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Interest rate risk and bank net interest margins[1]

Banks and their supervisors have spent considerable time and effort in recent years developing systems for monitoring and managing interest rate risk.[2] This special feature examines that specific component of interest rate risk arising from the possible effects of changes in market interest rates on bank net interest margins.

Such effects can be very large if interest rate risk is not managed carefully. For example, the secondary banking crisis in the United Kingdom in the 1970s reflected, at least in part, the funding of longer-term assets with short-term liabilities.[3] Similarly, funding of long-term, fixed rate mortgages with savings deposits led to a very sharp drop in net interest margins at US thrift institutions in the early 1980s when interest rates rose to historic highs and the yield curve inverted. The result was actually *negative* net interest income for two years at US thrifts, after net interest margins had averaged nearly 1.5% over the preceding decade (FHLBB (1984)).

By contrast, the results presented here suggest that commercial banks in the 10 industrial countries considered have generally managed their exposures to volatility in the yield curve in ways that have limited effects on their net interest margins. Thus, while fluctuations in net interest margins could be an important source of uncertainty in bank profitability – and could surely have adverse effects for particular institutions – changes in interest rates seem unlikely to undermine sharply the health of the banking sector through their effects on net interest income.

The next section provides background on interest rate risk at banks, and discusses methods for assessing it. Given data limitations, the approach taken here focuses on the effects of market interest rates on the average yields on bank assets and liabilities and also on bank net interest margins. The subsequent section reports on the empirical findings. A final section provides some concluding remarks and caveats.

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[1] The views expressed in this article are those of the author and do not necessarily reflect those of the BIS. Gert Schnabel provided invaluable assistance with the data.

[2] For a detailed discussion of interest rate risk, see BCBS (2001). For a broader perspective on bank supervision, see BCBS (1997).

[3] For a discussion of this crisis, see Remolona et al (1990).

Assessing interest rate risk

Assessing banks' interest rate risk directly ...

A bank's interest rate risk reflects the extent to which its financial condition is affected by changes in market interest rates. There are two different ways of thinking about such effects. The first approach focuses on the impact of changes in market interest rates on the *value* of bank assets, liabilities and off-balance sheet positions (potentially including those that are not marked to market for reporting purposes), and so arrives at an overall assessment of the impact of changes in market interest rates on the economic value of the bank. The second approach focuses on the implications of movements in market rates for the future *cash flows* that the bank will obtain. Since the present discounted value of the bank's cash flows must equal the economic value of the bank, these two approaches are consistent and both can be useful. For example, a focus on flows may suggest impending liquidity problems as cash flow dwindles. Alternatively, a sharp decline in economic value may imply that the bank is insolvent, even if operations continue to provide cash in the near term. In either case, action on the part of both bank managers and national authorities would seem appropriate.

... can require a great deal of information ...

To assess directly the extent of a bank's interest rate risk following either of these two perspectives would require detailed information about a number of possible sources of interest rate risk (see the discussion in the box "Sources of interest rate risk" on page 69). Clearly, one would need information on the pricing of the bank's assets and liabilities, including repricing periods and base rates. Moreover, this data would need to be supplemented by information on the adjustments that the bank is likely to make to the rates on assets and liabilities that it can reprice at its discretion following changes in market rates. One would also require information on the likelihood that bank customers would choose to repay loans or withdraw funds early as a result of changes in market rates. Finally, one would need information sufficient to allow an evaluation of other potential sources of interest rate risk, including the interest sensitivity of fee income and off-balance sheet exposures.

... which researchers may find hard to obtain

In addition to its inherent complexity, such a direct approach is difficult for the researcher to implement because the necessary information is lacking. There is a paucity of data on the repricing intervals of banks' assets and liabilities in many countries. In addition, while there has been considerable study of the pricing of some types of deposits and loans, such information is hardly complete.[4] Finally, the extent to which bank customers take advantage of the options embedded in some bank contracts is generally hard to assess because of a lack of data on such behaviour.[5]

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[4] For recent results, see Banking Supervision Committee (2000).

[5] There has been considerable work on the prepayment behaviour of US residential mortgage borrowers, but even here the effects for a particular bank are likely to depend considerably on the specifics of the pool of mortgages held. See, for example, Stanton (1996).

