP	0.32	0.53	0.63	0.74	0.82	0.84	0.58	7.5*	39	63	76	88	97
NL	1.08	0.96	1.04	1.08	1.08	1.08	0.39	0.8***	100	89	96	99	100
ES	0.0	0.30	0.51	0.80	1.06	1.17	1.48	41.0	0	25	43	67	90
SE (1)	-	0.74	0.86	0.92	0.92	0.92	1.45	41.4	-	80	93	99	100
(2)	-	0.61	0.76	0.79	0.80	0.80	1.10	0.1***	-	77	95	100	100
UK	1.00	1.01	1.01	1.01	1.01	1.01	0.14	1.7***	99	100	100	100	100
US (1)	0.43	0.75	0.80	0.85	0.88	0.88	0.47	0.0***	49	86	92	97	100
(2)	-	0.84	1.03	1.01	1.09	1.09	0.96	4.8**	-	77	95	93	100

[1] Time path of the response of the loan rate to a simulated 100 basis point change in both policy and money market rates. [2] Marginal significance level for the F-test that the long-run response of the loan rate is equal to 100 basis points.

Table 5

Loan rate response to a change in the policy rate (whole period)[1]

	Absolute change (in percentage points)						As % of long-run response				
	1 month	1 quarter	2 quarters	1 year	2 years	Long-run	1 month	1 quarter	2 quarters	1 year	2 years
AU	0.34	0.77	0.86	0.86	0.86	0.86	39	89	99	100	100
BE[2]	-	-	-	-	-	-	-	-	-	-	-
CA	0.73	0.93	0.97	1.00	1.00	1.00	73	93	97	99	100
FR	0.45	0.46	0.52	0.60	0.67	0.70	64	65	75	85	95
DE	0.11	0.50	0.61	0.81	0.99	1.05	11	48	58	77	94
IT	0.22	0.53	0.66	0.69	0.70	0.71	31	75	93	97	100
JP	0.00	0.24	0.48	0.64	0.74	0.76	0	31	63	84	97
NL	1.08	0.97	1.00	1.03	1.03	1.03	105	94	97	100	100
ES	0.00	0.31	0.51	0.76	0.97	1.06	0	29	48	71	91
SE (1)	-	0.59	0.81	0.89	0.90	0.90	-	66	90	99	100
(2)	-	0.50	0.69	0.77	0.78	0.78	-	65	89	99	100
UK	1.00	1.01	1.01	1.01	1.01	1.01	99	100	100	100	100
US (1)	0.34	0.74	0.78	0.79	0.79	0.79	44	94	99	101	100
(2)	-	0.91	1.03	0.99	1.06	1.06	-	86	97	94	100

[1] Time path of the response of the loan rate to a simulated 100 basis point change in the policy rate; the response of the money market rate is endogenised on the basis of the regressions shown in Annex I. [2] At least until the implementation of new operating procedures in January 1991, the response to changes in the interbank rate shown in Table 4 can be taken as a very good approximation to the response to changes in the policy rates.

loans related to market rates, adjusts faster than the prime, nowadays mainly representative of the retail segment. For Australia, independent evidence indicates that the adjustment of other rates is generally slower than the one chosen here (Lowe and Rohling (1992) and Lowe (1994)). In all countries the pass-through is virtually complete within two years, at least equal to some 90% of the long-run response.[42]

If the confidence bands around the point estimates are taken into account, cross-country differences are obviously not as sharp. In particular, the margin of doubt is comparatively large in the case of some of the slowest-adjusting countries, notably Spain and Italy, and in Belgium. It is, of course, also considerable in the case of those relationships estimated on quarterly data. Nevertheless, the broad picture is probably not misleading. Moreover, for the countries in which rates adjust fastest, the United Kingdom and the Netherlands, the confidence bands are especially narrow, highlighting their differences from the rest.

These conclusions regarding the broad pattern of responses are largely unchanged once the relationship between money market and policy rates is explicitly considered (See Table 5 and Annex I for detailed econometric results and plots of responses). The relatively close correlation between three-month money market and policy rates in conjunction with the direct link between policy and loan rates combine to produce this result.[43] The main exception is Japan, where no significant response can now be detected during the first month.

2. Minimum specification: stability over sub-periods

There are several reasons for believing that the relationships captured in the previous specifications may not have remained invariant over time; these are listed in Box 5 together with the countries affected and the periods concerned. The list includes: the temporary imposition or lifting of direct controls on banks' balance sheets, most notably on lending rates and credit extension (Australia, Italy and France); exchange rate crises (Canada and a number of European countries); changes in operating procedures (Australia, United States, Japan, Belgium, Spain and Italy); specific macroeconomic developments, such as widespread balance-sheet restructurings (several Anglo-Saxon countries, Sweden and Japan) or, in the case of Germany, the economic shock of reunification; and the broader process of financial liberalisation and heightening of competitive pressures in the financial industry. In order to analyse the impact of these events on the previous findings, stability tests were carried out (Table 6) and, where appropriate, the regressions were re-estimated over the most recent period.

The evidence indicates that the impact of the identified direct controls on banks' portfolio decisions is not important. Their effect either cannot be traced (Australia) or, when present, is not such as to affect the remaining properties of the regressions (Italy). In France, a significant break is detected following the lifting of the "encadrement du crédit"; the test, however, may also be capturing the effect of the 1992 ERM crisis.

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42 In order to assess the robustness of the findings, in the case of France and Germany two alternative rates were used: the rate on overdrafts (France; quarterly only) and the lower bound of the sample of rates used to construct the loan rate series (Germany). In neither case did the results alter the basic conclusions regarding the international ranking of the two countries. The new German rate adjusts somewhat faster in the first month (coefficient = 0.22) but its response is otherwise very similar. For France the rate on overdrafts actually responds less vigorously after one quarter (0.27) but more strongly thereafter (0.80 and 1.06 after one and two years respectively). This narrows the gap between France and most other countries over the longer horizons.

43 Note, however, that the link between policy and money market rates is not uniform across countries, nor, just as importantly, is the *uncertainty* surrounding point estimates of the relationship. To the extent that this uncertainty reflects the unpredictability of the response of market rates to policy actions rather than shortcomings in the estimation, it is clearly of significance for policy.

Box 5: Main reasons for possible changes in the average relationship

Australia:	*Operating procedures:*	January 1990	Announcement of standards for overnight rate.
	Macro events:	around 1989	Widespread balance-sheet restructuring.
Belgium:	*Operating procedures:*	January 1991	Fixing of one, two and three-month Treasury certificate rates discontinued.
Canada:	*Financial industry:*	1990	Pronounced heightening of competition in the loan market.
	Exchange rate:	September 1992	Exchange rate turbulence.
France:	*Loan rate setting:*	January 1987	Phasing out of the ceiling on bank lending (encadrement du crédit).
	Exchange rate	around September 1992	Exchange rate turbulence.
Germany:	*Macro events:*	late 1989 - mid-1990	Reunification.
Italy:	*Operating procedures*:	October 1990	Part of compulsory reserve holdings allowed to be used for settlement purposes. Final step in a series of changes starting in late 1988, beginning of the phasing out of the practice of setting a minimum price at Treasury bill auctions.
	Direct controls:	January-June 1986 September 1987 - March 1988	Temporary imposition of restrictions on lending.
Japan:	*Operating procedures:*	November 1988	Broad reform, including notably a shortening of the maturity of open market operations and a large increase in their frequency.
	Financial industry:	January 1989	Prime rate introduced; revised when the weighted average of the CD and other short-term market rates has changed by more than 0.25% since the previous change in the prime rate.
	Macro events:	late 1990	Widespread balance-sheet restructuring.
Spain:	*Operating procedures:*	January 1989 - May 1990	Reform of operating procedures, notably with greater emphasis on interest rate objectives.
	Financial industry:	around 1990	Pronounced heightening of competition in the loan market.
	Exchange rate:	around September 1992	Exchange rate turbulence.

Box 5: Main reasons for possible changes in the average relationship (cont.)			
Sweden:	*Macro events:*	around 1991	Widespread banking problems.
	Exchange rate:	September 1992	Exchange rate turbulence.
United Kingdom:	*Macro events:*	around 1990	Widespread balance-sheet restructuring.
	Exchange rate:	September 1992	ERM exchange rate turbulence.
United States:	*Operating procedures:*	about June 1989	Use of more explicit operating objectives for the overnight rate.
	Macro events:	around 1990	Widespread balance-sheet restructuring.

