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The Determinants of Bank Interest Rate Margins: An International Study

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THE DETERMINANTS OF BANK INTEREST RATE MARGINS: AN INTERNATIONAL STUDY

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INTRODUCTION

Interest rate margins - the spread between a bank's interest earnings and expenses as a percent of interest earning assets - vary widely across banks, both within and across countries. For example, interest margins for a sample of banks from 7 OECD countries are shown in table 1 for the years 1988-1995 along with the standard deviations of these margins. As can be seen, margins vary widely across these countries. For example, the 1995 mean NIM for the US (4.264 %) is over twice the size of Switzerland (1.731 %), Moreover, the relative size of cross-country margins appears to change over time. For example, Spain had the highest NIMs over the 1988-1992 period before being superseded by the US over the 1993-1995 period

A priori, it is not clear whether high margins are good or bad from a social welfare perspective. On the one hand narrow margins may be indicative of a relatively competitive banking system with a low level of regulatory "taxes" (e.g. reserve requirements, regulation "Q" type restrictions on interest rates and capital requirements). On the other hand, relatively large margins may bring a degree of stability for a banking system, in that they can add to the profitability and capital of banks so as to insulate then from macro and other shocks. As is well known bank failures can carry significant externalities and social costs (see for example Diamond and Dybvig (1983)). Further, in the absence of well functioning equity markets, margins and internal profit generation may be the only means banks have to add to their capital bases.

The goal of this paper will be to investigate the determinants of interest margins in a sample of banks in seven major countries of the OECD over the 1988-1995 period. Data for these countries (and banks) has been obtained in a standardized fashion from IBCA and their Worldscope data base. Of particular importance will be an attempt to decompose bank interest margins into three different components. Specifically: (i) a "tax" or regulatory component due to effects such as non interest bearing reserve requirements, (ii) a market structure component reflecting the relative degree of monopoly power in the banking market, and (iii) a risk premium component, reflecting the degree of risk borne by banks (especially interest rate risk), in providing intermediation services.

Apart from allowing a better understanding of the factors that drive bank margins, this paper's results produce some potentially valuable public policy insights. For example, if a significant proportion of bank margins in a given country are determined by interest rate volatility rather than monopolistic behavior by banks, then public policy attention might be better focused on that government's macro-economic policies as a tool for reducing the cost of intermediation services. Alternatively, if a large proportion of bank margins are due to regulatory taxes, such as reserve requirements, then a policy of paying interest on bank reserve holdings may have a more significant effect in reducing the cost of intermediation and hence margins.

To examine the three components of bank interest margins a model is developed based on that originally proposed by Ho and Saunders, 1981 and extended by a number of other researchers (for example Allen 1988, Angbazo 1996). Section 1 briefly outlines the model, section

2 develops the empirical specification to be used in our cross section-time series study of banks margins in 7 OECD countries. Section 3 discusses the data, the historical context and sample and Section 4 presents the empirical results. Finally Section 5 discusses some policy implications of our findings.

SECTION 1 : THE MODEL

The basic model to be used in this paper assumes that the representative bank is a risk averse agent that acts as a dealer in a market for the immediate provision of deposits and loans. Thus, the major portfolio risk facing the bank emanates from interest rate fluctuations, i.e. it focuses on banks risk exposure as providers of immediacy to the rest of the economy. This dealership framework has been developed and estimated for the US by Ho and Saunders (1981), although it might be noted that the importance of the relationship between interest rate volatility and bank margins was recognized as early as 1945 by Samuelson (1945).

The planning horizon is a single period during which bank rates, which are posted prior to observing the demand for immediacy, are held constant and a single transaction in loans or deposits occurs. Risk averse banks facing asymmetric arrival time for the demand for loans and the supply of deposits select optimal loan and deposit rates which minimize the risk of excessive demand for loans or insufficient supply of deposits. The optimal rates are:

$$R_L = (r + b)$$
$$R_D = (r - a)$$

and the margin is:

$$R_L - R_D = (a + b)$$

where:

R_L = is the rate set on loans
R_D = is the rate set on deposits
r = is the expected risk free interest rate
a and b are fees charged by the bank in order to provide immediacy and to bear interest rate risk.