Sources of interest rate risk

Interest rate risk can come in a variety of forms, including repricing risk, yield curve risk and basis risk. A bank will face repricing risk if either the average yield on its assets or that on its liabilities is more sensitive to changes in market interest rates. Such a difference in sensitivity could reflect a number of possible mismatches in the characteristics of assets and liabilities. First, fixed rate assets and liabilities could have different maturities. Second, floating rate assets and liabilities could have different repricing periods, with base rates that have maturities similar to their respective repricing periods (assets that reprice annually based on a one-year rate and liabilities that reprice quarterly based on a three-month rate, for example). Third, floating rate assets and liabilities could have base rates of different maturities (assets that reprice annually based on a long-term rate along with liabilities that reprice annually based on a one-year rate, for example). Fourth, in many countries there are assets and liabilities for which banks can adjust pricing at will (eg savings deposits and some types of retail loans) and the rate-setting policies that banks follow determine the effective repricing behaviour of such instruments. The pricing decisions in these cases will presumably depend on a variety of factors in addition to market interest rates, including the expected behaviour of bank customers and the extent of competition in the markets concerned. Finally, in some cases, bank customers have the option either to repay loans or withdraw their deposits at low (or no) cost, and the decisions of such customers will influence the response of the average pricing of such assets and liabilities to changes in market interest rates.[①]

Even if the yields on a bank's assets and liabilities adjust to changes in market rates to the same extent on average, a bank may still be subject to yield curve risk. Yield curve risk reflects the possibility that changes in the shape of the yield curve could have differential effects on the bank's assets and liabilities. For example, if a bank's assets and liabilities reprice annually, it might balance a medium-term base rate for its assets with a mixture of short-term and long-term base rates for its liabilities. In that case, increased curvature of the yield curve would, by boosting medium-term yields relative to short- and long-term yields, raise the rate on the bank's assets relative to the average cost of its liabilities.

Floating rate assets and liabilities that reprice at similar times and have base rates of similar maturity still may involve interest rate risk. If the instruments have different base rates, the bank will be subject to basis risk reflecting the possibility that the two base rates will diverge unexpectedly owing to differing credit risk or liquidity characteristics. For example, yields on a bank's floating rate assets could be tied to government security yields, while those on its floating rate liabilities could be tied to an interbank rate (eg Libor). In that case, a shock that boosted investors' demand for safety and liquidity might increase private yields relative to government yields, raising the cost of the bank's liabilities relative to the yield on its assets.

Banks may also be subject to interest rate risk through interest sensitivity of their non-interest income. For example, lower mortgage interest rates could lead to prepayments that deplete the pool of mortgages serviced by a bank, thereby trimming its fee income.[②] Perhaps more importantly, at least for large institutions, banks may have significant interest rate exposures embedded in their off-balance sheet positions, either as a hedge of their on-balance sheet interest rate exposures or as a result of trading activity in derivatives markets.

In practice, banks will generally have a mix of all of these types of interest rate risk, with the effects potentially offsetting or reinforcing one another. It is the complexity of the resulting combination of factors that makes interest rate risk difficult to manage.

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① A prominent example is the relatively low-cost refinancing of home mortgages in the United States. See Deep and Domanski (2002) for a discussion of the causes and consequences of mortgage refinancing in the United States. ② In some cases, however, fees associated with lending activity are amortised over the life of the credit and are included in interest income.

However, one can use data on banks' interest income and expense ...

As a result of these difficulties, a simpler approach is taken in this paper, focusing on the empirical relationships between market interest rates and banks' flows of interest income and expense.[6] By looking at the actual behaviour of interest income and expense, as well as net interest margins, one can see whether sharp movements in market rates or atypical configurations of long- and short-term interest rates have had large effects on banks' net interest income. Moreover, this evaluation implicitly takes account of the way that banks have chosen to adjust the pricing of their assets and liabilities, as well as the actual behaviour of bank customers with regard to prepayments and early withdrawals.

This approach leaves aside other possible sources of interest rate risk, including effects of interest rates on fee income, trading income and off-balance sheet exposures. In particular, to the extent that banks hedge the interest rate risk associated with their net interest income using derivatives such as swaps, the effects of their hedging may be missed. Nonetheless, it seems likely that much of banks' interest rate risk reflects mismatches on their balance sheet, and understanding this portion of banks' interest rate risk is a useful first step towards a broader assessment.

This approach is implemented in two steps. First, the empirical relationships between the average yield on bank assets and the average cost of bank liabilities, on the one hand, and short-term and long-term market rates, on the other, are estimated.[7] In particular, these relationships are examined to see if they are consistent with significant differences in the average repricing intervals of bank assets and liabilities. Then the slope of the yield curve and changes in market rates are tested to see if they appear to be related to banks' net interest margins.

... to see if market rates affect banks' net interest margins

International evidence on the effect of market interest rates on bank net interest margins

The conventional view among financial market observers, including academics and journalists, appears to be that interest rate changes and the slope of the yield curve have significant effects on banks' net interest income. In this view, returns on bank liabilities are thought to be relatively closely tied to short-term rates, and to adjust to changes in short-term rates relatively quickly. By contrast, returns on bank assets are seen as more closely tied to longer-term

[6] While the flows of interest income and expense are not, strictly speaking, cash flows (because of the effects of accrual accounting), they should nonetheless provide an effective benchmark for considering interest rate risk.