Table 6

Statistical evidence of structural breaks

	Reason[1]	Date[2]	RL Equation		RM Equation	
			Chow p-value (%)	Dummy (coefficient)	Chow p-value (%)	Dummy (coefficient)
AU	DC	85:4	n.s.	-	-	-
	OP/Macro	90:3	0.0***	-	0.0***	-
BE	OP	91:4	1.1**	-	-	-
CA	ER	92:9	-	n.s.	-	2.49***
	FI	90:1	0.1***	-	-	-
FR	DC	88:1	3.1**[3]	-	4.7**[3]	-
	ER	92:5-93:3	-	- 0.13***	-	1.23***
DE	Macro	90:1	n.s.	-	n.s.	-
IT	DC	86:1-86:6	-	0.13*	-	-
		87:9-88:3	-	n.s.	-	-
JP	OP/FI/Macro	90:5	0.0***	-	0.0***	-
NL	-	90:1	0.0***	-	n.s.	-
ES	OP/FI	90:7	0.0***	-	4.9**	-
	ER	92:9-93:4	-	n.s.	-	0.80***
SE[4]	ER	92:III (Q)	n.s.	n.s.	-	- 14.7***
UK	Macro	90:1	4.4**	-	1.2**	-
	ER	92:9	n.s.	-	n.s.	-
US (1)	OP/Macro	90:1	0.0***	-	n.s.	-
(2)		90:I (Q)	n.s.	-	n.s.	-

Key: n.s. = not significant; DC = direct controls; OP = operating procedures; Macro = macroeconomic events; ER = exchange rate; FI = financial industry.

[1] See Box 5 for details. [2] Dates for which the corresponding test was carried out. In the case of changes in operating procedures, a lag was generally allowed for so as not to contaminate the results of the tests. [3] Owing to multicollinearity, the equations had to be re-estimated without dummies. [4] Too few observations for a test on macroeconomic conditions.

Indeed, the effects of policies designed to contain downward exchange rate pressures are very different across countries. In France, loan rates remain appreciably below what would have been predicted by the observed levels of other rates: the additive dummy included in the regression is statistically significant.[44] In other countries, notably the United Kingdom, Canada and Sweden, the normal link between the loan rate and its proximate determinants is not severely disrupted; the use of quarterly data, though, calls for caution in interpreting the result for Sweden (see also Graph AI.1, Annex I). This suggests that in certain countries the authorities have greater room for manoeuvre when fighting speculative pressures.

The tests for the remaining factors that may have led to changes in the average relationship generally indicate that a closer look at the more recent period is warranted.[45] This should also help to clarify the nature and economic import of the statistical breaks identified, particularly in those cases where several influences may be at work at the same time. Sweden, of course, is not considered in what follows: the data are only quarterly and, in one case, already refer only to the last few years. The same is true for the quarterly US loan rate based on survey data.

In most countries, the basic pattern of results as regards the proximate determinants of the loan rate changes little in comparison with that over the whole period (Table 7).[46] One notable exception is Italy, where now the explanatory power of the new policy rate (the tender rate) is such that the Treasury bill rate (the proxy for the money market rate) drops out. This probably mainly reflects the fact that since the introduction of the new operating procedures the tender and three-month money market rates have moved quite closely together while the interbank market has gained in importance in loan pricing decisions.[47] Another possible exception is the United States, where now the contemporaneous change in the policy rate becomes significant alongside the money market rates. This is not inconsistent with the adoption of new operating procedures, which are likely to have reduced the "noise" in the policy rate. In the United Kingdom, the policy rate consolidates its importance: the loan rate appears to be practically indexed to it.

The broad picture regarding the response of the loan rate is also largely unaffected (Tables 8 and 9). Although some noticeable changes appear to have taken place in certain countries, the overall pattern of international differences is basically the same.

Indeed, in several countries the adjustment path is essentially unchanged. In the case of the United Kingdom it is apparent that the statistical evidence of instability mainly reflected the comparatively high precision of the estimates: adjustment remains immediate. For Canada, the simulations are unable to capture the relatively faster speed of adjustment to changes in the Bank Rate in the wake of heightened competitive pressures revealed by earlier work (e.g. Clinton and Howard (1994)): perhaps this change is diluted by the extension of the estimation period and masked by the relatively low frequency of the observations (monthly).[48] The rate remains quite sticky in France, especially in the long run.

In most of the remaining countries the changes are comparatively minor. In Italy and Belgium they are mainly concentrated at longer horizons (beyond one year): the long-run responses are more in line with theoretical priors (closer to unity). In Germany there are some weak signs of a somewhat slower response, especially at the one-month horizon: the impact effect is no longer

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44 Indeed, the dummy had to be included in the previous regression in order to obtain sensible results.

45 The Chow tests for Germany, however, do not reveal any statistically significant instability.

46 See Tables AI.3 and AI.4 in Annex I.

47 There was in fact little to choose between the equation reported here and one where the tender and three-month interbank rate were included.

48 The authors report that the beginning of the recent rising phase in market rates heralded the end of the period of more aggressive prime rate adjustments.

Table 7

Determination of the loan rate: basic pattern of results (recent period)[1]

	Short-run				Long-run		$\bar{R}^2$	SEE	DW	Sample period
	Δ_t		Δ_{t-i}		RP	RM				
	RP	RM	RP	RM						
AU ..	*					*[2]	0.82	0.15	1.99	90:3-94:7
BE ...		*		*		*	0.89	0.18	2.01	91:4-94:7
CA ..	*		*	*	*		0.82	0.27	1.90	90:1-94:7
FR ...	*	*				*	0.53	0.13	2.12	88:1-94:7
DE ..				*	*		0.51	0.12	2.03	90:1-94:7
IT	*		*		*		0.92	0.13	1.86	91:3-94:6
JP		*				*	0.68	0.09	1.81	90:5-94:7
NL ..	*				*	*	0.74	0.11	1.98	90:1-94:7
ES ...				*	*		0.57	0.26	2.27	90:7-94:7
UK ..	*						1.00	0.02	2.01	90:1-94:7
US ...	*	*			* (ws)	*	0.71	0.11	1.71	90:1-94:7

[1] The estimation period is that shown in Table 1. [2] But practically indistinguishable from policy rate.

significant.[49] This is probably the result of the relatively slow response of German loan rates in periods of falling market rates (see below). Some reduction also takes place in the case of the Netherlands at the one-month horizon. By contrast, a somewhat faster response within the first month can be detected in Australia. This may be due to the adoption of the new operating procedures: the standard errors in both the loan and money market regressions are considerably lower and the pass-through between policy and market rates seemingly faster. A similar, but smaller, increase in the one-month response can be detected for the United States; the reasons behind it may be analogous to those in Australia.

The two countries for which a marked change is most apparent are Japan and Spain:[50] in both cases the response is raised over the whole horizon, especially within a year. The change is particularly large in Spain: although no significant adjustment appears in the first month, the response is already a full one after one quarter. This finding is in line with the heightening of competitive pressures in the financial industry. In Japan, the adoption of the new procedures for setting loan rates (the "prime" rate) appears to have had a noticeable effect (Box 5).[51] Despite the higher response, however, at least Japan is still best classified among those countries in which loan rates appear to be comparatively sticky.

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49 Since the loan rate for Germany is sampled at mid-month while the policy and money market rates are end-of-month observations (see Boxes 1, 3 and 4), in principle the speed of adjustment could be somewhat understated in the first month. However, monthly-average and end-of-month series relating to the money market rate are extremely close. Similarly, when both observations are available, the corresponding policy rate series virtually coincide. The bias, therefore, is unlikely to be quantitatively significant.

50 Owing to difficulties in the estimation, the sample period for Spain was extended to January 1989, when the change in operating procedures took effect.

51 The result may also in part reflect the fact that since 1990:4 the series used relates exclusively to short-term loans.. Because of the specific characteristics of the Japanese market, however, this factor need not be very significant, especially prior to 1990.

Table 8

Loan rate response to a simultaneous change in policy and market rates (recent period)[1]

	Absolute change (in percentage points)						2 x SE	P-value[2] %	As % of long-run response				
	1 month	1 quarter	2 quarters	1 year	2 years	Long-run			1 month	1 quarter	2 quarters	1 year	2 years
AU	0.83[3]	0.74	0.79	0.85	0.87	0.87	0.43	0.0***	95[3]	85	91	98	100
BE	0.63	0.95	0.93	0.93	0.93	0.93	0.48	0.1***	68	102	100	100	100
CA	0.77	0.86	0.95	0.99	1.00	1.00	0.77	93.2	77	86	95	99	100
FR	0.51	0.53	0.55	0.58	0.59	0.59	0.55	0.0***	86	89	93	97	100
DE	0.00	0.36	0.53	0.74	0.91	0.98	0.57	89.6	0	37	54	76	94
IT	0.19	0.72	0.97	1.06	1.07	1.07	0.82	59.0	18	67	91	99	100
JP	0.45	0.63	0.77	0.86	0.89	0.89	0.30	0.2***	51	70	86	97	100
NL	0.71	0.95	1.02	1.03	1.03	1.03	0.30	27.0	69	92	99	100	100
ES	0.00	1.00	1.04	1.05	1.05	1.05	0.75	22.8	0	95	99	100	100
UK	1.00	1.00	1.00	1.00	1.00	1.00	0.25	-	100	100	100	100	100
US (1)	0.70	0.77	0.83	0.85	0.86	0.86	0.33	0.0***	81	90	96	99	100

[1] Time path of the response of the loan rate to a simulated 100 basis point change in both policy and money market rates. [2] Marginal significance level for the F-test that the long-run response of the loan rate is equal to 100 basis points. [3] Overshooting, down to 0.65 in the second month (74% of long-run response).