For example, suppose a deposit arrives at a different instant in time from a new loan demand, the bank will have to temporarily invest the funds in the money market at the short term risk free rate r. In so doing, the bank faces *reinvestment risk* at the end of the decision period should the short term rate fall. Similarly, if the demand for a new loan is met by the bank without a contemporaneous inflow of deposits, the bank would have to resort to short term borrowing in the money market at rate r to fund the loan, thereby facing *refinancing risk* if the short term interest rate goes up. The fees a and b have to compensate the bank for bearing this interest rate risk

The bank is assumed to maximize the following expected utility function:

$$\underset{a,b}{Max}\, EU(W_T) = \lambda_a EU(W_T|deposit) + \lambda_b EU(W_T|loan) \qquad (1)$$

where:

$\lambda_a = (\alpha - \beta a); \lambda_b = (\alpha - \beta b)$ are the probabilities of a deposit and loan transactions given by symmetric and linear supply of deposit and demand for loan functions

$EU(W_T|deposit)$ is the expected utility of net worth after deposit immediacy

$EU(W_T|loan)$ is the expected utility of net worth after loan immediacy

Solving the model, for the optimal fees a* , b* (see Appendix 1 at the end of the paper) and thus the spread s = (a+b), we have:

(2) $$s = (a+b) = \frac{\alpha}{\beta} + \frac{1}{2}R\sigma_I^2 Q$$

The first term $\frac{\alpha}{\beta}$, measures the bank's risk neutral spread and is the ratio of the intercept (α) and the slope (β) of the symmetric deposit and loan arrival functions of the bank. A large α and a small β will result in a large $\frac{\alpha}{\beta}$ and hence , spread (s). That is, if a bank faces relatively inelastic demand and supply functions in the markets in which it operates, it may be able to exercise monopoly power (and earn a producer's rent) by demanding a greater spread than it could get if banking markets were competitive (low $\frac{\alpha}{\beta}$ ratio).

Consequently, the ratio $\frac{\alpha}{\beta}$ provides some measure of the producer's surplus or monopoly rent element in bank spreads or margins. The second term is a first order risk adjustment term and depends on three factors: (i) R, The bank management's coefficient of absolute risk aversion; (ii) Q, the size of bank transactions; and (iii) σ^2 the instantaneous variance of the interest rate on deposits and loans. Note that the second term implies that, ceteris paribus, the greater the degree of risk aversion, the larger the size of transactions and the greater the variance of interest rates, the larger bank margins are. This spread equation has an important implication for the microfoundations of financial intermediation since it implies that even if banking markets are highly competitive as long as a bank 's management is risk-averse and faces transaction uncertainty, positive bank margins will exist as the price of providing deposit-loan immediacy.

In the next section we derive an empirical specification that will allow us to identify the sensitivity of bank margins to bank market structure $(\frac{\alpha}{\beta})$ and intermediation risk (σ_I^2), after controlling for regulatory tax effects that potentially distort the "pure" margin or spread. That is, actual margins may differ for the optimal margin in eqn (2) because of regulatory costs the bank needs to cover out of its NIM.

Three imperfections or regulatory costs are analyzed in this paper. The first is bank payments of implicit interest (instead of, or as well as, explicit interest) on deposits through service charge remissions and other types of depositor subsidy due to regulatory restrictions on explicit interest payments. In recent years many countries have imposed ceilings (or Central Banks have carried out moral suasion) limiting explicit interest payments on certain classes of deposit - the classic case being regulation "Q" in the US.

In a world without rate regulation where banks can pay a competitive rate on demand and time deposits and charge a price equal to marginal cost for services supplied, published interest expense would be more representative of true interest expense than under the current regulatory structure. In table 2 we show the size of implicit interest payments (so called fee proxy) for the 7 OECD countries over the 1988-1995 period. Here implicit interest payments are measured by non interest expense minus other operating income divided by total average assets. As can be seen, a relatively low NIM country such as Switzerland (see table 1) also pays the lowest implicit interest rates. Interestingly Spain, who along with the US has the highest NIM, has relatively high implicit interest payments.

The second imperfection, likely to impact bank margins is the bank's opportunity cost of holding required reserves. The existence of noninterest bearing reserve requirements increase the economic cost of funds over and above the published interest expense. This additional cost factor will depend on the size of reserve requirements as well as on the opportunity cost of holding reserves. In this paper we proxy for the economic cost of holding reserves by the ratio of non interest earning assets to total assets.