[7] Annual data on bank interest income, interest expense, assets and capital for 10 industrial countries are from OECD (2001). Where possible, the market interest rates used are those on government securities, so that the effects of changes in risk-free rates can be separated from the effects of changes in risk spreads. If available, the short-term market interest rate is the secondary market yield on three-month government bills, and the long-term market rate is the yield on 10-year government securities. Bill rates have been converted to a bond-equivalent basis. For Japan, the short-term rate is that on two-month bills. A three-month interbank or other private yield is used in some other countries. In several countries, the 10-year government bond yield is not available, and other maturities have been used. See the box on page 80 for a discussion of data issues.

Many observers believe that banks' have longer-term assets than liabilities ...

rates and slower to adjust to changes in market rates.[8] As a result, bank net interest margins are expected to be higher when the yield curve is steeper for a sustained period because, once assets and liabilities have repriced, a steeper yield curve implies higher rates on assets relative to those on liabilities. In addition, for a given yield curve slope, an increase in both short-term and long-term interest rates is expected to temporarily reduce net interest income, reflecting the more rapid adjustment of yields on liabilities than yields on assets.[9]

... so that a steeper yield curve boosts net interest margins

The behaviour of average rates on bank assets and liabilities

The relationships between the average yields on bank assets and liabilities and market interest rates are shown in Tables 1 and 2. Table 1 shows the long-run relationships between the levels of the yields and market rates, while Table 2 shows the short-run dynamic effects on the average yields of deviations from the long-run relationships and changes in market rates.[10]

For most countries, the long-run behaviour of the average yield earned on bank assets appears to reflect a weighted average of the short-term and long-term rates, with each of the weights less than one – and the sum of the weights

[8] Other factors could also result in changes in market rates influencing banks' net interest margins. For example, government regulation of loan or deposit pricing may, at times, have limited the extent to which changes in market interest rates were passed through to the pricing of bank assets and liabilities. However, deregulation is likely to have limited the importance of interest rate ceilings over the periods considered here. Alternatively, since nominal interest rates cannot fall below zero, banks may not be able to cut deposit interest rates in response to further declines in market rates once interest rates reach very low levels. As a result, lower rates may lead to narrower net interest margins (Banking Supervision Committee (2000), Silverman et al (2002)). Since the zero lower bound has been a significant issue primarily in Japan, where the low level of rates does not appear to have affected net interest margins (Oyama and Shiratori (2001)), this possibility is not examined here. Nonetheless, interest rates have fallen substantially in recent years in some countries, suggesting that this factor may be more important going forward.

[9] For examples of this view in the United States, see Tomasula (1994), Wiggins (2002) and Akella and Greenbaum (1992). A similar claim for European banks is made in Banking Supervision Committee (2000). By contrast, Oyama and Shiratori (2001) suggest that net interest margins in Japan have not been greatly affected by changes in interest rates or other factors. The assumed mismatch between the maturities of bank assets and liabilities plays a crucial role in models of bank runs (Diamond and Dybvig (1983)). It has also been argued that the very low levels of short-term rates in the early 1990s, and the consequent steep yield curve, boosted bank profitability in the United States (Boyd and Gertler (1993)). For a discussion, see English and Nelson (1998).

[10] Interest rates are commonly thought to be integrated, and augmented Dickey-Fuller tests reject the null hypothesis of a unit root in relatively few of the 40 yield and interest rate series employed here. As a result, the econometric approach follows the two-step procedure suggested by Engle and Granger (1991). The long-run, or cointegrating, relationships are shown in Table 1, while the short-run, or error correction, relationships are shown in Table 2. Given the short samples of annual data available, it is not possible to consider potential changes in the behaviour of banks over time, or to examine the short-run dynamics as closely as one might like. In particular, it seems likely that there could be asymmetric adjustment of asset and liability yields in response to increases and decreases in market rates (see Mojon (2000)).

Long-run relationship between average asset and liability yields and market interest rates

Annual data

Country	Asset yield		Liability yield	
	Short-term rate	Long-term rate	Short-term rate	Long-term rate
Australia	0.13	0.64	0.23	0.41
Canada	0.48	0.37	0.47	0.34
Germany	0.23	0.56	0.38	0.20
Italy	0.55	0.03	0.44	–0.00
Japan	0.25	0.44	0.17	0.54
Norway	0.61	0.06	0.62	–0.05
Sweden	0.50	0.19	0.61	–0.00
Switzerland	0.58	–0.04	0.65	–0.27
United Kingdom	0.66	0.36	0.72	0.08
United States	0.12	0.44	0.29	0.36

Table 1

The average yield on assets ...

generally less than one as well.[11] These regression results are broadly consistent with intermediate asset repricing periods. In almost all of the countries, there is a statistically significant adjustment towards this long-run relationship, judging by the error correction terms reported in Table 2, but the speed of the adjustment varies widely.

