Bank Spreads and Business Cycles *

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Abstract

This paper studies the behavior across business cycles of representative bank loan-deposit spreads and their components for Canada, Italy, Germany, the Netherlands, Switzerland, the United Kingdom, and the United States. A main finding is that the loan rate (adjusted for movements in overall market interest rates) in most countries is markedly countercyclical, consistent with financial accelerator theories of the business cycle. Another main finding is that in all countries the spread between savings-deposit rates and overall market interest rates is markedly countercyclical. This is consistent with banks exploiting market power over "core deposits" systematically across business cycles, possibly to buffer cyclical shocks either borrowers of the banks or to the cost of other (more competitive) bank deposits. Further, the evidence is consistent with banks in the continental-European countries adjusting the cost of domestic deposit liabilities over the business cycle much more than is the case in the English-speaking countries.

Keywords: banking, interest rates, business cycles

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1. Introduction

This paper studies the cyclical behavior of bank loan-deposit spreads and their components for seven major economies—Canada, Italy, Germany, the Netherlands, Switzerland, the United Kingdom, and the United States. Motivation for this analysis is twofold. First, estimates of the behavior of bank loan and deposit pricing over business cycles may provide insight into whether banks exploit market power in certain deposit market segments (*e.g.*, ordinary savings deposits) either to buffer adverse shocks to other (more competitive) deposit market segments (*e.g.*, time deposits or eurodeposits) or to their loan customers. Second, the amplitude of business cycle fluctuations themselves likely depends heavily on banks' pricing of loans (relative to other interest rates) at different stages of the business cycle. One reason for this is that financial distress and bankruptcies are countercyclical, and loan rates should reflect this. Another reason is that informational frictions in credit markets may be exacerbated during recessions. Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) present formal models of this "financial accelerator" mechanism. In these models, cyclical downturns negatively impact borrowers' net worth or collateral, and that raises the cost of borrowing and therefore amplifies the downturn.[1]

The empirical analysis in the paper leads to four main conclusions. First, loan rate spreads (*i.e.* loan rates relative to overall market interest rates) are statistically and economically significantly countercyclical for most countries considered (Canada and Germany are exceptions). Second, savings-deposit spreads (*i.e.* savings-deposit rates relative to overall market interest rates) are markedly countercyclical in all countries, and they are generally more countercyclical in the continental-European countries. Third, although less significant in quantitative terms than is the case for savings-deposit spreads, time-deposit spreads in most of the continental-European countries display marked countercyclicality. In contrast, time-deposit spreads in the English-speaking countries are modestly procyclical. Fourth, in all countries eurodeposit spreads are either acyclical or procyclical.

The observed cyclical behavior of loan rates suggests that financial accelerator mechanisms may be an important influence during business cycles in many countries. However, it is an interesting fact that the cyclical behavior of certain deposit spreads are generally at least as prominent as that of loan rates. Banks appear not only to have significant market power over savings-deposit rates and, in most of the continental-European countries, also over domestic time deposit rates, but also the evidence is consistent with them systematically adjusting deposit rate spreads across business

[1] See Bernanke, Gertler, and Gilchrist (1996) for references to related empirical studies.

cycles. The motivation for this type of bank behavior could be either to buffer adverse shocks to banks' borrowers or to banks' cost of funds in more competitive segments of deposit markets.

It is noteworthy that the evidence is consistent with the continental-European banking systems manipulating the cost of domestic deposit liabilities across the business cycle much more than is the case in the English-speaking countries. A plausible explanation for this is that historically the English-speaking countries have had better developed securities markets (particularly money markets) that may have resulted in greater competition in some deposit markets (domestic time deposits in particular), especially when funds are relatively scarce (*i.e.* during economic slowdowns when monetary policy is tighter). This explanation implies that less competitive deposit markets may have helped banks "finance" bank-borrower relationships in countries that have been categorized as having "relationship banking systems."

Regardless of why loan and deposit rates have the cyclical properties they are found to have, a general conclusion of the paper is that the sharpest difference across these two groupings of countries is the cyclical behavior of deposit rates rather than loan rates—domestic deposit rates are generally much more highly countercyclical in the continental-European countries than in the English-speaking countries.

The paper complements existing studies (see section 2) of bank "net interest margins"—bank-level aggregated spreads. Most of this work has focused on U.S. banks, during the past decade or so.[2] The present paper differs from this work in that the focus here is on the cyclical behavior of bank loan-deposit spreads and their components, for seven banking systems over the past 30 years or so. In contrast to studying bank net interest margins, the analysis below studies for seven countries benchmark loan interest rates and interest rates on three reasonably standardized types of deposits—ordinary savings accounts, domestic time deposits, and euro-deposits.

The format of the paper is as follows. Section 2 discusses related literature and presents an analytical framework for interpreting the cyclical behavior of spreads. Section 3 discusses data and the empirical methodology. Section 4 presents the empirical findings. The final section offers an interpretation of the empirical findings based on the analytical framework discussed in section 2 and contains concluding remarks.

2. Loan-Deposit Spreads

2.1. Existing Literature

There have been several theoretical studies of bank loan-deposit spreads and several empirical

[2] Maudos and de Guevara (2004) is an exception.

studies of a related variable, net interest margin, that is standard for banks to report in their accounting statements. Theoretical studies (*e.g.*, Ho and Saunders (1981), Wong (1997), Zarruk (1989)) identify various determinants of loan-deposit spreads, including: the volatility of short-term interest rates; bank market power in loan and deposit markets; bank risk aversion; and default risk on bank loans. Most empirical studies examine the importance of these and other factors for banks' net interest margins (*e.g.*, Graddy and Karna (1984), Olson and Simonson (1982), McShane and Sharpe (1985), Ho and Saunders (1981), Angbazo (1997)), which is defined as interest income less interest expense, divided by bank assets.[3]

This literature points out the role of credit risk in spread determination, but there has been little attempt to link credit risk to the business cycle explicitly. Such a link is the central idea of some recent theories of the business cycle. Specifically, the seminal papers by Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) show that business cycles are exacerbated by the cyclical behavior of bank lending rates because borrowers' net worth (or collateral) deteriorates during recessions—the "financial accelerator." That is, borrower creditworthiness is directly linked with the stage of the business cycle. This link could be strengthened if the returns on borrowers' investment projects are procyclical.

There have been some studies of the cyclical behavior of the cost of credit in the United States. Gertler and Lown (2000) examine the cyclical behavior of bond yields in the U.S. high-yield market. In an interesting empirical analysis, Berlin and Mester (1999) study loan rates for a sample of U.S. banks during 1977–1989 and find that banks with a greater proportion of "core deposits" (*i.e.* demand and savings deposits) change loan rates less during the business cycle—measured by the unemployment rate—than do banks with lower core deposits. Asea and Blomberg (1998) find that over the period 1977–1993 U.S. banks systematically weaken lending standards (including price and non-price contractual elements) over the business cycle. Santos and Winton (2005) find that loan spreads (loan rates minus Libor) widen during recessions for firms without public bond market access. Ruckes (2004) presents a formal model of countercyclical loan spreads driven by countercyclical screening of loan applicants and therefore countercyclical credit standards.

2.2. Interpreting Loan-Deposit Spreads

The prediction of the financial accelerator mechanism for the link between the business cycle,

[3] This is equal to a loan-deposit spread—which is the focus of theoretical models—when loans as well as deposits are homogeneous and when reported net interest income equals loan interest less deposit interest. In practice, net interest margins lump together many different loan interest rates and deposit interest rates and they often include other types of income and expenses (*e.g.*, net interest income in some countries includes income on a bank's securities holdings).

borrower creditworthiness, and bank spreads is the *baseline hypothesis* used in the paper to interpret loan-deposit spreads. Specifically, controlling for various other determinants of bank spreads, the baseline hypothesis is that loan-deposit spreads are countercyclical—they increase during recessions and decrease during economic expansions—and the reason for this is that loan markups (over some benchmark interest rate) have a marked countercyclical component.

The baseline hypothesis therefore focuses on the link from cyclical movements in borrower creditworthiness to loan rates and therefore to bank loan-deposit spreads. This hypothesis is arguably uncontroversial when loan and deposit markets are competitive. When loan or deposit markets are uncompetitive, however, loan or deposit rates (respectively) may plausibly exhibit marked cyclical behavior caused by banks systematically manipulating loan or deposit rates (respectively) at cyclical frequencies.[4] There appear to be two main hypotheses tying bank market power to the cyclical behavior of bank spreads.