The third imperfection is regulatory policies designed to reduce the default or credit risk in bank portfolios. Bank capital ratios (especially post 1988 for OECD countries) are viewed as insulating banks from credit risk shocks. While regulatory imposed bank capital requirements are minimums, banks often endogenously choose to hold more capital because of additional (perceived) credit risk exposures. However holding equity capital is relatively costly when compared to debt (because of tax and dilution of control reasons). Thus, banks that have relatively high capital ratios (high K/A) for regulatory /credit reasons can be expected to seek to cover some of this cost by imposing an extra spread (premium) in the banks' NIM over the pure spread for interest rate risk.

In sum, at any moment in time, it is hypothesized that the actual bank margins (NIM) will comprise a pure spread that is constant across banks in any country in any given year -- reflecting bank market structure and intermediation risk-- plus mark-ups for implicit interest expense (feepr), the opportunity cost of required reserves (neata ratio) and capital requirements for credit risk exposure (K/A). All other effects are reflected in the residual variable u.

In general form

$$\text{NIM} = f\{s(\tfrac{\alpha}{\beta}, R, Q, \sigma), \textit{feeproxy}, \textit{neata}, k/a, u\} \qquad (3)$$

From eqn (2). as long as banks in any given country share similar attitude to risk (R) and size of transactions (Q) as well as face the same market structure ($\frac{\alpha}{\beta}$) and interest rate volatility (σ_I^2), their pure spread (s) will be the same (i.e., $s_1 1 = s_2 2 = ... s_n n$ for each country j). However over time as market structure and volatility changes, so will the optimum pure spread (s).

SECTION 2. EMPIRICAL SPECIFICATIONS.

Given the above (eqn 3), we propose to analyze the determinants of NIM by following a two step process. The first step can be viewed as controlling for the effects on the NIM of regulatory imperfections (i.e. implicit interest, the opportunity cost of reserves and capital requirements) so as to insulate estimates of the pure spread (s) in each of the seven countries each year. The second step is to analyze the cross-country and time varying determinants of the pure spread - especially the effects of market structure and volatility on spreads.

Specifically:

Step 1. Cross sectional regressions of net interest rate margins of individual banks will be run in each country for each period. This will give C X T sets of parameters, where c is the number of countries and T is the number of time periods. The specification will be the following.

$$NIM_{ic} = \gamma_c + \sum_j \delta_j X_{jic} + u_i$$

where

NIM_{ic} = the published NIM of bank i in country c in some period t

X_{jic} = is a vector of regulatory variables (Feepr, Neata and K/A) for each bank i in country c in some time period t

u_{ic} = is the residual

and

γ_c = the regression constant is the estimate of the pure spread (s) component of the NIM for all i banks in country c at time t .

By repeating this cross sectional regression for years 1..8 (i.e. years 1988-1995) 8 estimates of the pure spread (s) for each country can be calculated. That is for seven countries we will have an eight period time series of the pure spread.

STEP 2

From eqn (2) the pure spread estimates from step 1's cross sectional regression should vary over time and across countries according to variations in market structure ($\frac{\alpha}{\beta}$), volatility σ_I^2, risk aversion (R) and transactions size (Q). Because of problems in estimating risk aversion parameters and transactions size we concentrate in the second step regression on the effects on the pure spread of market structure and volatility. Consequently the second step tests analyze a panel (cross section-time series) regressions of the form

$$\gamma_{tc} = \theta_o + \sum_{c-1} \eta_c + \theta_1 \sigma_c$$

where

γ_{ct} = a time series of pure spreads (t=1...8) for seven countries (c=1..7), which are also the intercepts of the regressions in step 1 above.

θ_o = is a constant that reflects the average effect across 7 countries of market structure on the pure spread

η_c = is a set of c-1 dummy variables reflecting differential market structure effects on the pure spread across countries (Germany is the excluded (base) country)

θ_1 = is the sensitivity of the pure spread to intermediation risk (interest rate volatility) changes over time.

Thus, this methodology will allow us to separate the effects on NIM for which macroeconomic policies are responsible (such as interest rate volatility) and components of the margin for which market structure (monopoly power) is responsible.