... appears to be relatively long-term in some countries

The relative importance of short- and long-term rates for the yield on assets differs considerably across the countries considered. In four of them – Australia, Germany, Japan and the United States – the rate earned on assets appears to carry a higher weight on the long-term rate than on the short-term rate, suggesting a longer average repricing period or base rate in those countries. For the same countries, the short-run dynamics also suggest a relatively large share of assets carrying longer-term rates, as evidenced by the relatively large and statistically significant coefficients on the change in the long-term rate in the error correction equation.

A comparison of these results with direct estimates of the maturity and repricing periods of bank assets shows both similarities and differences. Based on data for 1993 – about the midpoint of the samples used in this paper – Borio (1995) found relatively long repricing intervals for Germany, Japan and the United States, consistent with the results found here. However, he also noted relatively short repricing intervals for Australia, which is not consistent. In the

[11] That the sum of the coefficients is less than one is not that surprising once one remembers that some assets (eg buildings, equities, goodwill and the mark-to-market value of certain off-balance sheet contracts with positive net value) do not involve interest payments. On the liability side, some deposits carry below market rates because they offer liquidity services not provided by market instruments. Moreover, some liabilities (eg demand deposits in some countries and the mark-to-market value of off-balance sheet contracts with negative net value) do not pay interest. Note that in a few cases, most notably Switzerland, the coefficient on the long-term rate is negative. These anomalous results may be due to the relatively small data samples used, combined with particular shocks that arose in the affected countries (see below).

Short-run relationship between changes in average asset and liability yields and changes in market interest rates

Annual data

Country	Asset yield			Liability yield		
	Error correction term	Change in short-term rate	Change in long-term rate	Error correction term	Change in short-term rate	Change in long-term rate
Australia	–0.98**	0.04	0.39*	–1.14**	–0.00	0.29
Canada	–0.97**	0.43**	0.14	–0.69**	0.47**	0.09
Germany	–0.62**	0.25**	0.27*	–0.55*	0.36**	0.15
Italy	–0.52**	0.23*	0.08	–0.73**	0.21*	0.01
Japan	–0.80**	0.23	0.48*	–0.63*	0.25	0.52*
Norway	–0.60**	0.47**	–0.22	–0.46*	0.53**	–0.23
Sweden	–1.02**	0.33**	0.28*	–0.65*	0.50**	0.03
Switzerland	–0.55**	0.35**	0.14	–0.45*	0.36**	0.20
United Kingdom	–0.78*	0.51**	0.34	–0.53	0.64**	0.02
United States	–0.36	0.28**	0.23*	–0.42*	0.36**	0.18

Note: The error correction term is the lagged deviation from the long-term relationship shown in Table 1.

* = significant at the 5% level. ** = significant at the 1% level. Table 2

case of Switzerland, most assets were either short-term or repriced fairly often (at least once a year), findings consistent with the coefficients reported in Table 1. However, Borio also reported that many floating rate assets repriced relative to a rate that was itself fairly long-term, which would seem to imply a greater role for long-term rates than the one found here.[12]

The average yield on liabilities is generally similar to that on assets ...

Empirical results for the average rate paid on liabilities are broadly similar to those for the yield on assets. Again, long-term rates seem to play a larger role in Australia, Japan and the United States, though not, in this case, in Germany. Looking across countries, there appears to be a reasonably good match between the pricing of assets and liabilities in many cases, at least judging by the similarity of the coefficients on the assets and liabilities sides of the balance sheet. Nonetheless, in several of the countries – including Australia, Germany, Sweden, the United Kingdom and the United States – the rate earned on assets appears to carry a higher weight on the long-term rate and a lower weight on the short-term rate than does the rate paid on liabilities, providing some support for the conventional view.

... but some countries may have mismatches ...