Table 9

Loan rate response to a change in the policy rate (recent period)[1]

	Absolute change (in percentage points)						As % of long-run response				
	1 month	1 quarter	2 quarters	1 year	2 years	Long-run	1 month	1 quarter	2 quarters	1 year	2 years
AU	0.83[2]	0.67	0.71	0.78	0.80	0.80	95[2]	84	89	97	100
BE	0.61	0.82	0.85	0.85	0.85	0.85	72	96	100	100	100
CA	0.77	0.88	0.95	0.99	1.00	1.00	77	88	95	99	100
FR	0.53	0.56	0.58	0.59	0.60	0.60	89	94	96	98	100
DE	0.00	0.32	0.50	0.73	0.91	0.97	0	33	52	75	93
IT	0.19	0.72	0.97	1.06	1.07	1.07	18	67	91	99	100
JP	0.30	0.57	0.71	0.78	0.80	0.80	38	72	88	98	100
NL	0.71	0.90	0.95	0.95	0.95	0.95	74	95	99	100	100
ES	0.00	0.95	1.02	1.05	1.05	1.05	0	91	97	100	100
UK	1.00	1.00	1.00	1.00	1.00	1.00	100	100	100	100	100
US(1)	0.62	0.79	0.84	0.81	0.81	0.81	76	97	103	100	100

[1] Time path of the response of the loan rate to a simulated 100 basis point change in the policy rate; the response of the money market rate is endogenised on the basis of the regressions shown in Annex I. [2] Overshooting, down to 0.59 in the second month (73% of long-run response).

VI. SELECTED SPECIFIC ISSUES

The above results are based on the minimum specification of the loan rate equations. There are, however, at least three additional questions that merit particular attention. First, is there any evidence that loan rates respond asymmetrically to increases and decreases in interest rates? Second, do revisions of infrequently changed rates on official standing facilities speed up the adjustment of loan rates? Finally, does the average, as opposed to marginal, cost of funding help to determine the loan rate?

1. Asymmetric response of the loan rate

The existence of asymmetric responses of the loan rate to increases and reductions in the opportunity cost rates was tested by allowing two coefficients to be estimated separately for observations in which those rates were rising/falling. Tests were carried out for asymmetric responses in both first-difference and level coefficients: although in principle one might expect only the short-run response to differ, it may in practice be difficult to distinguish between the two given the elusive nature of the hypothesis examined. For similar reasons, in order to maximise the degrees of freedom and hence the power of the analysis, the tests were executed over the long sample.

The tests in general fail to detect much evidence of asymmetries: in most cases the hypothesis that the response is symmetric cannot be rejected at the standard significance levels (Table 10). The only exceptions are Germany and Japan; for the United Kingdom, the evidence is statistically very weak and the difference is negligible in economic terms. Consistent with theoretical priors, where asymmetries appear to be present the response is faster with respect to *increases* in rates. The effect, however, is primarily captured by the level terms in the equation, implying that the long-run response is also affected. This may be due to the limited period covered by the observations, which makes it difficult to distinguish short from long-run effects.

Table 10

Tests of asymmetric responses

	Δ	Levels	Joint	Difference*	
				Levels	Long-run
Australia	84.4	63.2	49.7	-	-
Belgium	77.2	48.1	90.0	-	-
Canada	62.9	94.0	59.2	-	-
France	33.7	-	-	-	-
Germany	18.3	2.3**	4.7**	+ 0.01	+ 0.11
Italy	47.2	19.5	52.4	-	-
Japan	80.2	1.5**	5.0*	+ 0.01	+ 0.25
Netherlands	29.6	79.2	21.8	-	-
Spain	68.2	97.1	91.8	-	-
Sweden (1)	25.7	17.3	37.9	-	-
(2)	82.5	80.4	96.7	-	-
United Kingdom	57.2	9.5*	42.6	+ 0.01	+ 0.01
United States (1)	13.0	47.0	22.3	-	-
(2)	29.0	16.4	37.0	-	-

* A positive number means that upward adjustments are larger/faster than downward adjustments.

It is hard to say precisely what lies behind this finding. Inspection of the graphs (Annex I) appears to indicate that the recent sizable widening of spreads plays a crucial role in the case of Japan: the spread did not narrow much as interest rates were rising between 1988-90. A similar pattern emerges in the case of Germany. In fact, when the estimation period in Germany is extended to the beginning of the 1980s or the 1970s to cover more interest rate cycles, the pattern disappears. Reunification may have played a role in the more recent period.

Also of some interest is the failure to uncover any evidence of asymmetries in the case of the United States. Not only have spreads widened markedly in the recent recession amid widespread balance-sheet restructuring among financial and non-financial agents; in addition, some empirical work, following a similar methodology, had found evidence of asymmetries in the early 1980s (Arak et al. (1983)). One possible interpretation is that a further heightening of structural competitive pressures during the period has reduced the scope for delayed adjustments. More specific testing, however, would be necessary to assess this hypothesis.

2. Role of infrequently changed rates on official standing facilities

As argued above, changes in the rates on official standing facilities may be relevant in determining loan rates for a number of related reasons. They may reinforce signals about the direction of policy, helping to crystallise expectations about future interest rates or to underline the persistence of a specific policy move. They may be used as key reference rates for loan rates, especially in oligopolistic structures. Finally, they may actually represent the marginal funding cost of banks; this justification, however, has lost much of its significance in recent years.

The hypothesis was tested by adding a rate on official standing facilities to the standard specification adopted in Section III. The rate was included in first differences. In order to highlight possible changes in the role of the rate over time, the equations were estimated over the whole sample and the more recent period.

The rates chosen were discount rates in virtually all instances.[52] For France, the five to ten-day "pension" (repurchase agreement) rate was used: the facility is available to banks on demand and the interest rate on the transactions moves less frequently than that on discretionary open market interventions. Owing to the specificity of operating procedures, in a few countries there was no rate corresponding to the required characteristics (Australia, Spain and Canada). The availability of only quarterly data precludes a meaningful test in the case of Sweden. A similar problem exists for the United Kingdom. Although the Minimum Lending Rate facility was discontinued in 1981, it has been reactivated for very short periods since then. In addition, "14:30 lending" has been used on a number of occasions to provide markets with a clear signal of policy intentions. However, since such lending is effective for one day at a time, it is more difficult to model.

Remarkably, when the regressions are estimated over the whole period, discount rates are highly significant in all the countries covered; in all cases they are associated with a stronger response of the loan rate, at least in the short run (Table 11). The additional explanatory power of the official rate generally survives with little change in recent years; the only exceptions are Belgium and France, where no significant correlation can be detected.

In the case of the Netherlands the result no doubt reflects the formula used by banks to set the loan rate used, which until the end of 1993 was actually tied to the discount rate through a variable, but administered, mark-up.[53] For the remaining countries it is not clear how best to interpret the result. The fact that the effect is generally limited to the first month is consistent with the signalling hypothesis, at least in the more recent period; indeed, this role has been explicitly recognised in the cases of Italy (e.g. Bank of Italy (1988)) and Japan (Okina and Sakuraba (1994)).

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52 For Germany, the lombard rate could alternatively have been tried.

53 Since then the rate has been linked to the rate on central bank advances.

Table 11

The role of infrequently changed official rates

	Behaviour of rate			Regression results						Estimation period
	$\Delta R0 = 0$ (% obs.)	$\Delta R0 = 0$		R0 coefficient		Comparison with standard specification				
		1980s[1]	1990s[1]	Δ_t	Δ_{t-i}	Δ impact coefficient[2]	Δ_{t-1} coefficient[2]	Δ long-run coefficient	$\Delta \bar{R}^2$	
BE (a).....	65	63	67	0.13**	-	+ 0.06	-	0.0	+ 0.01	84:1-94:7
(b)				-	-	-	-	-	-	91:4-94:7
FR (a)	70	74	65	0.04**	-	+ 0.02	-	- 0.02	+ 0.01	84:1-94:7
(b)				-	-	-	-	-	-	88:1-94:7
DE (a)	80	85	75	0.17**	0.27***	+ 0.12	+ 0.20	+ 0.05	+ 0.14	84:1-94:7
(b)				0.10**	0.38***	+ 0.10	+ 0.30	- 0.22	+ 0.28	90:1-94:7
IT (a)	76	83	67	0.13***	-	+ 0.06	-	+ 0.06	+ 0.02	84:1-94:7
(b)				0.13*	-	+ 0.07	-	0.0	+ 0.01	91:3-94:6
JP (a)	87	89	84	0.12***	0.28***[3]	+ 0.02	+ 0.04	+ 0.08	+ 0.06	84:1-94:7
(b)				-	0.13**	-	+ 0.13	0.0	+ 0.03	90:5-94:7
NL[4]	78	82	71	0.19**	-	+ 0.16	-	0.0	+ 0.01	84:1-93:12
US (a)[5]	85	85	85	0.21**	0.22**	+ 0.13	+ 0.15	- 0.02	+ 0.03	84:1-94:7
(b)				-	0.27***	- 0.09	+ 0.27	0.0	+ 0.07	90:1-94:7

[1] For Italy, Belgium, the United States and Japan, dates corresponding to changes in operating procedures. [2] Calculated as the sum of the effects of all relevant interest rates in the regressions. [3] Sum of coefficients lagged one to three periods. [4] Estimated to end-1993. [5] Prime rate.