SECTION 3. DATA SAMPLE AND HISTORICAL CONTEXT

3.1. Data Sample

The major source of data for this study is balance sheet and income statement information derived from IBCA's Worldscope Data Base. This data base is unique in that it attempts to standardize financial statements across countries so as to allow reasonable cross country comparison of banks performance to be made. The data base is annualized and covers the period 1988- 1995. The seven countries chosen include five of the major banking countries in the world: US, UK, Germany, Switzerland and France along with two countries that have had relatively controlled banking systems - Italy and Spain- and who might potentially offer "models" of recent Latin American banking systems. The number of banks in the sample for each country are as follows: Germany (151), Italy (135) Switzerland (94), UK (32), Spain (114) France (110) and the US (110). Only banks for which all required data was available for all 8 years, were selected. Because the US has a more segmented (or non universal) banking system compared to the other countries in the sample --all of which have relatively "universal" structures-- we re-ran some of the tests using those institutions designated as purely commercial banks in the US (103 out of the 110). The interest rate volatility figures were collected from Data Stream. Short rate volatility was calculated as the annual standard deviation of weekly interest rates on 3 month securities in each country. Long rate volatility was calculated as a the annual standard deviation of weekly interest rates on one year securities. The specific interest rates used are listed in appendix 2.

Figure 1 shows the volatility of short-rates and Figure 2 the volatility of long-rates over the 1988-1995 period. As can be seen there is considerable time variation in volatilities within countries and the degree of correlation in volatility shocks, across countries is quite low. For example, the annual short-rate volatility for the US varied from a low of 0.083 % in 1993 to a high of 0.85 % in 1988, while for Spain the annual short rate volatility varied from 0.23 % in 1990 to a high of 2.18 % in 1993

3.2. Historical Context.

The sample period selected (1988-1995) is interesting for a number of reasons. First it contains the world-wide recession of the late 1980s and early 1990s when the credit risk exposure of many banks increased as did their loan losses rates and charge-offs. As a result we are able to examine the determinants of the NIM over both expansionary and contractionary phases of economic activity. Second, the period 1988-1992 encompasses the phase-in and harmonization of capital ratios across the major banking countries of the world (the BIS risk-based capital requirements for an 8 % risk-based capital ratio). As a result a number of banks had to increase their capital ratios over this period. As discussed earlier such capital ratios can be viewed as a form of taxation on bank profitability that is likely to be reflected in bank NIMs. By including a variable for bank capital we should be able to capture the effects of the BIS capital guideline on bank NIMs. Third, the 1988-1995 period is also one of dramatic consolidation in banking through mergers and acquisitions. Over this period the numbers of banks in the US fell by nearly 25 % largely as a result of mergers and acquisitions as inter-state barriers to cross-state acquisitions fell. Similarly, Europe also saw increased consolidation both domestically and inter-European as the EC moved towards a single banking and capital market as a result of the Second Banking Directive. Our model specifies a variable that will pick up the effect of changing market structure (consolidation) on bank margins in the US and Europe.

SECTION 4. EMPIRICAL RESULTS.

Table 3 shows the results of the first step regressions. Of the three market imperfections, the one with the strongest impact appear to have been the implicit interest rate (or fee proxy). For virtually all countries this variable has a highly significant and positive impact on NIMs. That is restrictions on paying explicit interest on deposits appears to be met by positive implicit payments (or subsidies to depositors) instead. To finance these payments, however banks have to increase their loan rates and thus their actual NIM. From a policy perspective, phasing out interest rate regulations on deposits may well lead to an erosion of implicit interest payments and potentially a narrowing in actual NIMs. While the overall effect on bank profitability is unclear, to the extent that scarce labor and capital resources used by banks to produce banking services are priced more efficiently (i.e. the subsidy effect is eliminated), then there may be an overall social welfare improvement.

With respect to the opportunity cost of reserves variable (neata), in most countries and years, as expected the sign is positive and the coefficients are significant.

The third market imperfection --bank capital assets ratios-- are generally significant and have the expected positive signs. That is to say high regulatory and/or endogenously determined capital ratios tend to erode bank profitability. Banks seek to lower the cost of holding relatively high capital-debt ratios by demanding higher NIMs.

As discussed in Section II, The intercepts of these regressions (in the context of the margin model) can be viewed as the common pure spread (s) across all banks in a single country in the same year. For example, for all US banks the pure spread in 1995 is estimated as 2.65 % compared to a gross NIM of 4.264 %. That is, in 1995 the pure spread is estimated to comprise (explain) about 62 % of the US NIM with the remaining 38 % being explained by "regulatory tax" variables and other (excluded residual) effects; also as can be seen these pure spreads are generally statistically significant and vary across time and across countries.