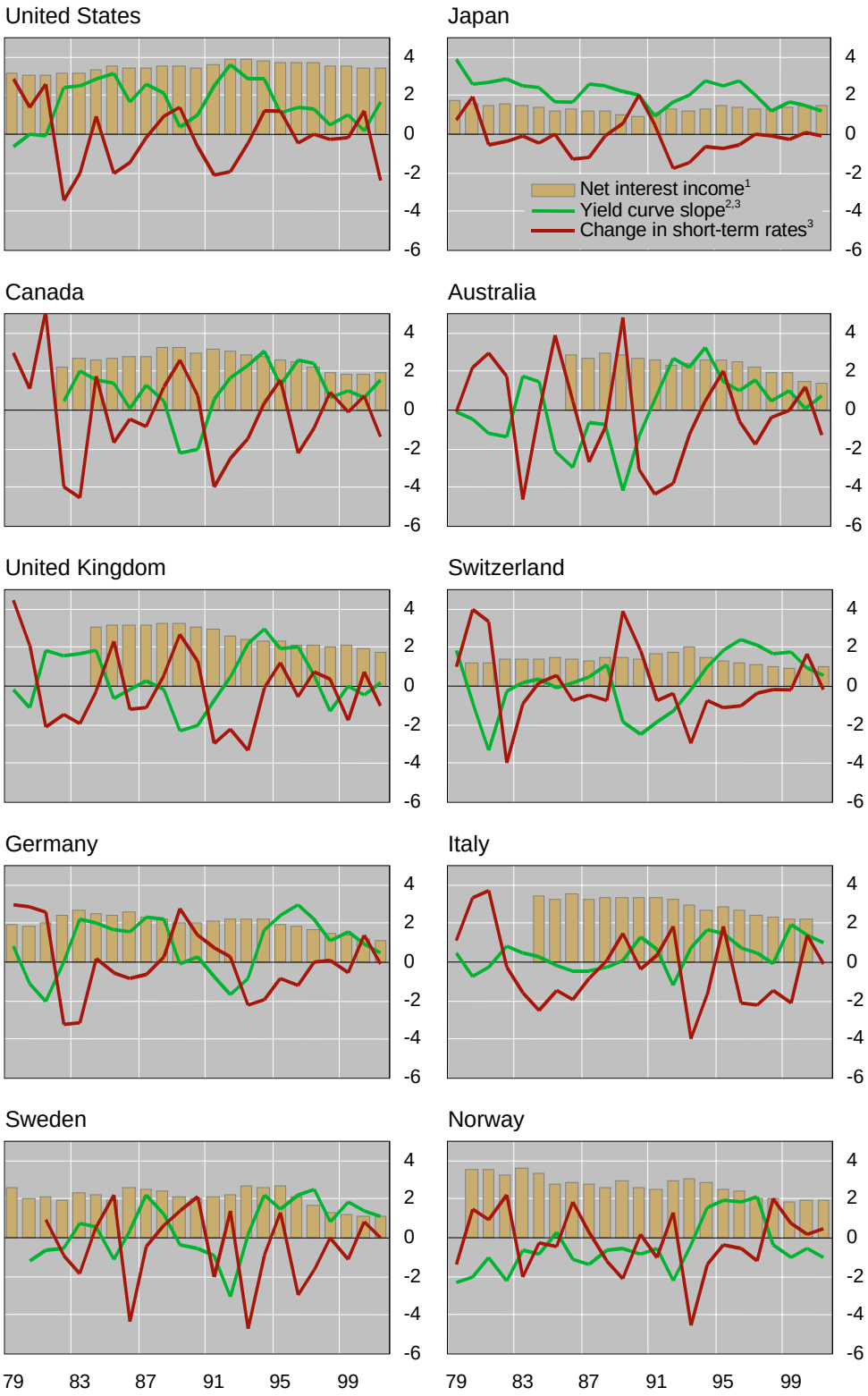
The behaviour of net interest margins

... suggesting that market rates could affect margins

The results in the previous section suggest that the configuration of market interest rates should influence bank net interest margins in a number of the countries examined. To the extent that the average yield on bank assets is more closely related to long-term rates than the average yield on liabilities, a steep yield curve should be associated with higher net interest margins. In

[12] In part, differences relative to Borio (1995) may reflect the broader set of intermediaries included in that analysis.

Net interest income, yield curve slope and short-term rate change



[1] As a percentage of average assets. [2] Long-term rate less short-term rate. [3] In percentage points.

Sources: OECD; national data. Graph 1

addition, as mentioned earlier, the speed with which changes in market interest rates are incorporated into the yields on bank assets and liabilities may differ, and so such changes may temporarily affect net interest margins.

To examine these hypotheses, Graph 1 shows net interest margins for the 10 countries along with the slope of the yield curve (the long-term rate less the short-term rate) and the change in the short-term rate for each country.[13] The graph does not suggest a strong relationship among the variables in most of the countries.[14]

Empirical results for net interest margins are mixed ...