However, the fact that lagged changes are also present raises doubts about this interpretation for Germany (one lag) and Japan (two lags). One possibility is that the slowly moving discount rate may act as a proxy for sticky administered deposit rates which are an element in the loan pricing decision.[54]

3. Marginal versus average cost of funds

It was argued in Section II that, if banks behave according to profit maximisation or similar objectives, it is the *marginal* opportunity cost of funds which is relevant. By contrast, in the presence of full-cost pricing or, more generally, "satisfying" behaviour, the average cost of funds may be more directly relevant. Such behaviour would help to explain stickiness in the loan rate with respect to policy and market rates: deposit rates, especially those for retail customers, have comparatively low reaction speeds.

Unfortunately, the data to test this hypothesis are generally not available. Exceptions are Germany, Italy and Spain, for which weighted averages of the cost of domestic currency deposits exist, even at monthly frequencies. The strategy followed was to test for their statistical significance in the benchmark regressions containing policy and/or money market rates and, where appropriate, to re-estimate the "best" specification.

Table 12

Marginal vs. average funding costs: summary of results

	Germany	Italy	Spain
RD coefficients			
ΔRD_t	0.55***	0.30**	0.41**
ΔRD_{t-1}	-	-	0.32*
RD_{t-1}	-	0.12***	-
Joint p-value (%)[1]	0.1***	0.04***	0.8***
Comparison with standard specification			
Δ impact[2]	+ 0.54	+ 0.26	+ 0.41
Δ long-run	+ 0.01	+ 0.01	- 0.27
$\Delta \bar{R}^2$	+ 0.04	+ 0.01	+ 0.04
Estimation period	1984:1-1994:7	1984:9-1994:6	1984:6-1994:7

[1] Marginal significance level of the null hypothesis that the RD coefficients are jointly zero. [2] Sum of the contemporaneous coefficients on all rates.

The results are broadly consistent with the relevance of average funding costs (Table 12): in all regressions the weighted average cost of deposits is statistically highly significant. For Germany and Spain, however, only changes are significant. For Italy, the influence of the variable is considerably starker: a clear effect can be traced in both the short and the long run. These results confirm previous findings (e.g. Bank of Italy (1988) and García et al. (1994)): both central banks include average funding costs in their standard specifications. The reason why the present evidence is less strong in the case of Germany and Spain probably has to do with the choice of loan rate, viz. a narrow one (current account credits) compared with that in country-specific work (an average rate on

54 In the case of Germany, another plausible reason is the fact that the loan rate is sampled at around mid-month while the discount rate relates to the end of the month. This explanation appears to be the relevant one for the United States, where one lag is also present: if month-end observations for the loan rate are used, only the contemporaneous change is significant; while concentrated in one month, the overall size of the effect remains unaltered.

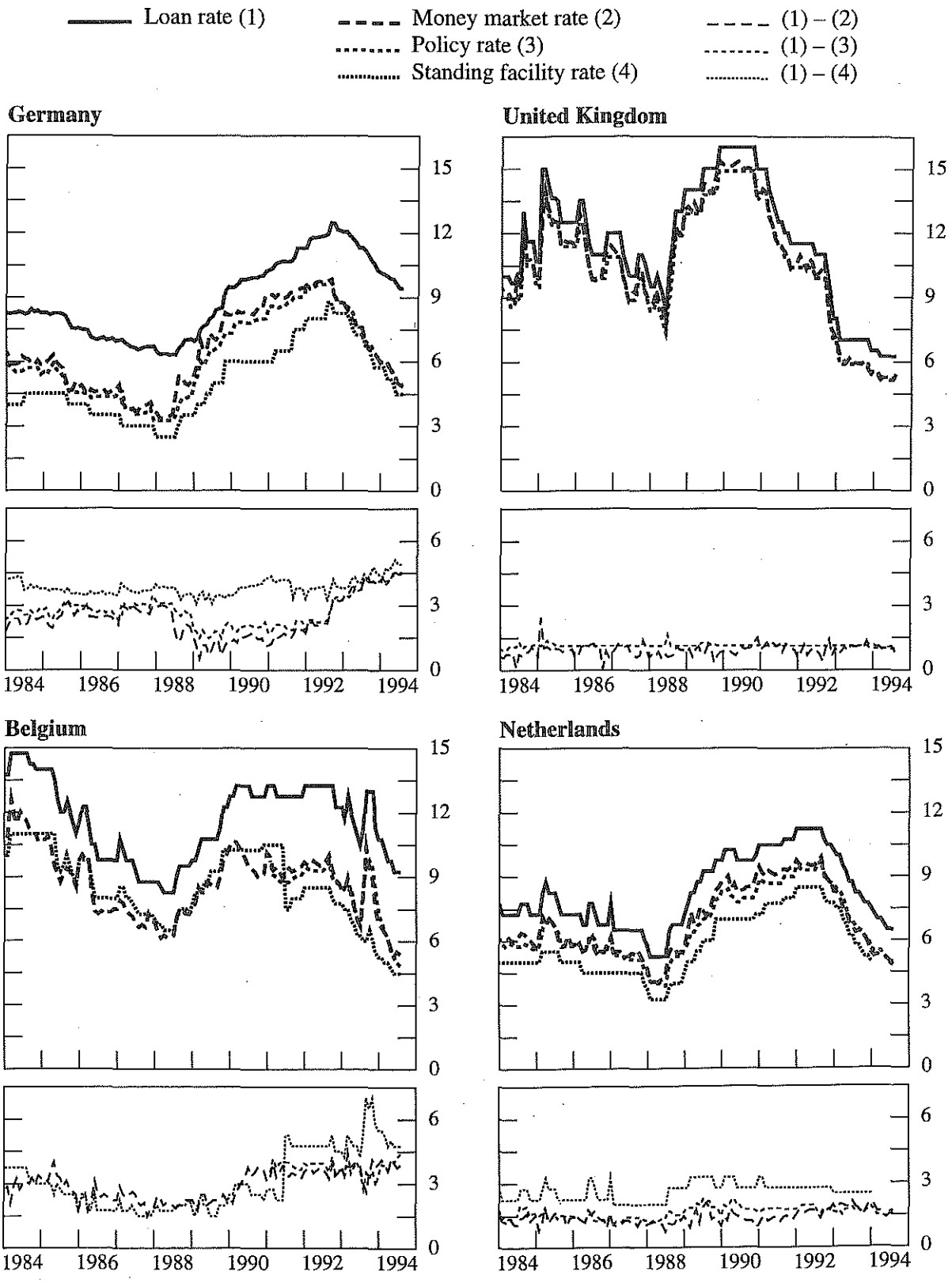
all new loans), the same rate used for Italy. These findings suggest that it would be useful to consider average deposit rates also in the other countries covered, especially where loan rates appear comparatively sticky.