The first hypothesis, referred to as the *relationship hypothesis*, builds on existing research that emphasizes banks with market power may exploit this market power in order to smooth loan rates as part of long-term relationships between banks and their loan customers. When market power pertains to loan markets, banks and their borrowers may enter into multi-period contracts that involve smoothing loan rates across time (see Peterson and Rajan (1995)). Market power in deposit markets can facilitate loan-rate-smoothing contracts, because banks can utilize deposit market power to insulate themselves from variations in the cost of smoothing loan rates. Berlin and Mester (1999) present evidence that banks with market power in deposit markets smooth loan rates more than banks with less deposit market power. The specific form of the relationship hypothesis studied in this paper is that banks manipulate deposit rates (*relative* to overall market rates) to buffer loan rates (and thus bank spreads and profitability) from shocks. This hypothesis predicts that interest rates on deposits in less competitive segments of the deposit market will, relative to overall market interest rates, have a significant countercyclical component. For deposits over which banks have less market power (*e.g.*, eurodeposits), one would expect less countercyclical behavior (again, relative to overall market interest rates).

In summary, the relationship hypothesis predicts that for deposits over which banks have market power (*e.g.*, possibly savings deposits) the spread between deposit rates and overall market interest rates will exhibit marked countercyclical behavior. In addition, the spread between

[4] There is evidence that banks have market power in both loan markets and at least some segments of the deposit market. For the United States, Hannan and Berger (1991) and Neumark and Sharpe (1992) present evidence of this for certain deposit markets and Peterson and Rajan (1995) present similar evidence for loan markets.

loan rates and overall market interest rates will not be highly countercyclical—the loan rate is "smoothed." In practice, lending relationships could involve other aspects besides loan rates (*e.g.* loan covenants, collateral requirements, and working with distressed borrowers). For instance, Allen and Gale (1995) emphasize that a key difference between the German and Japanese banking systems on the one hand and the U.S. banking system on the other hand is a willingness and, for legal reasons, the ability to engage in debt workouts with distressed borrowers. If this is the main aspect of bank-borrower relationships, then one would not expect to observe smooth loan rates, but banks may still "pay for" relationships across the business cycle partly by varying (countercyclically) deposit rates (relative to overall market interest rates).

In the case of less than fully competitive deposit and loan markets, the second main hypothesis used to interpret the evidence is referred to as the *cyclical competitiveness hypothesis.* The essential idea here is that banks exploit market power in certain segments of the deposit markets to buffer adverse shocks to banks' cost of funds in more competitive segments of the deposit market.[5] For instance, eurodeposits are surely a more competitive market than that of savings deposits. If competition in the eurodeposit market is systematically more intense at certain stages of the business cycle (*e.g.*, at cyclical peaks when monetary policy has been tightened and the demand for loans is high), then this will likely result in systematically higher *relative costs* of eurodeposits at these times—*i.e.* a narrower spread between the eurodeposit rate and overall market interest rates. By the same token, for deposit rates over which the bank has considerable market power, the spread between those deposit rates and overall market interest rates should have either a less pronounced cyclical component, or even a qualitatively opposite cyclical behavior if banks are manipulating these deposit rates to buffer shocks to more competitive deposit markets or to their loan customers. This hypothesis therefore has the following prediction: the cyclical behavior of deposit rates (relative to overall market interest rates) over which the bank has market power will be quantitatively less, or qualitatively opposite, the cyclical behavior of deposit rates over which the bank has little market power.[6]

The purpose of introducing these three hypotheses is to establish an analytical framework that

[5] Deposit rates may also have cyclical properties (relative to overall market rates) if there is no deposit insurance on the class of deposits under consideration. Deposit insurance systems are briefly summarized in the appendix, and their potential role in the paper's findings is discussed in section 5. Note, however, that in the empirical analysis bank deposit rates are measured relative to overall market interest rates, and for the latter, several possible interest rates are considered, including an interbank rate (interbank deposits are generally explicitly excluded from deposit insurance coverage). It turns out that the results are not sensitive to which interest rate is used.

[6] It is possible that a bank might exploit loan market power to buffer adverse funding shocks. In that event, the prediction of this hypothesis is that loan rates and competitive deposit rates have opposite cyclical properties.

can be used to interpret the empirical results. These hypotheses are *not* mutually exclusive. For instance, a bank might manipulate deposit rates in less competitive segments of the deposit market both to buffer adverse shocks to loan customers (loan-rate smoothing) and adverse shocks to more competitive segments of the deposit market. The baseline hypothesis imposes the most structure on bank behavior and market structure. Consequently, it has the most straightforward predictions. The other two hypotheses generalize bank behavior and market structure and therefore build on the predictions of the baseline hypothesis.

2.3. Discussion: Relationship versus Transactional Banking Systems

Allen and Gale (1995) distinguish between transactional and relationship banks. They associate the German and Japanese systems with the latter and the U.S. and the U.K. banking systems with the former. In their definition, relationship banking systems are distinguished by banks providing both equity and debt finance to firms, having long-term ties to firms, possibly having direct input into the management of the firms, and renegotiating with distressed borrowers. In contrast, transactional banks specialize largely in just providing debt financing to firms and are reluctant for legal reasons to renegotiate with troubled borrowers.

Allocating banking systems to these two categories is useful for some purposes, but for other purposes it may be unhelpful. Specifically, if relationships are defined alternatively as continuous monitoring of borrowers' financial conditions, the option to refinance a distressed borrower (possibly with concessions), and long-term smoothing of lending terms, then "relationship banking" may characterize well some transactional banking systems. Berlin and Mester (1998,1999) emphasize some of these forms of relationships between U.S. banks and their borrowers. Thus, it is not clear cut that one should expect smoother loan rates in so-called relationship banking systems. Rather, the key difference between relationship and transactional banking systems is likely the manner and degree to which banks deal with distressed borrowers and have input (via large equity stakes) into the management of non-bank firms.

There may also be significant differences in the closeness of relationships between banks and their loan customers across different relationship banking systems and across different transactional banking systems. For example, the Canadian banking system is typically categorized as a transactional banking system. However, certain features of the bankruptcy code in Canada (Buckley (1997)), as well as the ability of Canadian banks to acquire sizable stakes in non-financial firms (Barth *et. al* (1997)), suggest the Canadian banking system shares some key features attributed to the relationship banking systems. Similarly, Barca (1996) emphasizes aspects of bank-borrower relationships in Italy versus the United States or Germany.

3. Data and Empirical Methodology

3.1. Data

To interpret loan-deposit spreads in terms of the factors discussed in section 2 it is important that bank lending and deposit rates are not tightly regulated. Six major industrial countries were identified where loan and deposit rates were deregulated by the mid-1970s (or sooner) and for which data was available. These countries are Canada, Germany, Italy, the Netherlands, Switzerland, and the United Kingdom.[7] The United States is also included in the analysis, in large part because it has been the focus of most studies of bank net interest rate margins. One should bear in mind when interpreting the U.S. results that several bank interest rates were regulated until the 1980s (see OECD (1989)).

The appendix contains details of data, sample ranges, and data sources. Bank loan rates considered in the study are typically "benchmark" or "representative" rates in each country. While the lending rates are most often associated with short-term business financing, longer-term business lending in many countries is often at floating interest rates that are tied to the loan rates under consideration here. In Canada, for instance, most bank lending is floating-rate loans priced as a markup over the "prime rate" used in this paper. Similarly, in Italy, 60 percent of all bank lending with maturities up to 18 months is short-term loans to firms, and the loan rate used in this paper (the "unsecured overdraft rate") is associated with half of these loans (Borio and Fritz (1995)).[8] In the range of 40 percent of all business loans are at floating interest rates in the universal banking countries of Germany, Switzerland, and the Netherlands (The Economist (1998)). For these countries, the loan interest rates used are benchmark rates for shorter-term financing and, in that segment of the market, apply to much bank lending (see Borio and Fritz (1995)). We emphasize

[7] The source for historical accounts of interest rate regulations is Annex III, Section 1, OECD (1989). The following is a brief discussion of bank loan and deposit rate deregulation in these six countries.