Regression tests, shown in Table 3, provide mixed results. In five of the countries – including Australia and the United Kingdom, where the earlier results suggested some possible mismatch in the pricing of assets and liabilities – there is no evidence that the slope of the yield curve or changes in the levels of short-term and long-term rates influence bank net interest margins.[15] Thus, in these countries banks appear to have avoided significant exposures to market interest rates, at least in the aggregate, over the period considered. Only in the case of the United States does the slope of the yield curve enter significantly with the positive sign that the conventional view would suggest. Somewhat surprisingly, given the earlier results, the slope of the yield curve enters significantly but with a negative sign in Germany and Sweden, as well as in Norway and Switzerland. Thus, while increases in short-term rates in

Relationship between net interest margin and market interest rates

Annual data

Country	Own lag	Yield curve slope	Change in short-term rate	Change in long-term rate
Australia	1.10**	0.04	0.01	0.03
Canada	0.91**	–0.05	-0.05	–0.00
Germany	1.02**	–0.09**	-0.08**	0.05
Italy	0.91**	–0.05	0.01	0.05
Japan	0.81**	–0.05	-0.05	0.00
Norway	0.84**	–0.12*	-0.06	–0.02
Sweden	0.86**	–0.11**	-0.14**	0.13*
Switzerland	0.67**	–0.08**	-0.02	–0.10
United Kingdom	1.06**	0.01	0.04	–0.06
United States	0.82**	0.07**	-0.00	0.02

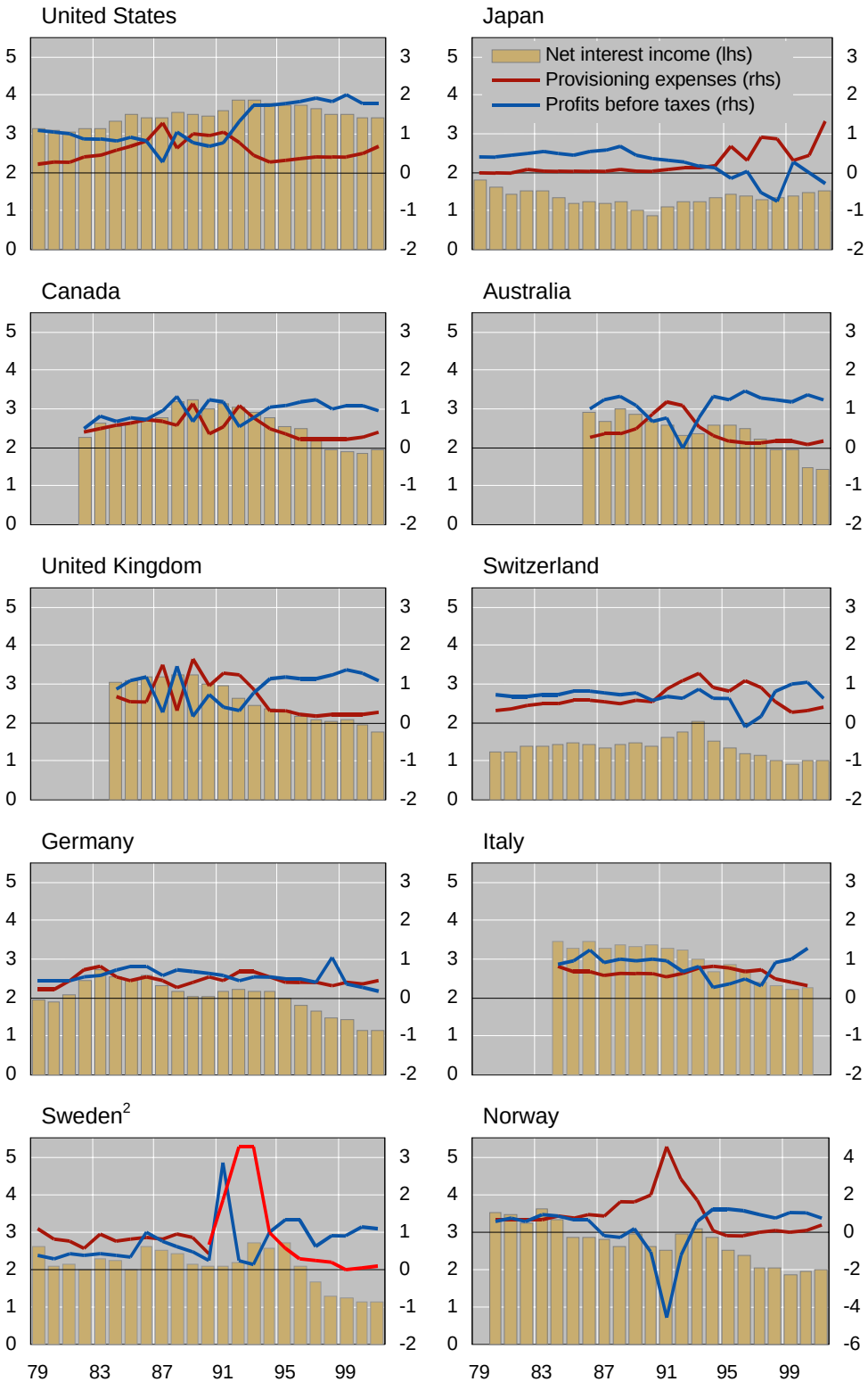
* = significant at the 5% level. ** = significant at the 1% level. Table 3

[13] The net interest margin is defined to be net interest income as a percentage of average assets. See the box on page 80 for a discussion of measurement issues.