Using the estimated intercepts from the country specific cross sectional regressions as dependent variables measuring the pure spread, we then run the second step panel regression (see eqn 5 in section 2). The key parameters of interest are the intercepts of that regression, which show the general average effect of market structure on pure bank spreads across the seven countries, the individual country market structure dummies and the sensitivity of pure spreads with respect to market volatility of long and short interest rates. Table 4 panel (a) shows the regression tests with the country specific market structure dummies constrained to zero while table 4 panel b shows the results when country specific dummy variables are introduced. In both cases the individual coefficient p-values reflect adjustments for heteroskedasticity and for cross sectional correlation across residuals.

With respect to table 4 the results suggest that banking markets are on average quite efficient with the intercept variable suggesting that only approximately 0.20 % of margins on average can be explained by market structure (i.e.rents generated by monopoly power). However as can be seen from Table5, when individual country dummies are included (Germany is the intercept or the excluded variable) the results are quite interesting. Perhaps due to restrictions on interstate banking and universal banking the pure spread for the US banks are by far the largest with the dummy coefficient suggesting that the non competitive structure in the US adds 1.5 % to the spread compared to Germany (the intercept). By comparison France and the UK (with negative dummies) appear to have the most competitive banking markets. Interestingly US and Spain also have on average the largest gross NIMs.

With respect to intermediation costs (i.e. the volatility of interest rates) the higher the volatility of interest rates then the higher the pure spread - as implied by the model. The results also suggest that spreads appear to be equally sensitive to both short and long rate volatility of interest rates and that on average a 1 % increase in the volatility of interest rates increase bank margins by about 0.2 % (see table 5).

Overall, the results suggest that margins (or pure spreads) are sensitive to both market structure effects and volatility effects. However the effects of market structure on spread appear to be quite heterogeneous across countries.

SECTION V. POLICY IMPLICATIONS.

The major policy implication from this study are as follows:

(i) Regulatory taxes (market imperfections) have a significant impact on banks NIMs - especially interest rate restrictions on deposits. Consequently NIMs might be reduced by allowing competitive explicit rates to be paid by banks

(ii) Reserve requirements and related opportunity cost effects impact these countries NIMs. Thus, countries can lower their banks NIM by requiring lower reserve requirements or paying interest on such required reserves balances

(iii) Because of the relative cost of bank equity, high capital ratios impose an extra burden on banks and are reflected in higher NIMs. This suggests an important policy trade off. High capital ratios improve the solvency position of the banking system. On the other hand high NIMs are costly for users of bank services (i.e. depositors and borrowers).

(iv) The effect of market structure on bank spreads varies across countries. The more segmented or restricted the banking system, in terms of geographic restrictions on branching and universality of banking services, the larger appears to be the monopoly power of existing banks and the higher their spreads.

(v) Macro interest rate volatility has a significant impact on bank NIMs. For the 7 countries studied a 1 % increase in volatility increases bank NIMs by 0.2 %. This suggests that macro policies consistent with reduced interest rate volatility (e.g. low inflation policies) could have a positive effect in reducing bank NIMs.

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TABLE 1
Net Interest Margins: Basic Statistics

		1988	1989	1990	1991	1992	1993	1994	1995
Germany	**Mean**	2.434	2.372	2.347	2.477	2.588	2.630	2.676	2.531
	St. Deviation	1.035	1.070	1.064	1.144	1.287	1.271	1.240	1.207
Spain	**Mean**	5.087	5.410	5.265	5.094	4.851	4.717	4.438	4.131
	St. Deviation	0.940	1.158	1.033	1.098	1.125	1.094	1.156	1.045
France	**Mean**	3.318	2.980	2.889	2.642	2.486	2.547	2.569	2.496
	St. Deviation	2.289	2.004	1.711	1.519	1.556	1.766	1.786	1.670
Great Britain	**Mean**	2.103	2.356	2.213	2.176	2.240	2.113	2.088	2.038
	St. Deviation	0.380	0.369	0.334	0.364	0.309	0.308	0.255	0.399
Italy	**Mean**	4.059	4.387	4.465	4.389	4.617	4.201	3.731	4.022
	St. Deviation	1.192	1.353	1.357	1.341	1.465	1.405	1.248	1.383
United States	**Mean**	3.827	3.738	3.932	4.643	4.897	4.558	4.923	4.197
	St. Deviation	1.514	1.585	2.193	3.645	3.423	3.185	3.192	2.797
Switzerland	**Mean**	1.293	1.646	1.948	2.042	1.969	1.752	1.814	1.732
	St. Deviation	0.838	1.195	1.352	1.369	1.202	0.884	0.838	0.738