Canada eliminated all remaining restrictions on bank loan and deposit rates in 1967. Also in 1967, Germany abolished the Interest Rate Decree which fully deregulated bank lending and deposit rates. In Italy, the interbank agreement on bank loan and deposit rates was terminated in 1969. Netherlands and Switzerland were free of official regulations on bank loan and deposit rates by 1960. In the case of Switzerland, through the 1980s there were local or regional interbank agreements affecting bank lending rates. However, these agreements were not government regulations; rather they appear to be the consequence of financial system architecture. While it will be important to keep this fact in mind when interpreting the empirical results, because these are not governmental regulations Switzerland is included in the analysis. Finally, in the United Kingdom, the interest rate cartel of London Clearing Banks and Scottish banks was dismantled in 1971 at official request. The Recommended Interest Rate System of building societies was continued through 1984, but that is unimportant for the present study as the loan and deposit rates studied below are associated with the activities of London Clearing Banks.

[8] Moreover, roughly 80 percent of all bank lending to firms in Italy, of all maturities, is at variable interest rates, and thus the loan rate used here has even broader relevance (The Economist (1998)).

that, on the one hand, care is required in making precise quantitative comparisons of results across countries—because loan rates do not apply to precisely the same group of borrowers in each country. On the other hand, the loan rates considered provide a good starting point for assessing differences and similarities in the behavior of loan-deposit spreads across countries.

The paper considers three deposit interest rates for each country. First, the rate on ordinary savings deposits (data is unavailable for Germany and for the United States). Intuition suggests that ordinary savings deposits are probably the least competitive interest-bearing deposit market segment. Second, a local (*i.e.* home-country) time deposit rate. These are typically three-month deposit rates. Third, three-month eurodeposit rates denominated in the currencies of each of the seven countries considered.

The analysis uses quarterly data.[9] Sample periods begin in the late 1960s or early 1970s and end in the late 1990s. Exceptions are eurodeposit rates for Canada and Italy which are not available until the mid to late 1970s.

3.2. Econometric Specification

The first stage of the empirical analysis is estimating a model of loan-deposit spreads individually. The second stage is determining the contribution to the cyclical behavior of spreads of deposit rates and loan rates. If interest rates generally have a cyclical component, then loan and deposit rates will probably also contain this component. One must be careful in the second stage, therefore, to separate any general cyclical component in loan and deposit rates from the cyclical component specific to these bank interest rates.

Begin by defining a *loan-deposit spread* in period t as $R_{L,t} - R_{D,t}$. One can define a corresponding *loan spread* as $R_{L,t} - R_{b,t}$, and a corresponding *deposit spread* as $R_{b,t} - R_{D,t}$, where $R_{b,t}$ is an interest rate that captures the overall behavior of shorter-term interest rates. Note that the sum of the loan spread and the deposit spread is exactly equal to the corresponding loan-deposit spread. In the empirical analysis, two alternative interest rate series are considered for $R_{b,t}$: a "short-term money rate," which is typically an overnight funds rate, and a "benchmark rate," which is typically a three-month interest rate barometer.

The model estimated is:

$$spread_{i,t} = E_t A(L) YGROW_{i,t} + X'_{i,t}\beta + \epsilon_{i,t}. \tag{1}$$

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[9] Data on interest rate spreads is available at monthly frequencies for several of these countries, but reliable historical data on economywide output and various other data on control variables (discussed below) is available only at quarterly intervals.

$spread_{i,t}$ is a spread for country i in period t. $YGROW$ is the (seasonally-adjusted) growth rate of real GDP and X is a vector of control variables. The first term on the right side, which is a polynomial in the lag/lead operator, measures the cyclical behavior of the spread. $A(L)$ is the main focus of the paper. Real GDP is divided by its sample standard deviation, so the coefficients on $YGROW$ can be interpreted as the effect of a one-standard deviation change in real GDP on the spread. Lagged and contemporaneous GDP may matter for spreads because borrower creditworthiness is countercyclical; this is the main point of Bernanke and Gertler (1989) and Kiyotaki and Moore (1997). Expected future GDP may matter for similar reasons: an anticipated deterioration in borrower creditworthiness could be reflected in current loan rates. The specification estimated in section 4 includes three leads, three lags, and contemporaneous $YGROW$. Alternative specifications were considered, and the results are robust to increasing the order of the polynomial $A(L)$.

In addition to a constant, eight control variables are included in the vector $X_{i,t}$. These control variables are not of primary interest to this study, but including them is important for estimating $A(L)$ correctly. The first control variable is a short-term interest rate that measures the marginal cost of funds to banks, denoted $SHORT_{i,t}$.[10] This could matter for spreads if the flexibility of bank lending rates and deposit rates differ; a special case of this is that loans have longer maturities than deposits.[11] Normally it is suggested that spreads will be increasing in the level of short-term interest rates, but the opposite is also possible for at least two reasons. First, loan interest rates may be adjusted less frequently than some deposit rates (*e.g.* eurodeposits). Thus, a loan-deposit spread constructed from loans and deposits with this property may be decreasing in the short-term interest rate. Second, Wong's (1997) analysis suggests that the qualitative effect of short-term interest rates on bank spreads depends on whether a bank has a long or short position in interbank markets.

A second control variable is the volatility of short-term interest rates, denoted $SHORTVOL_{i,t}$. This variable has been suggested by several authors (see Ho and Saunders (1981), Wong (1997), and Angbazo (1997)). If banks are risk averse and have a maturity mismatch between liabilities and assets, then higher interest rate volatility may increase spreads. On the other hand, if loan rates and deposit rates have quite different "dynamic impulse response functions" to interest rate shocks, it is possible that higher volatility could, at least temporarily, reduce certain loan-deposit

[10] For a precise definition of this interest rate in each country see the item "short-term money" in the appendix.

[11] See Wong (1997) for a theoretical argument linking bank spreads to a short-term interest rate; see also Slovin and Sushka's (1983) work on loan rate pricing. Flannery (1980,1981) studies empirically the link between a short-term interest rate and bank profitability, and Olson and Simonson (1982) and Graddy and Karna (1984) study the link between a short-term interest rate and bank net interest margins.

spreads. Previous empirical studies (e.g. Flannery (1981), McShane and Sharpe (1985), Ho and Saunders (1981), Angbazo (1997)) consider a variety of proxies for the volatility of short-term interest rates. In this study, interest rate volatility during each quarter is measured by the average over the quarter of squared monthly deviations of the short-term interest rate $SHORT_{i,t}$ from the trend of this interest rate. The trend of this interest rate is estimated using the Hodrick-Prescott filter (Hodrick and Prescott (1996)).

The third control variable is ratio of bank reserves to total assets, denoted $RESERVES_{i,t}$ (see Angbazo (1997)). This could be an important determinant of bank spreads for two reasons that have conflicting predictions for the spread. First, the level of reserves is directly associated with bank liquidity risk which is probably important for bank spreads. Second, reserves are relatively costly for banks to hold. Because these two effects have opposite effects on the spread, it is not *a priori* clear what sign the coefficient will be.

The remaining control variables are: the slope of the yield curve, denoted $SLOPE_{i,t}$; the inflation rate, denoted $INF_{i,t}$; the lagged ratio of savings deposits to demand deposits for the banking system, denoted $DEP_{i,t-1}$; the lagged ratio of loans to total assets for the banking system, denoted $LOAN_{i,t-1}$; and a time trend.[12] Including more lags of these explanatory variables does not significantly alter the reported estimates of $A(L)$. A time trend is included, as in Berlin and Mester (1999), to capture structural changes in banking systems.

$SLOPE_{i,t}$ is defined as the spread between a three-month rate and the overnight rate.[13] Motivation for including $SLOPE_{i,t}$ is that a bank loan-deposit spread could, in part, reflect differences in maturities of the loan and deposit that make up of the spread. If the loan has a longer (shorter) period of time between adjustments in its rate than does a particular type of deposit, then one would expect $SLOPE_{i,t}$ to be positively (negatively) related to the loan-deposit spread.

The motivation for including $INF_{i,t}$ is that bank spreads are the difference between two nominal interest rates, and thus if inflation shocks are not passed through to both rates equally quickly then spreads may reflect this. Cottarelli and Kourelis (1994) have found inflation to be important for explaining the flexibility of loan rates across countries and thus it may also be important for bank spreads. The relationship between inflation and the spread could go either way depending on which rate adjusts more quickly.