[14] As discussed below, effects of changes in the long-term rate are even harder to identify, perhaps because they are slow to accumulate. In order to avoid cluttering the graph, those changes are not shown.

[15] In the case of Italy, if only the short-term rate is included in the regression, then it is significant (although the yield curve slope remains insignificant). It may be that the co-movements of long- and short-term interest rates are sufficiently close to make the effects hard to identify if both variables are included in the regression because of multicollinearity. Such multicollinearity does not appear to be a general problem, however, since neither the short-term nor the long-term rate entered alone is significant for any of the other countries.

Net interest income, provisioning expenses and profits[1]



[1] As a percentage of average assets. [2] A change in the tax system in 1991 led to the dissolution of a substantial volume of untaxed reserves over that and the subsequent few years. To avoid the effects of this accounting change, the graph shows provisions for the period 1979–90 and loan losses (a component of non-interest expense) for 1990–2001. Note that bank income in the early 1990s was boosted substantially by the unwinding of the reserves.

Sources: OECD; national data. Graph 2

these countries are associated with lower net interest margins, consistent with the conventional view (though the effect is not always statistically significant), a steep yield curve has an unexpected negative effect.

... perhaps reflecting the short time series available

These mixed results may be due to the relatively short samples used. For example, in many European countries during the second half of the 1990s, the yield curve was relatively steep at the same time that net interest margins narrowed. However, the narrowing of margins may well have been the result of increased competition, owing to changes in technology and regulation, rather than the shape of the yield curve.[16] The results found for these countries might also suggest more subtle influences, perhaps including hedging activity by banks.

While large and persistent moves in interest rates may affect margins ...

The generally large coefficients on the lagged net interest margin in these regressions suggest that adjustments to changes in market rates and the slope of the yield curve, if any, take place fairly gradually.[17] As a result, even given the relatively small size of the estimated coefficients on the changes in market rates and the slope of the yield curve, a long period with rising or falling rates or with a very steep or flat yield curve could result in a substantial cumulative effect on the net interest margin. For example, the large and sustained swing in the slope of the yield curve in the United States in the early 1990s can explain about two thirds of the 44 basis point rise in the net interest margin between 1990 and 1993.

... such moves are not very common

However, as shown in Graph 1, such large moves in the yield curve or in the short-term market rate are not very common. Thus, these econometric results suggest that major fluctuations in net interest margins caused by movements in the yield curve are likely to be fairly rare. Indeed, as shown in Graph 2, year-to-year movements in net interest margins have generally been quite small compared to the very large fluctuations in loan loss provisions and overall profits in the banking sector.

Conclusions and caveats

These results suggest that banks in the countries examined have been fairly successful in limiting the exposure of their net interest margins to market interest rates over the past 20 years or so. The relatively stable outcomes found here probably reflect, in part, the shorter-term focus of commercial banks' business mix in many countries (relative to that of building societies, thrifts and other similar institutions). The results are also consistent with banks having made efforts to limit their interest rate risk through the selection of assets and liabilities, the setting of rates on core deposits and retail loans, and hedging activities.

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[16] See Banking Supervisory Committee (2000) for a discussion of reasons for the narrowing of margins.

[17] In a few cases (Australia, Germany and the United Kingdom), the coefficient on the lagged term is greater than one, suggesting explosive dynamics. However, in none of these cases is the coefficient statistically significantly greater than one.

It is possible that some effects of maturity and repricing period mismatches may have been missed in this analysis. To the extent that banks in a given country have assets and liabilities denominated in other currencies, interest rates in those other currencies could also affect net interest margins. At the same time, the effects of interest rates in the domestic currency would be diminished, making them harder to observe in the regression tests employed here. Without longer time series and data on the currency distributions of assets and liabilities of banks in the various countries, however, these possible effects are difficult to evaluate.[18]

A more fundamental qualification arises from the fact that macroeconomic shocks could influence both market interest rates and banks' desired net interest margins. One might expect, for example, that banks would raise their desired margins in periods of slow growth, reflecting higher expected loan risk.[19] At those times, however, central banks might well ease policy in order to support aggregate demand, thereby steepening the yield curve. The resulting correlation between bank margins and the slope of the yield curve would then suggest that bank liabilities either reprice more rapidly than bank assets or have base rates of shorter maturity, even if this is not the case. Addressing this issue completely would require both modelling of banks' desired margins and development of macroeconomic models of the countries covered to extract measures of macroeconomic shocks. Such a large task could not be attempted here.