ANNEX I

Detailed statistical and econometric information

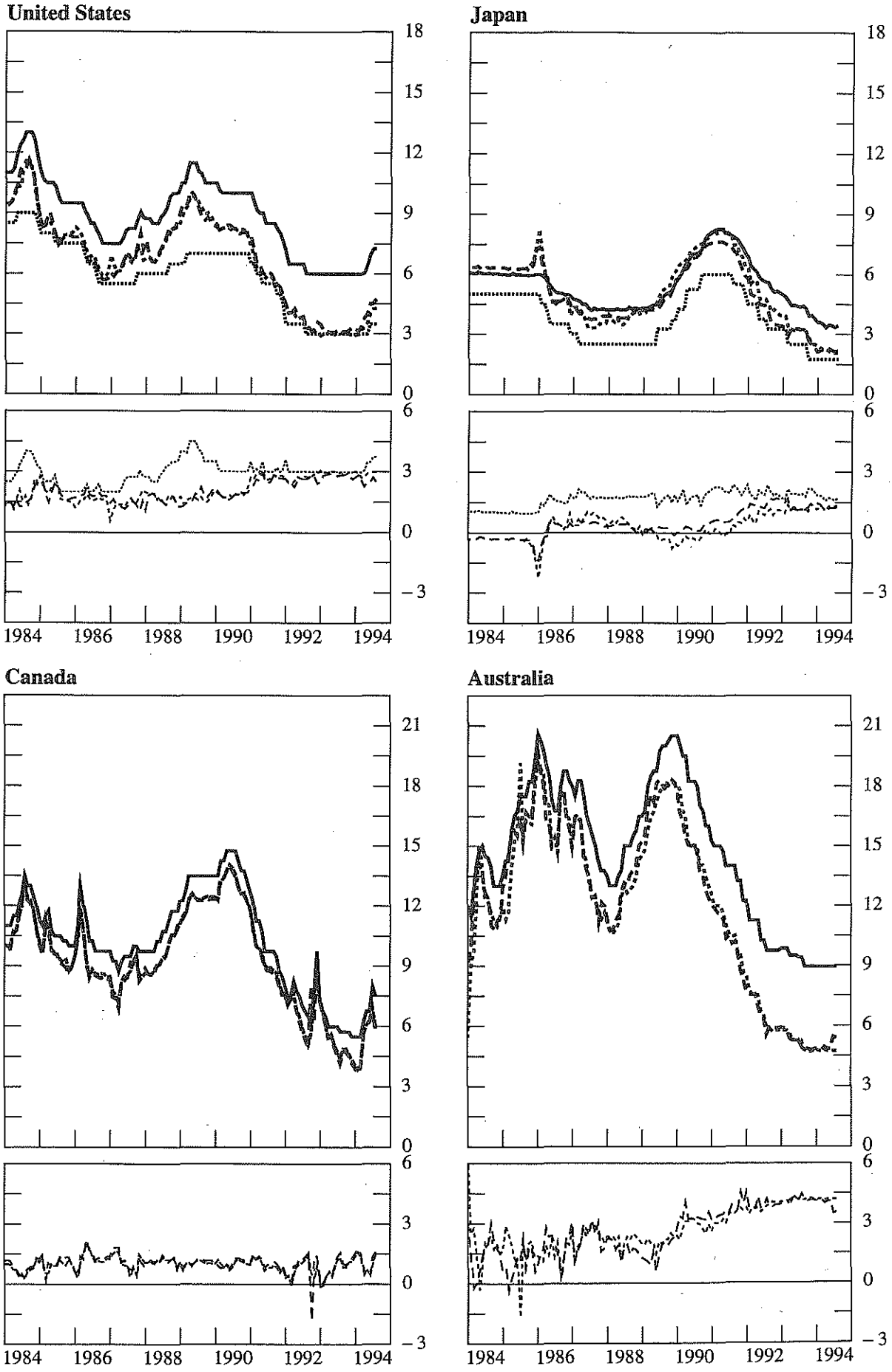
Graph AI.1

Interest rate series and spreads *

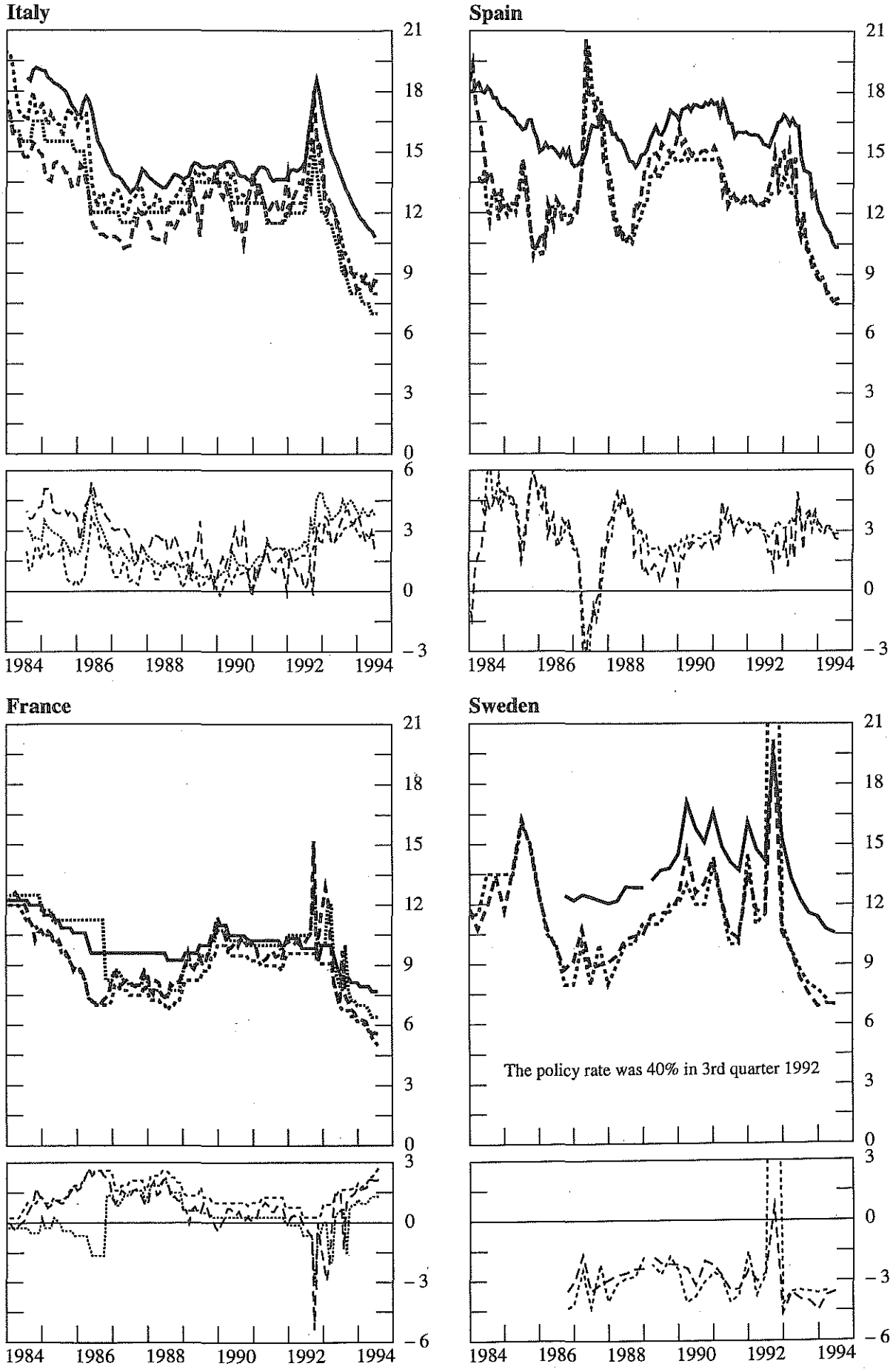


* For a definition of the rates, see Boxes 1 – 4.

Graph AI.1 (cont.)

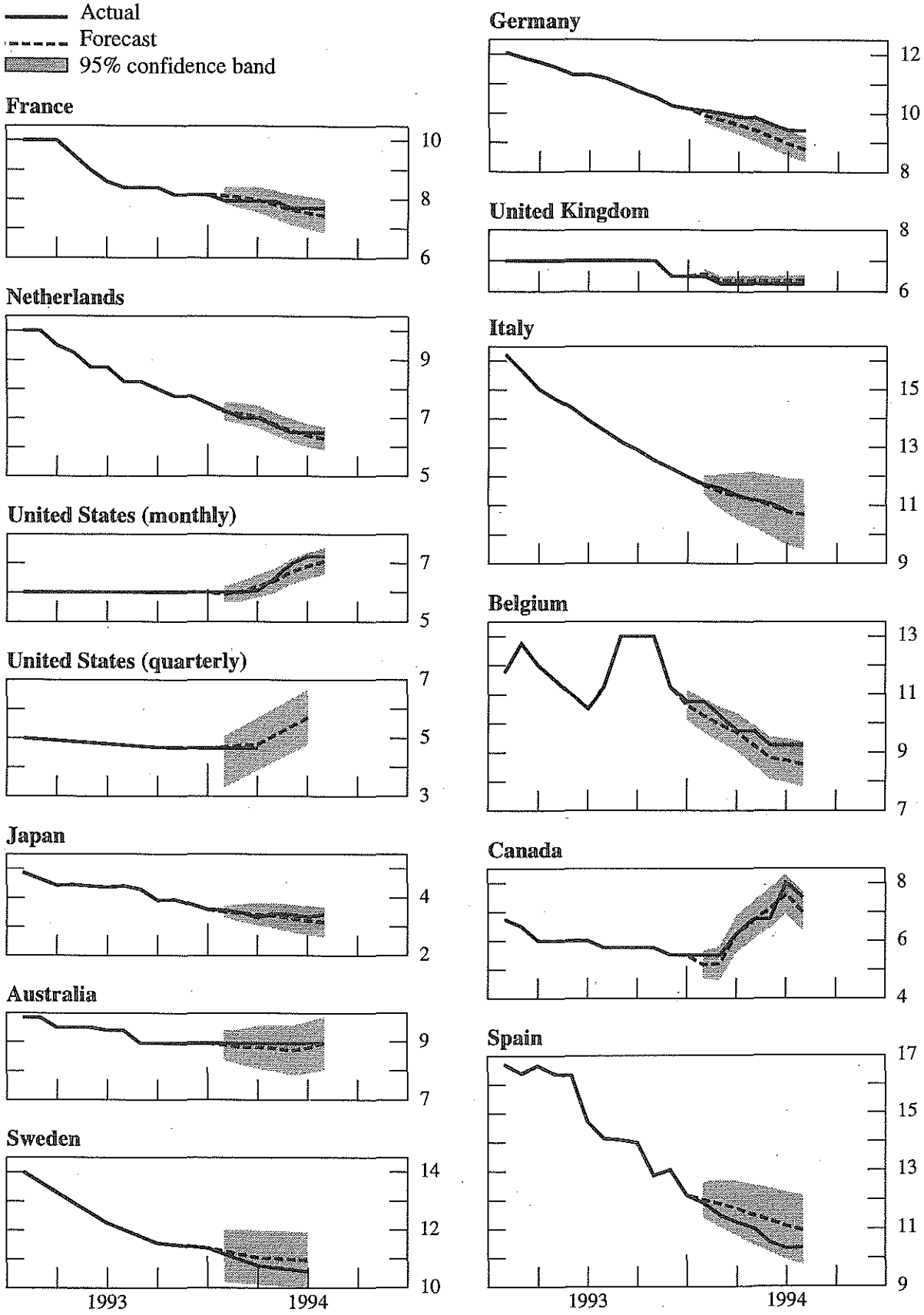


Graph AI.1 (cont.)