The final two explanatory variables, $DEP_{i,t-1}$ and $LOAN_{i,t-1}$, capture the influence on

[12] For the United Kingdom, the IFS database does not report demand and time deposits separately. The ratio of total deposits to total assets is therefore used in this instance.

[13] The three-month interest rate used is the "benchmark rate" (see the appendix), except for Switzerland where the long-term bond yield is used.

spreads of the supply of deposits and the demand for loans. Zarruk (1989) argues that, if the supply of deposits is stochastic, then deposit variability may be important for bank spreads. A similar argument would apply with a stochastic demand for loans. If these variables are procyclical, for example, then that could exert a procyclical influence on bank spreads. The qualitative relationship between these variables and bank spreads is unclear. We use the lagged values of both of these variables because of the contemporaneous endogeneity of loans, deposits, and bank spreads.

3.3. Estimation

There are three main econometric hurdles involved in estimating (1). First, (1) includes as explanatory variables expected future growth rates of real output, which are unobservable. If expectations are unbiased then we can include realized values of this variable in place of expected values. However, this introduces correlation between the right-hand-side variables and the disturbance term. OLS is biased and inconsistent in these circumstances. Second, there is quite likely a simultaneous-equations bias because $YGROW_{i,t}$, as well as possibly $SHORT_{i,t}$ and $SLOPE_{i,t}$, may be determined simultaneously with the spread. Third, the disturbance term in (1) will not satisfy the classical properties: at a minimum, the first point above introduces an MA(3) process (or MA(4) if contemporaneous $YGROW$ should rightly also be treated as an expectation) into the disturbance term. In addition, the fairly long period of time over which spreads are studied could plausibly lead to heteroskedasticity.

A standard instrumental variables (IV) estimator is consistent (though inefficient) in these circumstances. The estimated standard covariance matrix is also incorrect. To investigate the properties of the disturbance term, we first estimate (1) by IV and test for heteroskedasticity and serial correlation.[14] Without exception, for all of the regressions discussed in section 4, the null hypothesis of homoskedasticity is rejected, as is the null hypothesis of serially uncorrelated errors.

Under these circumstances—both autocorrelation and heteroskedasticity of unknown form—it has been argued that heteroskedasticity and autocorrelation consistent estimators (HAC) "come into their own", and are greatly superior to a classical estimator or White's heteroskedasticity-robust estimator.[15] In sum, to accommodate these various econometric issues we employ an efficient instrumental variables estimator and estimate the covariance matrix of the parameter estimates

[14] The test for heteroskedasticity is the Breusch-Pagan LM test. The variables included in the artificial regression to calculate the LM test statistic (*i.e.* normalized, squared residuals regressed on a set of variables present in the initial regression) are all of the variables discussed above except future output growth. The test for serial correlation used is the portmanteau Q statistic.

[15] See Andrews (1991) for Monte Carlo results that establish this. See also Davidson and MacKinnon (1993) for discussion.

using Newey and West's (1987) HAC estimator.[16] Specifically, the reported results are based on a GMM estimator.[17] The instrument set includes lags of right hand side variables (beginning with period $t-1$) as well as the contemporaneous values of INF and $RESERVES$.

4. Results

Consider first some general features of loan-deposit spreads (Table 1). Four observations are noteworthy. First, in all countries there is a marked decrease in average spreads moving left to right across the table—from savings deposits to time deposits and then to eurodeposits. This is consistent with our earlier suggestion above about the relative competitiveness of these three deposit markets. Second, consistent with savings deposits being "core deposits," spreads calculated using savings deposit rates are economically very large. Third, there is not a marked difference in average spreads calculated using savings deposits between English-speaking countries and the other countries considered. Fourth, there is a marked difference in average spreads between these two groups of countries when spreads are calculated using local time deposit rates and, to a lesser degree eurodeposit rates—in the English-speaking countries these spreads are smaller. As noted above, this could be because time deposit markets have historically been subjected to greater competition from securities markets (particularly money markets) in the English-speaking countries.

Turning to estimates of the model of spreads, consider first loan-deposit spreads calculated using savings-deposit rates. There are three main conclusions (Table 2).[18] First, spreads are statistically and economically significantly countercyclical in all countries. For example, a one-standard-deviation increase in the growth rate of real GDP—roughly one percentage point, but depending on the country[19]—persisting for seven quarters decreases this spread by slightly more than a third of a percentage point in Canada up to about two percentage points in Italy and the Netherlands. A seven quarter shock is used to match the order of the polynomial $A(L)$, and is not an unreasonable duration for an economic upturn. The largest single coefficient in the polynomial $A(L)$ (not shown) ranges from -0.10 in Canada to -0.67 in the Netherlands; thus, even a shock

[16] The Bartlett kernel is used and the lag parameter is data dependent as in Newey and West (1994).

[17] If the disturbances satisfy the classical assumptions the GMM parameter estimates will be identical to those obtained with a standard IV estimator. With non-spherical disturbances, the GMM estimator is consistent and efficient, whereas the conventional instrumental variables estimator is consistent but inefficient.

[18] The figures below parameter estimates are the probability (p-value) that the null hypothesis is not rejected (*i.e.* the estimated parameter is statistically insignificantly different from zero.

[19] The sample standard deviations of (seasonally-adjusted) real GDP growth rates (in percent) are as follows: 1.13 for the U.K., 1.59 for Switzerland, 0.89 for Italy, 0.97 for Canada, 2.2 for Germany, 0.85 for the Netherlands, and 0.91 for the United States. For presentation purposes the estimated coefficients on $YGROW$ are reported as aggregates of lags (including current output) and leads.

lasting one quarter is economically important.

The second conclusion from Table 2 is the increase in spreads during an economic downturn (for example) begins well in advance of the downturn and continues well into it—this is reflected by the significance of both "lags" and "leads" in the table. The third conclusion is that the countercyclical behavior of spreads appears to be economically less significant in the English-speaking countries.

We next decompose these spread dynamics by estimating (1) for loan spreads and savings-deposit spreads separately.[20] The main observation from loan spreads is that they are much less countercyclical than loan-savings deposit spreads (compare tables 2 and 3). Nonetheless, loan spreads have significant countercyclical components at both leads and lags for four countries—the Netherlands, Switzerland, the United Kingdom, and the United States. Further, loan spreads for Germany and, to a lesser extent, Italy, behave countercyclically with past output growth. In the case of Germany, this relationship is offset by a procyclical link with expected future output growth, leaving the loan spread roughly flat across a cycle (conditional, of course, on other factors included in the regressions that may themselves behave cyclically). Canada is the only case where loan spreads exhibit no cyclical relationship with either past or expected future output growth. Finally, in contrast to loan-savings deposit spreads, there is not compelling evidence that loan spreads are systematically less (or more) countercyclical in the English-speaking countries.

These estimates for loan spreads have predictions for the potential importance of the financial accelerator mechanism discussed above. A one-standard-deviation shock to real GDP for seven quarters affects loan rates relative to overall market interest rates by roughly 60–70 basis points in the United States and the Netherlands, 50 basis points in Switzerland, and about 30 basis points in the United Kingdom. The point estimate for Italy (focusing on just lagged output growth in this case) implies about a 30 basis point change in the loan spread, but the statistical significance of this point estimate is borderline for conventional test sizes. Loan spreads in Germany and Canada do not exhibit a statistically significant response to this type of shock.

The United States is therefore at the upper end in terms of the cyclical behavior of loan rates. The largest coefficient in the polynomial $A(L)$ for the United States is -0.30. It noteworthy that Berlin and Mester (1999) estimate that the countercyclical behavior of the loan rate in the United States for *above-prime borrowers* falls in the range 40–94 basis points for a one-period, one-standard deviation shock to GDP, depending on the amount of core deposits in the bank.[21] Santos

[20] All of the results are unchanged when the "benchmark rate" (defined in the appendix) is used in place of "short-term money."

[21] Specifically, Berlin and Mester's estimate of the pure cyclical component is 98 basis points (for a one-standard

and Winton (2005) estimate that the contemporaneous effect of a recession on loan spreads (the loan rate minus Libor) is 20–40 basis points, depending on whether one controls for cross-sectional differences in firm specific risk. Our estimate of 30 basis points therefore seems reasonable. In addition, the implied financial accelerator effect on the business cycle is economically large. For example, a one-standard deviation decrease in real GDP growth in two successive quarters increases the loan rate relative to overall market interest rates by more than one percentage point in the United States and Netherlands and by roughly three quarters of a percentage point in the United Kingdom and Switzerland.