Source: Worldscope data base. IBCA. 1996

TABLE 2
Fee Proxy: Basic Statistics

		1988	1989	1990	1991	1992	1993	1994	1995
Germany	**Mean**	1.529	1.505	1.504	1.549	1.636	1.538	1.781	1.541
	St. Deviation	0.887	0.957	0.882	0.915	1.010	1.081	1.079	0.968
Spain	**Mean**	2.857	2.929	2.879	3.164	3.317	3.281	3.278	2.748
	St. Deviation	0.776	0.878	0.745	0.743	1.247	1.403	1.276	0.970
France	**Mean**	2.847	2.809	2.953	3.128	3.474	3.346	2.928	2.972
	St. Deviation	1.927	1.830	1.782	2.044	2.194	2.291	1.957	2.306
Great Britain	**Mean**	1.024	1.580	1.270	1.501	1.522	1.163	0.945	0.836
	St. Deviation	0.558	1.478	0.692	0.761	0.911	0.884	0.633	0.794
Italy	**Mean**	2.196	2.301	2.287	2.290	2.649	2.437	2.945	2.758
	St. Deviation	0.745	0.779	0.818	0.786	0.912	1.078	1.151	1.134
Switzerland	**Mean**	0.305	0.486	1.002	1.035	0.836	0.352	0.713	0.531
	St. Deviation	1.142	1.220	1.261	1.773	1.538	1.973	1.717	1.545
United States	**Mean**	2.170	2.559	2.728	2.779	2.362	1.970	1.812	1.703
	St. Deviation	1.323	1.560	1.715	2.105	1.465	1.427	1.438	1.247

Source: Worldscope data base. IBCA. 1996

TABLE 3

OLS REGRESSIONS. DEPENDENT VARIABLE: NET INTEREST MARGIN (NIM)
NIM= (INTEREST INCOME-INTEREST EXPENSE)/AVERAGE INTEREST EARNING ASSETS

GERMANY(131 Financial Institutions)

	1988	1989	1990	1991	1992	1993	1994	1995
Intercept	0.356 (0.0421)	0.308 (0.200)	0.252 (0.205)	0.558 (0,005)	0.345 (0,033)	0.12 (0,346)	0.316 (0,111)	0.24 (0,067)
Feepr	0.970 (0.000)	0.677 (0.000)	0.914 (0.000)	0.919 (0,000)	1,053 (0,000)	1.062 (0,000)	0.923 (0,000)	1.117 (0,000)
neata	0.097 (0.000)	0.147 (0.000)	0.108 (0.001)	0.071 (0,023)	0.070 (0,004)	0.063 (0,000)	0.025 (0,091)	0.01 (0,245)
eta	0.025 (0.354)	0.072 (0.039)	0.046 (0.122)	0.028 (0,365)	0,030 (0,272)	0.116 (0,000)	0.107 (0,000)	0.085 (0,000)
R2	69.2	45.7	60.3	54	73.2	83.1	62.5	80

UK (32 Financial Institutions)

	1988	1989	1990	1991	1992	1993	1994	1995
Intercept	1.083 (0.000)	0.994 (0.095)	1.071 (0.051)	0.078 (0.851)	-0.647 (0.078)	0.534 (0.336)	-1.228 (0.032)	-1.054 (0.09)
Feepr	1.785 (0.000)	0.191 (0.147)	1.371 (0.000)	1.179 (0.000)	0.987 (0.000)	0.793 (0.000)	1.387 (0.000)	1.009 (0.000)
neata	-0.063 (0.349)	0.104 (0.119)	-0.128 (0.055)	-0.067 (0.312)	0.0226 (0.267)	0.062 (0.124)	0.075 (0.01)	0.096 (0.001)
eta	-0.078 (0.164)	0.186 (0.063)	-0.024 (0.796)	0.137 (0.063)	0.303 (0.000)	0.124 (0.123)	0.352 (0.000)	0.37 (0.000)
R2	71.7	28.7	61.6	69.8	82.9	47.8	70.2	61.3

ITALY (133 Financial Institutions)