Graph AI.2

Out-of-sample forecast performance *

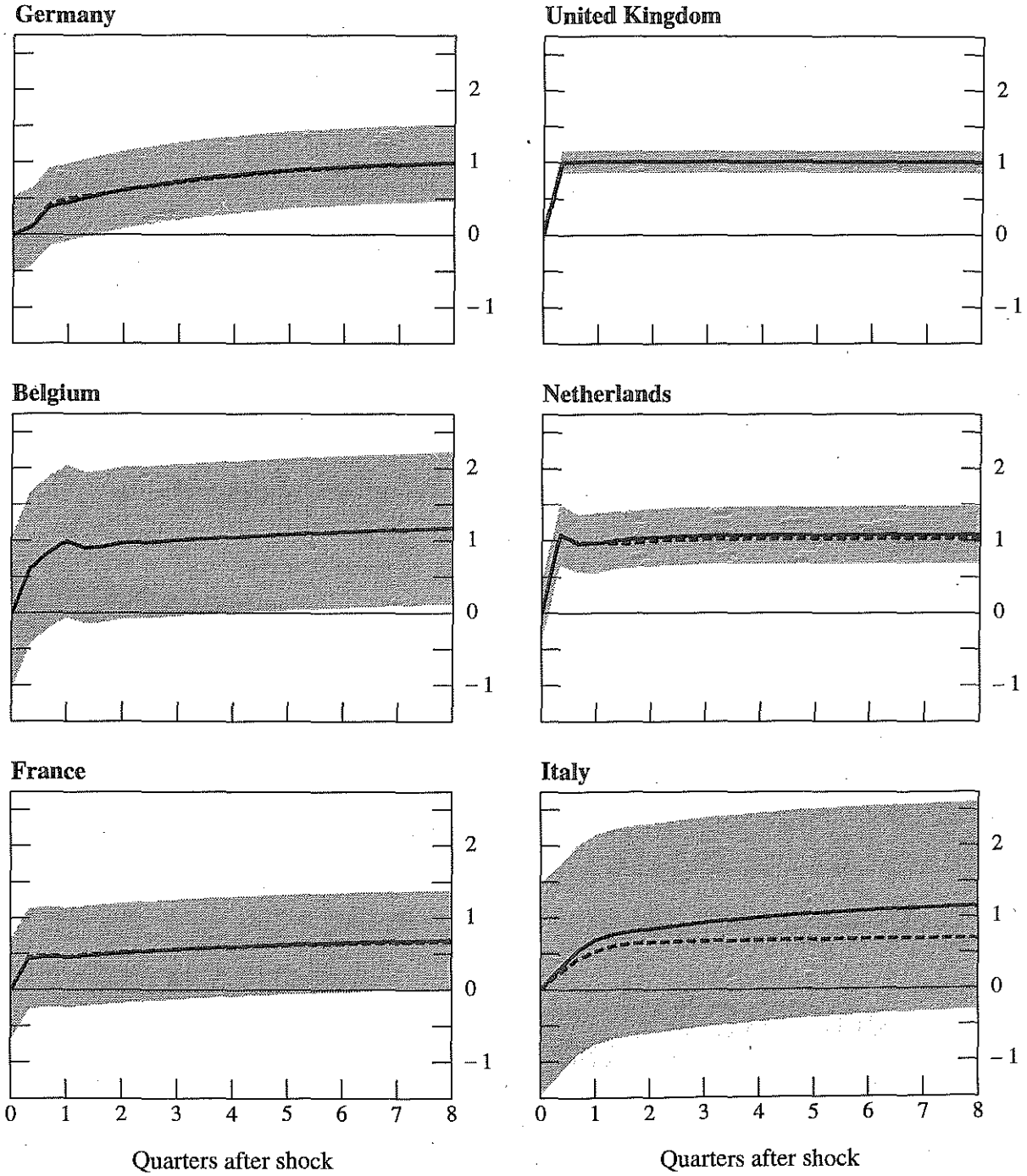


* Minimum specification, whole sample.

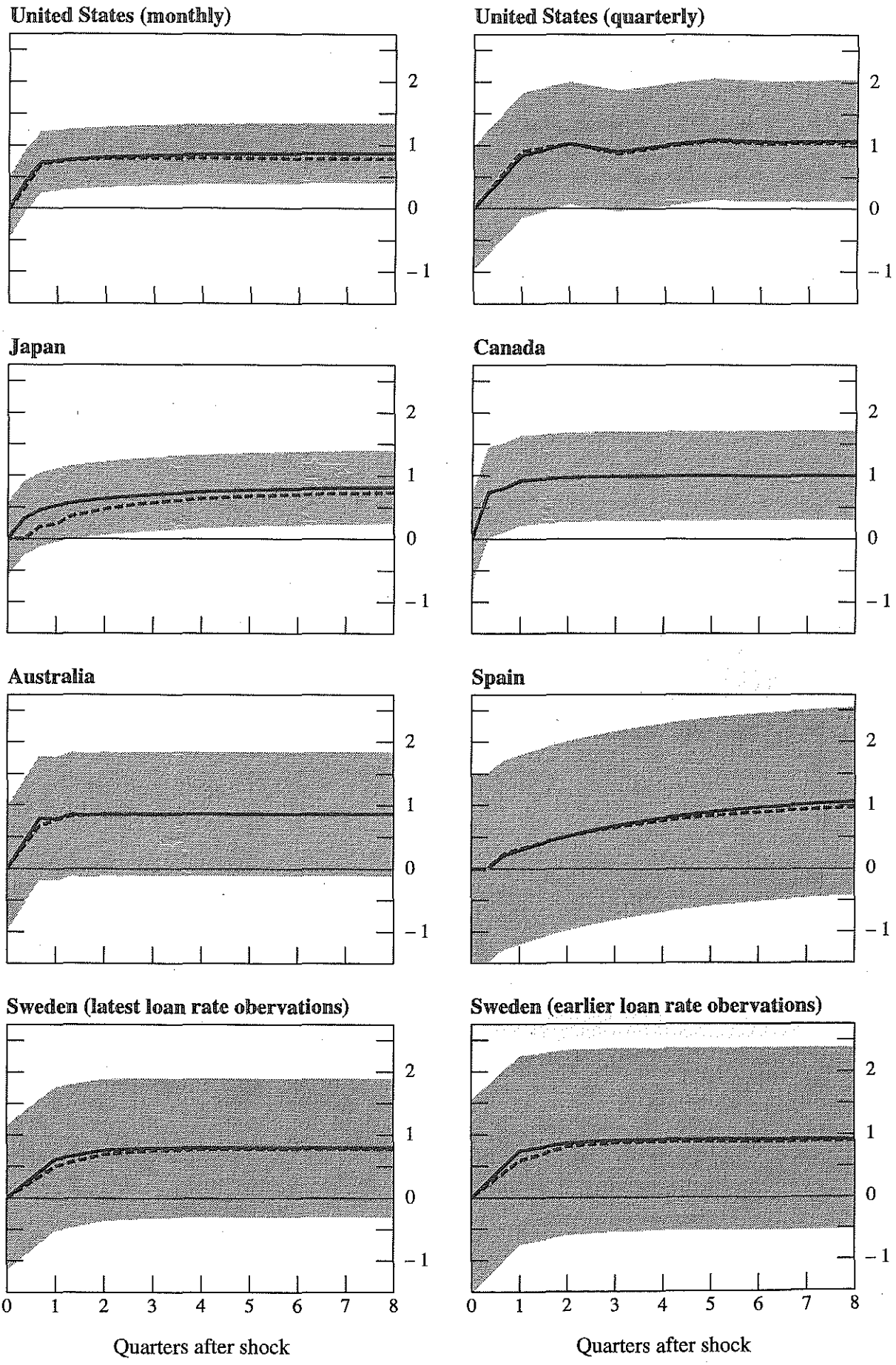
Graph AI.3

Simulations of loan rate responses (whole period)

Simulation 1: 100 b.p. increase in both policy and money market rates
Simulation 2: 100 b.p. increase in policy rate, money market rate endogenous
95% confidence band for simulation 1