Turning to savings-deposit spreads, these are markedly countercyclical in all countries except perhaps the United Kingdom (where lags and leads offset each other), and especially so in the continental European countries (see Table 4). The countercyclical behavior of savings-deposit spreads is generally at least as large as the cyclical behavior of loan spreads; they are much larger for most continental European countries. In sum, the countercyclical behavior of loan-deposit spreads using savings deposits is in most countries attributable to countercyclical behavior of both loan and deposit spreads, and particularly deposit spreads (the latter is true in all countries).

Consider next spreads using local time deposit rates (Tables 5–6). The main observation from loan-deposit spreads is that they are uniformly less countercyclical using time deposits than saving deposits. The explanation for this is that time-deposit spreads themselves are considerably less countercyclical than savings-deposit spreads (see Table 6). In fact, time deposit spreads in the English-speaking countries have modest procyclical behavior, whereas in most of the continental-European countries time deposit spreads are (as with savings deposits) generally highly countercyclical (they appear to be only mildly countercyclical in Switzerland).

Finally, loan-deposit spreads calculated using eurodeposit rates exhibit even less countercyclicality (see Table 7). This is because eurodeposit spreads display either no cyclical behavior, or (in Italy, the Netherlands, and the United Kingdom) procyclical behavior (Table 8).

5. Interpretation and Concluding Remarks

There are four main conclusions from the empirical results. First, loan spreads are significantly countercyclical for the majority of countries considered. Canada and Germany are the main exceptions. Second, savings deposit spreads are markedly countercyclical in all countries, and this effect is generally largest in the continental-European countries. Third, though less so

deviation change in GDP), minus an amount ranging between 4 and 58 basis points depending on the bank's "core deposit ratio." Their specification measures just the contemporaneous effect as their model not allow for dynamic effects.

than savings-deposit spreads, time-deposit spreads in the continental-European countries display marked countercyclicality. In contrast, time-deposit spreads in the English-speaking countries are procyclical. Fourth, eurodeposit spreads are either acyclical (the United States, Canada, Germany, and Switzerland) or procyclical (the United Kingdom, Italy, and the Netherlands).

Recalling the hypotheses discussed in section 2, these findings have two main implications. First, a main prediction of the baseline hypothesis—countercyclical loan spreads—is confirmed for the four (or five, if we include Italy, where loan-rate countercyclicality is statistically and economically borderline) of seven countries considered. Moreover, the quantitative implications of this for a financial accelerator mechanism underlying business cycles could be important.

The second implication is that the baseline hypothesis is too restrictive in its predictions for overall loan-deposit spreads because deposit spreads themselves generally exhibit significant cyclical behavior. Savings-deposit spreads in particular exhibit marked countercyclicality in all countries. In the continental-European countries, this is also true for time deposit spreads, though to a lesser degree than is the case for savings deposits. In comparison, time deposit spreads in the English-speaking countries are procyclical. These observations are consistent with time deposits being more competitive markets than savings deposit markets. Overall, banks in the continental-European countries appear to vary domestic deposit spreads in a countercyclical fashion, and especially time deposit spreads, much more than is the case in the English-speaking countries.

The empirical findings are broadly consistent with the relationship hypothesis. Specifically, the marked countercyclical behavior of savings-deposit spreads in all countries, and time deposits as well in the continental-European countries, is consistent with banks exploiting market power in some deposit market segments to buffer cyclical shocks to their borrowers—the relationship hypothesis. An important caveat is that it is impossible to ascertain from the data under consideration if, in fact, this is the only motive behind banks' behavior with regard to setting deposit rates—we do not observe the counterfactual cyclical behavior of loan rates when deposit rates do not have the properties we have found them to have. It is noteworthy, however, that loan rates in Canada and Germany, and possibly Italy, do not display pronounced cyclical behavior, in contrast to the marked countercyclical behavior of deposit rates in less competitive deposit market segments in these countries.

If the relationship hypothesis is not the only explanation for our findings, then it raises the question of what other motive could explain the findings. The cyclical competitiveness hypothesis is consistent with the behavior of deposit rates in some countries. Recall that time deposit spreads in the English-speaking countries and eurodeposit spreads for Italy, the Netherlands, and the United

Kingdom, are procyclical. As the cyclical competitiveness hypothesis predicts, the cyclical behavior of rates in more competitive deposit market segments should be opposite that of rates in less competitive deposit market segments. Savings-deposit spreads in these countries as well as time deposit spreads in Italy and the Netherlands are strongly countercyclical. Thus, we cannot rule out the possibility that banks in the English-speaking countries and in Italy and the Netherlands are exploiting market power in some deposit markets to buffer adverse shocks to bank funding costs in more competitive deposit market segments—the cyclical competitiveness hypothesis.

The explanation for our findings does not appear to be caused by features of deposit insurance systems. If deposit insurance systems are narrower in scope in the English-speaking countries than in the other countries then it could lead to a procyclical risk premium in deposit rates in the English-speaking countries. In fact, however, deposit insurance systems appear to be broader in most English-speaking countries than in most of the other countries (see the appendix). It is possible that bank riskiness is a factor in explaining eurodeposit spreads. Specifically, this might be factor underlying the procyclical behavior of eurodeposit rates in the few countries where this occurs (mainly Italy and the United Kingdom). However, even for eurodeposit spreads it is not clear that little or no insurance for eurodeposits accounts for our findings. On the one hand, most countries explicitly exclude "interbank" deposits—which includes much of the eurodeposit market—from deposit insurance coverage. On the other hand, our analysis uses the spread between deposit rates and "short-term money," which in most cases is an interbank rate. Moreover, as Rochet and Tirole (1996) note, governments have implicitly insured most interbank claims—particularly those of larger banks that tend to be active in the eurodeposit market.

In summary, the evidence presented in this paper is consistent with banks in all countries systematically exploiting market power over savings deposit rates and, in the continental-European countries, also market power over time deposit rates, across the business cycle either to buffer adverse shocks to their borrowers or to interest rates in more competitive segments of deposit markets. The evidence is consistent also with the continental-European banking systems adjusting the cost of domestic deposit liabilities (relative to overall market interest rates) across the business cycle much more than is the case in the English-speaking countries. As we suggested above, a plausible explanation for this is that historically the English-speaking countries have had better developed securities markets that may have resulted in greater competition in national bank deposit markets—both among banks for securitized deposits and with other money market securities—particularly when funds are relatively scarce (*i.e.* during economic slowdowns when monetary policy is tighter). To the extent that this is true, less competitive domestic deposit markets may have helped banks "finance" bank-borrower relationships in countries that have been categorized as having "relationship banking systems." Berlin and Mester (1999) suggest that simply being able to pay low deposit rates may allow banks to smooth lending rates. In relationship banking systems, bank-borrower relationships involve other features besides loan rate smoothing (see Allen and Gale (1995)). These other aspects of relationships are likely systematic across the business cycle. If deposit markets in these countries are less competitive, in part due to less developed securities markets, then this may have facilitated these bank-borrower relationships by allowing banks to vary the cost of deposits in line with movements in the cost of maintaining relationships. An important question for future research is to better understand the relative importance of the two hypotheses outlined in this paper for interpreting the cyclical behavior of bank deposit rates.

Appendix A — Data

I. Interest Rate Data.

The sample periods in the empirical analysis of the paper are dictated by the availability of bank interest rate data. The main source for these data—an OECD database—has data for most series beginning in the late 1960s. Samples end in the mid to late 1990s as data were unavailable (discontinued) after this for several interest rates in the database.

Canada.

a. Eurodeposit Canadian Dollar Rate: three-month rate. Average of mid-month rates. Sample: 1975.1-1996.2. Source: Datastream.
b. Local time deposit: three-month time deposit. Since April 1981, average of Wednesday rates for large deposits; previously, average of rates on the last Wednesday of the month. Sample 1968.1-1996.2. Source: OECD Financial Statistics Monthly Databank.
c. Ordinary deposit rate: non-checkable savings deposits with banks. Since April 1981, average of Wednesday rates; previously, average of rates on the last Wednesday of the month. Sample 1968.1-1996.2. Source: OECD Financial Statistics Monthly Databank.
d. Short-term money: overnight interbank loans. Since April 1981, average of Wednesday rates; previously, average of rates on the last Wednesday of the month. Sample 1968.1-1996.2. Source OECD, Financial Statistics Monthly Databank.
e. Benchmark rate: three-month treasury bill rate. Since April 1981, average of Thursday rates; previously, average of rates on the last Thursday of the month. Sample 1968.1-1996.2. Source: OECD, Financial Statistics Monthly Databank.
f. Lending rate: prime lending rate. Since April 1981, average of Wednesday rates; previously, average of month-end rates. Sample 1968.1-1996.2. Source: OECD, Financial Statistics Monthly Databank.