The analysis of net interest margins presented here has left aside two potentially important issues. First, there has been no effort to evaluate whether the net interest margins earned by banks are appropriate given the expected riskiness of bank assets. Differences in the expected riskiness of bank assets over time or across countries would be expected to influence net interest margins. In addition to possible cyclical changes in risk spreads on bank loans, one might also expect secular changes reflecting developments in the banking industry. For example, over the past three or four decades, as banks in the United States have shifted their assets toward riskier activities, including loans to households and riskier firms, the levels of both provisioning and net interest margins have trended higher (FDIC (2001)). By contrast, net interest margins in Japan do not appear to have responded to the much higher loss rates of the past decade.[20] The second important issue not pursued here is the extent to

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[18] Banks in some countries, notably Canada, are likely to have considerable US dollar assets and liabilities. If US interest rate measures are added to the net interest margin regressions shown in Table 3, at least one of the US variables is statistically significant in four countries, including Canada. However, the results vary considerably across countries, and some of the coefficients are difficult to interpret. Moreover, it is hard to have much confidence in these results because of the small number of degrees of freedom in the regressions and the possibility that the US interest rates are serving as proxies for more general global macroeconomic shocks. Nonetheless, such cross-currency effects would be a useful topic for future research.

[19] This need not, however, be true. Banks could pull back from risk-taking in such situations, choosing to increase holdings of safer loans and government securities. In that case, their intended net interest margin would decline.

[20] See Oyama and Shiratori (2001) for a discussion of possible reasons for the lack of adjustment in Japan.

which the approach employed masks important differences either among banks or over time. Even if the banks in a country avoid mismatches in the pricing of their assets and liabilities on average, particular institutions, or even the industry as a whole, could have significant interest rate exposures on occasion. Some banks will presumably make mistakes, while others may choose to mismatch maturities at times in order to profit from forecast movements in interest rates. More broadly, the net interest margin of the banking sector could be exposed to interest rate changes for a period if a large number of banks, presumably responding to the same or similar market signals, choose to take on similar exposures. Moreover, even if banks avoid interest rate risk associated with their net interest income, there are other possible sources of interest rate risk. As a result, banks and supervisors need to remain alert to developments that could lead to excessive exposure to changes in market interest rates.

Data and measurement issues

Measuring net interest margins and average yields on assets and liabilities on a consistent basis across countries is difficult. Differences in accounting rules – for example, with regard to loan loss reserves, netting or market value accounting – can affect the measures, as can differences in the activities of banks across countries. To minimise the effects of accounting differences, annual data from the OECD are used; these data reflect an effort to put balance sheet and income information for OECD countries on a comparable basis. In many cases, the OECD provides banking data for more than one group of depository institutions, and data for "commercial banks" have been selected where such a category is available. Despite these efforts, however, important differences in coverage and accounting may remain, and so comparisons of net interest margins across countries should be made with care.

The net interest margin employed here is calculated as net interest income for a year as a percentage of average assets for that year. Average assets are a simple average of assets at the start and end of the year. It might be preferable to use interest-earning assets as the denominator, but information on interest-earning assets is not available from the OECD.

The average yield on assets is calculated as gross interest income divided by average assets. The average yield on liabilities is calculated as gross interest expense divided by average assets less average capital and reserves. This is the only capital measure available from the OECD.

Because there is no interest expense associated with bank capital, the measure of net interest margin used here will exceed an alternative measure calculated as the difference between the average yield on assets and the average cost of liabilities (Banking Supervision Committee (2000)). The wedge that capital drives between these two measures will fluctuate over time, reflecting changes in the ratio of capital to assets and in the average cost of liabilities. In particular, changes in capital regulation could affect reported margins by causing changes in actual capital ratios. However, the empirical results reported here are not importantly affected if the difference between the average return on assets and the average return on liabilities is employed rather than the net interest margin.

Changes in accounting rules in a given country can impair the comparability of the yield and margin measures over time. Indeed, in many cases, the OECD volume provides only a relatively short time series, presumably reflecting the difficulties national authorities faced in constructing comparable data for a longer period. Given the statistical exercises employed in this article, the sample has been limited to countries with at least 15 years of data.[①]

The short-term and long-term interest rates are annual averages of daily or month-end data, depending on availability.

[①] Where possible, the OECD data begin in 1979, and the published data generally end in 1998 or 1999. However, in most cases, we have been able to get comparable data up to 2001 from national authorities. Short samples make it impossible to include a number of countries that would be of considerable interest, notably France. In addition, lack of a sufficiently long time series for either the short-term or long-term interest rate led to the exclusion of some countries. For example, there was no consistent long-term benchmark interest rate series for Spain before the late 1980s.

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