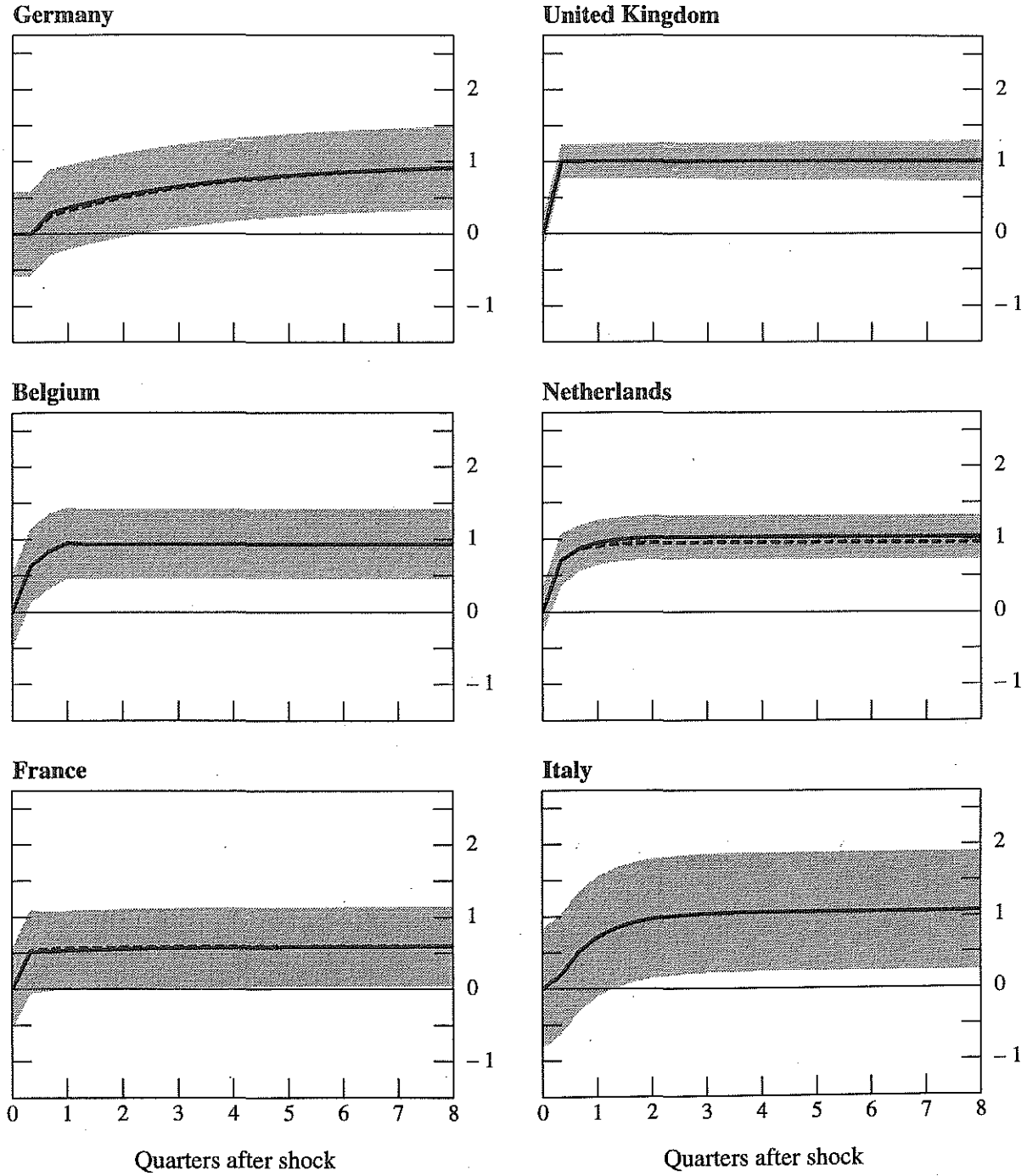
Graph AI.3 (cont.)



Graph AI.4

Simulations of loan rate responses (recent period)

Simulation 1: 100 b.p. increase in both policy and money market rates
Simulation 2: 100 b.p. increase in policy rate, money market rate endogenous
95% confidence band for simulation 1



Graph AI.4 (cont.)

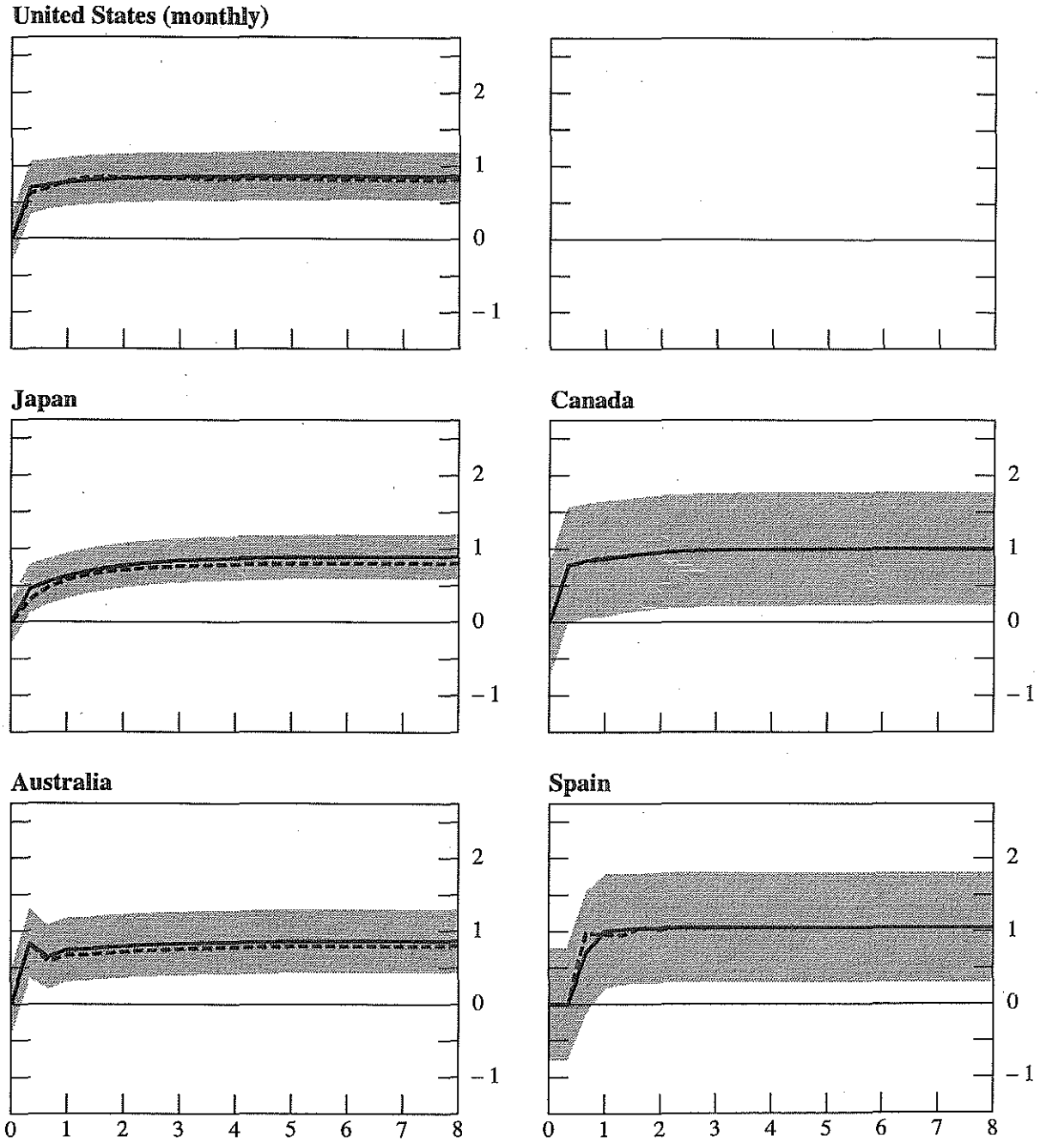


Table AI.1

Loan rate regressions: standard specification (whole period)[1]

	AU	BE	CA	FR	DE	IT	JP	NL	ES	SE(1)	SE(2)	UK	US(1)	US(2)
ΔRM_t	0.20***	0.61***	- 0.14***	0.04**	0.11***	0.09***	0.32***	-	-	0.74***	0.61***	0.06***	0.43***	0.84***
	(4.65)	(14.07)	(2.83)	(2.37)	(2.71)	(3.99)	(7.40)			(10.29)	(19.79)	(2.92)	(10.84)	(8.24)
ΔRM_{t-1}	0.42***	0.39***	-	-	0.18***	0.07***	-	-	-	-	-	0.04**	-	-
	(10.22)	(5.64)			(4.32)	(2.94)						(2.12)		
ΔRM_{t-2}	-	0.38***	0.26***	- 0.03**	-	-	-	0.16**	-	-	-	-	-	-
		(5.34)	(4.85)	(2.25)				(2.23)						
ΔRP_t	0.20***	-	0.88***	0.40***	-	0.17***	-	1.08***	-	-	-	0.94***	-	-
	(5.24)		(16.08)	(753)		(4.77)		(17.60)				(49.14)		
ΔRP_{t-1}	-	-	-	-	-	-	-	-	0.11***	-	-	-	0.23***	-
									(2.80)				(4.97)	
ΔRP_{t-2}	-	-	- 0.20***	-	-	-	-	- 0.21***	-	-	-	-	-	-
			(3.50)					(2.66)						
ΔRL_{t-1}	- 0.22***	- 0.37***	-	-	-	0.61***	0.30***	- 0.12**	-	-	-	- 0.04**	-	-
	(3.86)	(4.60)				(8.86)	(3.97)	(2.39)				(2.00)		
ΔRL_{t-2}	0.17***	- 0.28***	-	-	-	- 0.16**	-	-	-	-	-	-	-	- 0.20**
	(3.61)	(3.91)				(2.34)								(2.57)
RL_{t-1}	- 0.13***	- 0.07*	- 0.27***	- 0.08***	- 0.10***	- 0.04***	- 0.08**	- 0.33***	- 0.09***	- 0.67***	- 0.79***	- 0.63***	- 0.16***	- 0.77***
	(3.18)	(1.94)	(4.23)	(3.19)	(5.65)	(3.01)	(3.52)	(4.59)	(3.57)	(3.66)	(5.31)	(7.39)	(4.54)	(5.14)
RM_{t-1}	-	0.10**	-	0.06***	-	0.05***	-	0.14**	0.10***	0.62***	0.63***	-	0.36***	0.84***
		(2.21)		(3.46)		(3.02)		(2.15)	(6.06)	(3.89)	(6.10)		(6.99)	(5.43)
RP_{t-1}	0.11***	-	0.27***	-	0.11***	-	0.07***	0.22**	-	-	-	0.63***	- 0.22***	-
	(3.35)		(4.17)		(6.47)		(3.74)	(2.29)				(7.39)	(4.98)	
$\bar{R}^2$	0.80	0.71	0.82	0.45	0.51	0.77	0.62	0.80	0.36	0.86	0.96	0.99	0.76	0.78
SEE	0.24	0.24	0.23	0.13	0.11	0.16	0.09	0.15	0.28	0.42	0.39	0.07	0.13	0.42
DW	2.15	1.97	2.16	1.99	2.14	2.10	2.15	1.97	2.23	2.03	1.95	2.16	2.09	1.87