Germany.

a. Eurodeposit Deutsche Mark Rate: three-month rate. Up to September 1981, average of end-of-month rates; since September 1981, average of daily rates. Sample 1968.2-1996.2. Source: OECD Financial Statistics Monthly Databank.
b. Local time deposit: up to May 1986, average of daily rates for three-month time deposits; since May 1986, average of daily rates on 1-3 month time deposits. Sample 1968.2-1996.2. Source: OECD Financial Statistics Monthly Databank.
c. Short-term money: average of daily rates on day-to-day loans in call money market. Sample 1968.2-1996.2. Source OECD, Financial Statistics Monthly Databank.
d. Benchmark rate: average of daily rates on three-month interbank loans. Sample 1968.2-1996.2. Source: Series 60bs, International Financial Statistics (International Monetary Fund).
e. Lending rate: average of monthly rates for unsecured credits in current account of less than DM 1 million. Sample 1968.1-1996.2. Source: OECD, Financial Statistics Monthly Databank.

Italy.

a. Eurodeposit Italian Lira Rate: three-month rate. Average of mid-month rates. Sample 1978.3-1995.4. Source: Datastream.
b. Local time deposit: weighted-average rate on savings deposits with commercial and savings banks during the month ending the quarter. Sample 1972.1-1995.4. Source: OECD Financial Statistics Monthly Databank.
c. Ordinary deposit rate: weighted-average rate on current accounts with commercial and savings banks during the month ending the quarter. Sample 1972.1-1995.4. Source: OECD Financial Statistics Monthly Databank.

d. Short-term money: average of end-of-month rates on ordinary advances. Source OECD, Financial Statistics Monthly Databank.
e. Benchmark rate: average of daily three-month interbank rates. Sample 1972.1-1995.4. Source: International Financial Statistics (International Monetary Fund), series 60b.
f. Lending rate: prime rate on unsecured overdrafts from commercial banks. Average of rates recorded at ten-day intervals. Sample 1972.1-1995.4. Source: OECD, Financial Statistics Monthly

Netherlands.

a. Eurodeposit Dutch Guilder Rate: three-month rate. Up to September 1981, average of end-of-month rates; since September 1981, average of daily rates. Sample 1966.1-1995.4. Source: OECD Financial Statistics Monthly Databank.
b. Local time deposit: three-month time deposit. Monthly average of rates paid by universal banks, the Postbank, and the pilot rate announced by the Rabobanks. Sample 1966.1-1995.4. Source: OECD Financial Statistics Monthly Databank.
c. Ordinary deposit rate: monthly average of rates on ordinary savings accounts paid by universal banks, the Postbank, and the pilot rate announced by the Rabobanks. Sample 1966.1-1995.4. Source: OECD Financial Statistics Monthly Databank.
d. Short-term money: average of daily rates on representative call loans. Sample 1966.1-1995.4. Source OECD, Financial Statistics Monthly Databank.
e. Benchmark rate: average of daily rates on three-month interbank loans offered by seven banks. Sample 1966.1-1995.4. Source: OECD, Financial Statistics Monthly Databank.
f. Lending rate: daily average rate for prime borrowers on unsecured advances. Sample 1966.1-1995.4. Source: OECD, Financial Statistics Monthly Databank.

Switzerland.

a. Eurodeposit Swiss Franc Rate: three-month rate. Up to September 1981, average of end-of-month rates; since September 1981, average of daily rates. Sample 1966.1-1995.3. Source: OECD Financial Statistics Monthly Databank.
b. Local time deposit: three-month deposit rate. Average of daily rates. Sample 1966.1-1995.3. Source: OECD Financial Statistics Monthly Databank.
c. Ordinary deposit rate: average of beginning-of-month rates on ordinary savings accounts at Cantonal Banks. Sample 1966.1-1995.3. Source: OECD Financial Statistics Monthly Databank.
d. Short-term money: average of daily rates in call money market. Sample 1966.1-1995.3. Source OECD, Financial Statistics Monthly Databank.
e. Long-term bond yield: monthly average of the weighted average yield on ten government bonds with at least five years to maturity. Sample 1966.1-1995.3. Source: International Financial Statistics (International Monetary Fund) series 61.
f. Lending rate: average of end-of-month rates for overdrafts to prime borrowers from commercial banks. Sample 1966.1-1995.3. Source: OECD, Financial Statistics Monthly Databank.

United Kingdom.

a. Eurodeposit British pound sterling rate: three-month rate. Up to September 1981, average of end-of-month rates; from October 1981, average of daily rates. Sample 1971.4-1996.1. Source: OECD Financial Statistics Monthly Databank.
b. Local time deposit: three-month certificate of deposit rate. Average of daily maximum and minimum rates in the secondary market. Sample 1971.4-1996.1. Source: OECD Financial Statistics Monthly Databank.
c. Ordinary deposit rate: prior to January 1984, seven-day sight deposits of London Clearing Banks; since January 1984, instant access savings accounts at London Clearing Banks. Sample

1971.4-1996.1. Source: International Financial Statistics (International Monetary Fund), series 60L.
d. Short-term money: call Money rate. Average of end-of-month maximum rates. Sample 1971.4-1996.1. Source OECD, Financial Statistics Monthly Databank.
e. Benchmark rate: three-month Treasury bill rate. Average of weekly rates. Sample 1971.4-1996.1. Source: OECD, Financial Statistics Monthly Databank.
f. Lending rate: rates charged by London clearing banks for overdrafts (minimum rate). End-of-month rate through August 1977; since September 1977, monthly average of daily rates.Sample 1971.4-1996.1. Source: OECD, Financial Statistics Monthly Databank.

United States.

a. Eurodeposit U.S. dollar Rate: three-month rate. Up to September 1981, average of end-of-month rates; from October 1981, average of daily rates. Sample 1968.1-1996.2. Source: OECD Financial Statistics Monthly Databank.
b. Local time deposit: three-month certificate of deposit rate on secondary market; simple average of daily rates. Sample 1968.1-1996.2. Source: OECD Financial Statistics Monthly Databank.
c. Ordinary deposit rate: NA.
d. Short-term money: overnight federal funds rate. Average of daily rates. Sample 1968.1-1996.2. Source OECD, Financial Statistics Monthly Databank.
e. Benchmark rate: three-month Treasury bill rate. Average of weekly rates for new issues. Sample 1968.1-1996.2. Source: International Financial Statistics, series 60c.
f. Lending rate: average of prime rate charged by 30 large commercial banks; average of daily rates. Sample 1968.1-1996.2. Source: OECD, Financial Statistics Monthly Databank.

II. Other Data.

Sample sizes for the following data match those listed for the loan rates above.

Real GDP: International Financial Statistics (International Monetary Fund), except for the Netherlands (the source is the OECD Analytical Database) and Germany (the source is the Bundesbank). GDP for Germany relates only to West Germany.

Deposits: demand deposits (series 24) and time deposits (series 25) from International Financial Statistics (International Monetary Fund). For the United Kingdom the aggregate series 25l is used which includes demand, time, savings, and foreign currency deposits. For the United States time deposits (by the IFS definition) excludes certificates of deposits. Our definition includes certificates of deposits.

Bank reserves: defined as reserves of deposit money banks. Source: International Financial Statistics (International Monetary Fund), series 20.

Total banking system assets: defined as the sum of the following series: series 20 (reserves), 21 (foreign assets), claims on government (series 22), and claims on private sector (series 22d). Source: International Financial Statistics (International Monetary Fund).

Price deflators: the GDP deflator. Source: International Financial Statistics (International Monetary Fund), except the Netherlands and Switzerland (the source is the OECD Analytical Database) and Germany (the source is the Bundesbank).

Appendix B — Deposit Insurance Systems

The sources for the following brief overview of deposit insurance systems are Kyei (1995) and Garcia (1999). In addition to the historical discussion below, note that deposit insurance systems in the European Union were harmonized as of 1995. As a general fact, foreign currency deposits and/or interbank deposits are typically excluded from deposit insurance coverage, and thus Eurodeposit rates are generally outside of (explicit) deposit insurance system coverage.

United Kingdom. The deposit insurance system began with an implicit guarantee in 1973 under the "lifeboat fund." Explicit protection began in 1982 (The Deposit Protection Board). There is no coverage for certificates of deposit, interbank deposits, or foreign currency deposits. In addition, the coverage ratio for insured deposits is 75 percent up to a specified maximum nominal amount.

Germany. Deposit insurance was implemented in 1966 and covers most deposits. Excludes interbank deposits but does include deposits of German bank branches abroad.

Italy. The 1936 Banking Law provided for implicit deposit insurance. The Interbank Deposit Protection Fund was established in 1987 to provide further protection. Covers most deposits, excluding interbank.

The Netherlands. Established in 1979. Covers all household deposits and those of small enterprises. Excludes interbank and large corporations' deposits.

Switzerland. Established in 1984. Covers all household deposits, and excludes interbank and most non-household deposits.

Canada. The Canadian Deposit Insurance Corporation was established in 1967. Excludes only interbank and foreign currency deposits.

United States. The Federal Deposit Insurance Corporation was established in 1934 and the Federal Savings and Loans Insurance Corporation was established one year later. Covers all deposits except those booked offshore.

Appendix C - Tables

Table 1: Summary Statistics on Loan-Deposit Spreads

	savings deposits		time deposits		eurodeposits	
	mean	std.dev.	mean	std.dev.	mean	std.dev.
Canada	3.85	1.63	1.36	0.65	1.22	0.40
Germany	-	-	4.95	1.07	4.26	1.33
Italy	6.55	1.57	5.52	1.57	1.82	2.07
Netherlands	4.36	2.10	3.68	2.00	1.17	0.91
Switzerland	3.02	0.73	2.58	1.67	1.73	2.10
United Kingdom	2.90	1.23	0.79	0.69	0.28	1.19
United States	-	-	1.62	0.93	1.05	1.14

Table 2. Spread Between Loan Rate and Savings Deposit Rate (p-values in parentheses)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
total	-0.357 (.00000)	-	-1.931 (.00000)	-2.073 (.00000)	-0.735 (.00000)	-0.545 (.00001)	-
lags	-0.223 (.00000)	-	-0.831 (.00000)	-0.351 (.02129)	-0.089 (.25700)	-0.683 (.00000)	-
leads	-0.134 (.00000)	-	-1.099 (0.00000)	-1.722 (.00000)	-0.645 (.00000)	0.138 (.09586)	-
R^2	0.91	-	0.74	0.60	0.29	0.37	-
Wald (p-value)	0.990	-	0.981	0.990	0.989	0.994	-
No. Obs.	114	-	96	120	119	98	-

Notes: "total" is the sum of the parameter estimates for three leads, three lags, and current real output growth ("lags" includes current real output growth and three lags). All regressions include the set of control variables, a constant and time trend. "Wald" is the p-value for the chi-square test that the overidentifying restrictions are not rejected.

Table 3. Spread Between Loan Rate and Short-Term Money Market Rate (p-values in parentheses)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
total	0.062 (.37827)	0.373 (.12210)	-0.277 (.10074)	-0.692 (.00000)	-0.468 (.00000)	-0.319 (.00000)	-0.569 (.00001)
lags	-0.010 (.l87079)	-0.938 (.00000)	-0.236 (.05998)	-0.324 (.00000)	-0.293 (.00047)	-0.118 (.00037)	-0.222 (.00447)
leads	0.073 (.07203)	1.3111 (.00000)	-0.041 (.61823)	-0.367 (.00000)	-0.175 (.00636)	-0.200 (.00000)	-0.346 (.00001)
R^2	0.30	0.64	0.83	0.78	0.90	0.53	0.46
Wald (p-value)	.991	.994	.981	.994	.993	.999	.995
No. Obs.	114	114	96	120	119	98	114

Notes: "total" is the sum of the parameter estimates for three leads, three lags, and current real output growth ("lags" includes current real output growth and three lags). All regressions include the set of control variables, a constant and time trend. "Wald" is the p-value for the chi-square test that the overidentifying restrictions are not rejected.

Table 4. Spread Between Saving Deposit Rate and Short-Term Money Market Rate(p-values in parentheses)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
total	-0.389 (.00000)	-	-1.664 (.00000)	-1.346 (.00000)	-0.312 (.00690)	-0.252 (.05186)	-
lags	-0.188 (.00634)	-	-0.611 (.00000)	-0.020 (.88677)	0.189 (.02882)	-0.562 (.00000)	-
leads	-0.200 (.00002)	-	-1.053 (.00000)	-1.326 (.00000)	-0.502 (.00000)	0.310 (.00005)	-
R^2	0.88	-	0.90	0.79	0.94	0.43	-
Wald	0.996	-	0.986	0.985	0.992	0.997	-
No. Obs.	114	-	96	120	119	98	-

Notes: "total" is the sum of the parameter estimates for three leads, three lags, and current real output growth ("lags" includes current real output growth and three lags). All regressions include the set of control variables, a constant and time trend. "Wald" is the p-value for the chi-square test that the overidentifying restrictions are not rejected.

Table 5. Spread Between Loan Rate and Time Deposit Rate (p-values in parentheses)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
total	0.392 (.00001)	-1.165 (.00000)	-1.472 (.00000)	-2.066 (.00000)	-0.626 (.00009)	0.123 (.04474)	-0.501 (.00056)
lags	0.127 (.06725)	-1.335 (.00000)	-0.464 (.00012)	-0.302 (.03788)	-0.496 (.00040)	0.103 (.01697)	-0.203 (.01128)
leads	0.264 (.00000)	0.170 (.23995)	-1.008 (.00000)	-1.764 (.00000)	-0.130 (.26281)	0.019 (.56460)	-0.298 (.00137)
R^2	0.47	0.73	0.63	0.53	0.71	0.56	0.42
Wald (p-value)	0.991	0.992	0.977	0.989	0.987	0.988	0.997
No. Obs.	114	114	96	120	119	98	114

Notes: "total" is the sum of the parameter estimates for three leads, three lags, and current real output growth ("lags" includes current real output growth and three lags). All regressions include the set of control variables, a constant and time trend. "Wald" is the p-value for the chi-square test that the overidentifying restrictions are not rejected.

Table 6. Spread Between Time Deposit Rate and Short-Term Money Market Rate (p-values in parentheses)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
total	0.3333 (.00000)	-1.591 (.00000)	-1.089 (.00000)	-1.350 (.00000)	-0.121 (.22608)	0.413 (.00000)	0.165 (.00056)
lags	0.101 (.09000)	-0.431 (.00038)	-0.201 (.00236)	0.015 (.90757)	-0.156 (.01492)	0.202 (.00001)	0.061 (.00214)
leads	0.231 (.00000)	-1.160 (.00000)	-0.888 (.00000)	-1.366 (.00000)	0.035 (.67983)	0.211 (.00000)	0.104 (.00340)
R^2	0.47	0.61	0.85	0.75	0.60	0.79	0.53
Wald (p-value)	0.987	0.996	0.985	0.980	0.994	0.998	0.986
No. Obs.	114	114	96	120	119	98	114

Notes: "total" is the sum of the parameter estimates for three leads, three lags, and current real output growth ("lags" includes current real output growth and three lags). All regressions include the set of control variables, a constant and time trend. "Wald" is the p-value for the chi-square test that the overidentifying restrictions are not rejected.

Table 7. Spread Between Loan Rate and Eurodeposit Rate (p-values in parentheses)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
total	-0.157 (.01900)	0.316 (.25830)	0.944 (.00000)	-0.491 (.00000)	-0.452 (.02304)	0.318 (.00020)	-0.627 (.00031)
lags	-0.234 (.00000)	-1.368 (.00000)	0.356 (.00413)	-0.370 (.00000)	-0.582 (.00029)	0.101 (.08427)	-0.150 (.07813)
leads	0.077 (.02851)	1.685 (.00000)	0.588 (.00000)	-0.121 (.03463)	0.129 (.22658)	0.217 (.00005)	-0.476 (.00010)
R^2	0.20	0.47	0.47	0.60	0.70	0.66	0.53
Wald (p-value)	.992	.987	.999	.994	.988	.993	.996
No. Obs.	86	114	70	120	119	98	114

Notes: "total" is the sum of the parameter estimates for three leads, three lags, and current real output growth ("lags" includes current real output growth and three lags). All regressions include the set of control variables, a constant and time trend. "Wald" is the p-value for the chi-square test that the overidentifying restrictions are not rejected.