[1] For the dummies included in order to take into account the 1992 ERM turbulence, see Table 6.

Table AI.2

Money market rate regressions (whole period)[1]

	AU	BE[2]	CA	FR	DE	IT	JP	NL	ES	SE	UK	US(1)	US(2)
ΔRP_t	0.72***	-	1.04***	1.46***	1.06***	0.54***	0.58***	1.05***	0.86***	0.80***	0.95***	0.80***	1.08***
	(10.03)		(23.22)	(6.21)	(11.23)	(4.71)	(12.93)	(14.53)	(7.45)	(8.79)	(24.81)	(12.07)	(17.5)
ΔRP_{t-1}	-	-	-	-	0.22**	-	-	0.35***	-	-	-	0.21***	-
					(2.51)			(3.13)				(3.28)	
ΔRP_{t-2}	-	-	-	-	-	0.25**	0.13***	-	-	-	-	-	-
						(2.21)	(2.94)						
ΔRM_{t-1}	0.16**	-	-	-	-	-	-	- 0.42***	-	-	-	-	-
	(2.37)							(4.41)					
ΔRM_{t-2}	-	-	-	-	-	-	-	- 0.19***	-	-	-	-	-
								(2.96)					
RP_{t-1}	0.28***	-	1.24***	0.82***	0.33***	0.12**	0.11**	-	0.58***	0.90***	0.71***	0.33***	0.90***
	(2.96)		(13.05)	(8.69)	(4.30)	(2.59)	(2.20)		(5.47)	(4.00)	(7.61)	(4.80)	(5.32)
RM_{t-1}	- 0.29***	-	- 1.23***	- 0.85***	- 0.34***	- 0.21***	- 0.13**	-	- 0.60***	- 0.93***	- 0.71***	- 0.34***	- 0.93***
	(3.08)		(13.16)	(9.59)	(4.45)	(3.74)	(2.33)		(6.14)	(4.24)	(7.66)	(4.94)	(5.42)
$\bar{R}^2$	0.54	-	0.82	0.44	0.53	0.20	0.64	0.64	0.33	0.82	0.83	0.65	0.89
SEE	0.51	-	0.27	0.62	0.19	0.64	0.14	0.18	0.78	0.60	0.28	0.20	0.24
DW	1.96	-	2.03	2.11	2.05	2.19	1.90	2.10	2.20	1.91	2.03	1.92	1.99

[1] For the dummies included in order to take into account the 1992 ERM turbulence, see Table 6. [2] The three-month interbank rate moves closely in line with the rate on three-month Treasury certificates, the best indicator of a policy rate until the reforms in January 1991.

Table AI.3

Loan rate regressions: standard specification (recent period)[1]

	AU	BE	CA	FR	DE	IT	JP	NL	ES	UK	US (1)
ΔRM_t	-	0.63***	-	0.05**	-	-	0.45***	-	-	-	0.37***
		(11.98)		(2.57)			(6.46)				(3.24)
ΔRM_{t-1}	-	- 0.15**	-	-	0.19**	-	-	-	0.19***	-	-
		(2.09)			(2.04)				(3.46)		
ΔRM_{t-2}	-	-	0.31***	-	-	-	-	-	0.13***	-	-
			(4.19)						(2.39)		
ΔRP_t	0.83***	-	0.77***	0.46***	-	0.19***	-	0.71***	-	1.00***	0.33**
	(9.61)		(11.1)	(7.17)		(8.55)		(8.46)		(151.4)	(2.53)
ΔRP_{t-1}	-	-	-	-	-	0.15***	-	-	-	-	-
						(3.81)					
ΔRP_{t-2}	-	-	- 0.34***	-	-	-	-	-	-	-	-
			(4.09)								
ΔRL_{t-1}	- 0.23***	-	-	-	-	0.43***	-	-	-	-	-
	(3.63)					(4.69)					
ΔRL_{t-2}	-	-	-	-	-	-	-	-	-	-	-
RL_{t-1}	- 0.25**	- 1.18***	- 0.30***	- 0.14***	- 0.10***	- 0.11**	- 0.22***	- 0.51***	- 0.48***	-	- 0.28***
	(2.46)	(7.37)	(2.95)	(3.41)	(3.53)	(2.08)	(4.35)	(4.90)	(4.25)		(3.58)
RM_{t-1}	0.22**	1.10***	-	0.08***	-	-	0.20***	0.20***	-	-	0.48***
	(2.36)	(7.44)		(3.33)			(4.67)	(2.96)			(4.26)
RP_{t-1}	-	-	0.30***	-	0.10***	0.11**	-	0.32***	0.51***	-	- 0.24**
			(2.88)		(4.68)	(2.27)		(2.71)	(4.46)		(2.34)
$\overline{R}^2$	0.82	0.89	0.82	0.53	0.51	0.92	0.68	0.74	0.57	1.00	0.71
SEE	0.15	0.18	0.27	0.13	0.12	0.13	0.09	0.11	0.26	0.02	0.11
DW	1.99	2.01	1.90	2.12	2.03	1.86	1.80	1.98	2.27	2.01	1.71

[1] For the dummies included in order to take into account the 1992 ERM turbulence, see Table 6.

Table AI.4

Money market rate regressions (recent period)[1]

	AU	BE	CA	FR	DE	IT[2]	JP	NL	ES	UK[2]	US (1)
ΔRP_t	0.73***	0.97***	1.06***	1.48***	0.73***	-	0.68***	0.98***	2.39***	-	0.80***
	(4.41)	(8.16)	(11.47)	(4.30)	(6.61)		(8.24)	(10.20)	(8.22)		(8.22)
ΔRP_{t-1}	-	0.81***	-	-	0.28**	-	-	-	-	-	-
		(4.19)			(2.10)						
ΔRP_{t-2}	-	-	-	-	-	-	-	-	-	-	-
ΔRM_{t-1}	-	- 0.50***	-	-	- 0.31**	-	0.25***	- 0.21**	- 0.78***	-	0.26***
		(3.86)			(2.13)		(2.76)	(2.47)	(7.28)		(3.04)
ΔRM_{t-2}	-	- 0.44***	-	-	-	-	-	-	- 0.21**	-	-
		(4.66)							(2.14)		
RP_{t-1}	0.43**	-	1.28***	0.96***	-	-	0.22**	-	-	-	0.47***
	(2.38)		(8.66)	(7.02)			(2.35)				(4.34)
RM_{t-1}	- 0.46**	-	- 1.28***	- 0.96***	-	-	- 0.25**	-	-	-	- 0.48***
	(2.51)		(8.76)	(8.27)			(2.40)				(4.36)
$\bar{R}^2$	0.42	0.77	0.74	0.48	0.49	-	0.62	0.66	0.63	-	0.70
SEE	0.25	0.28	0.37	0.75	0.15	-	0.13	0.14	0.50	-	0.13
DW	1.97	2.36	2.07	2.07	1.95	-	2.09	2.39	2.43	-	1.89

[1] For the dummies included in order to take into account the 1992 ERM turbulence, see Table 6. [2] Not relevant since no money market rate enters the loan rate equation.

List of symbols used in the tables

Δ	change (first difference)	AU	Australia
SD	standard deviation	BE	Belgium
$\overline{R}^2$	adjusted R^2	CA	Canada
SEE	standard error of the equation	FR	France
DW	Durbin Watson statistic	DE	Germany
CH (x)	Chow test (p-value); x is the year	IT	Italy
	that splits the sample	JP	Japan
*	significant at the 10% level	NL	Netherlands
**	significant at the 5% level	ES	Spain
***	significant at the 1% level	SE	Sweden
(.)	figures in brackets under coefficient	UK	United Kingdom
	estimates are t-statistics	US	United States
–	not applicable/not statistically significant		
n.a.	not available		
RL	lending rate		
RM	money market rate		
RP	policy rate		
RD	(average) cost of deposits		
RC	opportunity cost rate		
R0	standing facility rate		

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