Table 8. Spread Between Eurodeposit Rate and Short-Term Money Market Rate (p-values in parentheses)

	Canada	Germany	Italy	Netherlands	Switserland	United Kingdom	United States
total	0.043	-0.150	1.019	0.174	-0.032	0.697	0.062
	(.34509)	(.52286)	(.00000)	(.01532)	(.80120)	(.00000)	(.30118)
lags	-0.030	-0.501	0.097	-0.054	-0.317	0.256	0.114
	(.36969)	(.00313)	(.51730)	(.23336)	(.00343)	(.00002)	(.00020)
leads	0.073	0.351	0.921	0.229	0.284	0.441	-0.051
	(.00079)	(.03820)	(.00000)	(.00000)	(.00162)	(.00000)	(.31068)
R^2	0.57	0.53	0.63	0.59	0.63	0.75	0.57
Wald (p-value)	0.989	0.988	0.998	0.995	0.991	0.990	0.995
No. Obs.	86	114	70	120	119	98	114

Notes: "total" is the sum of the parameter estimates for three leads, three lags, and current real output growth ("lags" includes current real output growth and three lags). All regressions include the set of control variables, a constant and time trend. "Wald" is the p-value for the chi-square test that the overidentifying restrictions are not rejected.

References

Allen, Franklin and Douglas Gale (1995) A Welfare Comparison of Intermediaries and Financial Markets in Germany and the United States. *European Economic Review* 39, 179–209.

Andrews, Donald W.K. (1991) Heteroskedasticity and Autocorrelation Consistent Covariance Matrix Estimation. *Econometrica* 59, 817–858.

Andrews, Donald W.K. and J. Christopher Monahan (1992) An Improved Heteroskedasticity and Autocorrelation Consistent Covariance Matrix Estimator. *Econometrica* 60, 953–966.

Angbazo, Lazarus (1997) Commercial Bank Net Interest Margins, Default Risk, Interest Rate Risk, and Off-Balance Sheet Banking. *Journal of Banking and Finance* 21, 55–87.

Asea, Patrick K. and Brock Blomberg (1998) Lending Cycles. *Journal of Econometrics* 83, 89–128.

Barca, Fabrizio (1996) On Corporate Governance in Italy: Issue, Facts and Agenda. Nota Di Lavoro 10.96, Fondazione ENI Enrico Mattei.

Barth, James R., Nolle, Daniel E., and Tara N. Rice (1997) Commercial Banking Structure, Regulation, and Performance: An International Comparison. Working Paper, Office of the Comptroller of the Currency, February.

Berlin, Mitchell and Loretta J. Mester (1998) On the Profitability and Cost of Relationship Lending. *Journal of Banking and Finance* 22, 873–879.

Berlin, Mitchell and Loretta J. Mester (1999) Deposits and Relationship Lending. *Review of Financial Studies* 12, 579–607.

Bernanke, Ben, and Mark Gertler (1989) Agency Costs, Net Worth, and Business Fluctuations. *American Economic Review* 79, 14–31.

Bernanke, Ben, Gertler, Mark, and Simon Gilchrist (1996) The Financial Accelerator and the Flight to Quality. *Review of Economics and Statistics* 78, 1–15.

Borio, Claudio E.V., and Wilhelm Fritz (1995) *The Response of Short-Term Bank Lending Rates to Policy Rates: A Cross-Country Perspective.* (Basle: Bank for International Settlements).

Buckley, F.H. (1997) The Canadian Keiretsu. *Journal of Applied Corporate Finance* 9, 46–56.

Cottarelli, Carlo and Angeliki Kourelis (1994) Financial Structure, Bank Lending Rates, and the Transmission Mechanism of Monetary Policy. *International Monetary Fund Staff Papers* 41, 587–623.

Davidson, Russell and James G. MacKinnon (1993) *Estimation and Inference in Econometrics*, (New York: Oxford University Press).

Flannery, Mark J. (1980) How Do Changes in Market Interest Rates Affect Bank Profits? *Business Review*, Federal Reserve Bank of Philadelphia, November-December, 13–22.

Flannery, Mark J. (1981) Market Interest Rates and Commercial Bank Profitability: An Empirical Investigation. *Journal of Finance* 36, 1085–1101.

Garcia, Gillain G.H. (1999) Deposit Insurance: A Survey of Actual and Best Practices. IMF WP/99/54. April.

Gertler, Mark and Cara S. Lown (2000) The Information in the High Yield Bond Spread for the Business Cycle: Evidence and Some Implications. NBER Working Paper 7549 (Cambridge MA: NBER).

Graddy, Duane B. and Adi S. Karna (1984) Net Interest Margin Sensitivity Among Banks of Different Sizes. *Journal of Bank Research* Winter, 283–90.

Hannan, Timothy H. and Allen N. Berger (1991) The Rigidity of Prices: Evidence from the Banking Industry. *American Economic Review* 81, 938–945.

Ho, Thomas S.Y. and Anthony Saunders (1981) The Determinants of Bank Interest Margins: Theory and Empirical Evidence. *Journal of Financial and Quantitative Analysis* 16, 581–600.

Hodrick, Robert J. and Edward C. Prescott (1997) Postwar U.S. Business Cycles: An Empirical Investigation. *Journal of Money, Credit, and Banking* 29, 1–16.

Kiyotaki, Nobuhiro and John Moore (1997) Credit Chains. *Journal of Political Economy* 105, 211–248.

Kyei, Alexander (1995) Deposit Protection Arrangements: A Survey. IMF WP 95/134, December.

Maudos, Joaquin, and Juan Fernanadez de Guevera (2004) Factors Explaining the Interest Margin in Banking Sectors of the European Union. *Journal of Banking and Finance* 28, 2259–2281.

McShane, R.W. and I.G. Sharpe (1985) A Time Series/Cross Section Analysis of the Determinants of Australian Trading Bank Loan/Deposit Interest Margins: 1962–1981. *Journal of Banking and Finance* 9, 115–136.

Neumark, David, and Steven A. Sharpe (1992) Market Structure and the Nature of Price Rigidity: Evidence from the Market for Consumer Deposits. *Quarterly Journal of Economics* 107, 657–680.

Newey, Whitney K. and Kenneth D. West (1987) A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix. *Econometrica* 55, 703–708.

Newey, Whitney K. and Kenneth D. West (1994) Automatic Lag Selection in Covariance Matrix Estimation. *Review of Economic Studies* 61, 631–653.

Olson, Ronald L. and Donald G. Simonson (1982) Gap Management and Market Rate Sensitivity in Banks. *Journal of Bank Research* Spring, 53–58.

OECD (1989) *Competition in Banking.* (Paris: OECD).

Peterson, M.A. and R.G. Rajan (1995) The Effect of Credit Market Competition on Lending Relationships. *Quarterly Journal of Economics* 110, 407–443.

Rochet, Jean-Charles and Jean Tirole (1996) Interbank Lending and Systemic Risk. *Journal of Money, Credit and Banking* 28, 733–762.

Ruckes, Martin (2004) Bank Competition and Credit Standards. *Review of Financial Studies* 17, 1073–1102.

Santos, Joao A.C. and Andrew Winton (2005) Bank Loans, Bonds, and Information Monopolies across the Business Cycle. mimeo. March.

Slovin, Myron B. and Marie Elizabeth Sushka (1983) A Model of the Commercial Loan Rate. *Journal of Finance* 38, 1583–1596.

The Economist (1998) Euro Towers or Fawlty Towers? October 31.

Wong, Kit Pong (1997) On the Determinants of Bank Interest Margins under Credit and Interest Rate Risks. *Journal of Banking and Finance* 21, 251–271.

Zarruk, Emilio R. (1989) Bank Spread with Uncertain Deposit Level and Risk Aversion. *Journal of Banking and Finance* 13, 797–810.