	1988	1989	1990	1991	1992	1993	1994	1995
Intercept	-0,006 (0,977)	-0,329 (0,224)	0.151 (0,554)	0.004 (0,988)	0.327 (0,304)	1.422 (0,000)	0.749 (0,022)	0.991 (0,008)
Feepr	1.117 (0,000)	1.227 (0,000)	1.172 (0,000)	1.208 (0,000)	0.876 (0,000)	0.777 (0,000)	0,657 (0,000)	0.747 (0,000)
neata	0.084 (0,000)	0.075 (0,000)	0.078 (0,000)	0.068 (0,000)	0.074 (0,000)	-0,029 (0,450)	0.002 (0,959)	-0,071 (0,055)
eta	0.063 (0,000)	0.101 (0,000)	0.057 (0,000)	0.075 (0,000)	0.119 (0,000)	0.117 (0,000)	0,113 (0,000)	0.159 (0,000)
R2	74.2	72	72.1	72.7	59.4	51.3	53.2	53.2

SPAIN (114 Financial Institutions)

	1988	1989	1990	1991	1992	1993	1994	1995
Intercept	0.727 (0.160)	1.76 (0.000)	0.948 (0.088)	0.908 (0.127)	2.524 (0.000)	1.434 (0.009)	1.758 (0.000)	0.258 (0.572)
Feepr	0.964 (0.000)	0.914 (0.000)	0.885 (0.000)	0.958 (0.000)	0.645 (0.000)	0.517 (0.000)	0.116 (0.006)	0.718 (0.000)
neata	0.081 (0.033)	0.054 (0.166)	0.108 (0.089)	0.062 (0.216)	0.073 (0.361)	0.033 (0.717)	0.078 (0.344)	0.171 (0.037)
eta	0.155 (0.000)	0.062 (0.09)	0.13 (0.000)	0.097 (0.007)	-0.044 (0.174)	0.172 (0.000)	0.118 (0.006)	0.136 (0.000)
R2	39.2	39.9	34.5	33.9	24.8	39.7	19.5	46.8

FeePr: (Non Interest Expense-Other Operating Income)to Average Assets
Eta: Equity to Assets
Neata: Non Earning Assets to Total Av Assets
p-value between brackets

TABLE 3 (cont')

OLS REGRESSIONS. DEPENDENT VARIABLE: NET INTEREST MARGIN (NIM)
NIM= (INTEREST INCOME-INTEREST EXPENSE)/AVERAGE INTEREST EARNING ASSETS

SWITZERLAND (94 Financial Institutions)

	1988	1989	1990	1991	1992	1993	1994	1995
Intercept	0.415	0.040	0.085	0.380	0.312	0.158	0.681	0.781
	(0.027)	(0.866)	(0.696)	(0.111)	(0.165)	(0.414)	(0.000)	(0.000)
Feepr	0.303	0.352	0.378	0.218	0.294	0.309	0.207	0.198
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
neata	0.029	0.09	0.115	0.073	0.086	0.161	0.034	0.017
	(0.293)	(0.000)	(0.003)	(0.059)	(0.016)	(0.000)	(0.289)	(0.375)
eta	0.060	0.096	0.080	0.084	0.078	0.064	0.062	0.055
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R2	33.2	44.3	54.7	47.4	48.9	52.3	35.5	41.2

FRANCE (110 Financial Institutions)

	1988	1989	1990	1991	1992	1993	1994	1995
Intercept	-0.374	-0.352	-0.408	0.112	0.58	0.499	0.547	1.317
	(0.104)	(0.204)	(0.149)	(0.723)	(0.101)	(0.134)	(0.095)	(0.001)
Feepr	1.043	1.064	0.978	0.756	0.595	0.626	0.609	0.372
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
neata	0.068	0.074	0.079	0.088	0.061	0.008	0.039	0.053
	(0.000)	(0.000)	(0.000)	(0.000)	(0.054)	-0.832	(0.107)	(0.238)
eta	0.109	0.064	0.046	0.046	0.073	0.101	0.071	0.042
	(0.000)	(0.060)	(0.114)	(0.106)	(0.007)	(0.000)	(0.009)	(0.123)
R2	87.3	83.8	79.2	67.2	48.6	55.1	45.6	24.1

US(110 Financial Institutions)

	1988	1989	1990	1991	1992	1993	1994	1995
Intercept	1.628	2.054	1.360	1.719	-0.102	1.884	3.495	2.551
	(0.000)	(0.000)	(0.010)	(0.003)	(0.877)	(0.037)	(0.000)	(0.000)
Feepr	0.787	0.575	0.595	0.409	0.874	0.239	0.345	0.683
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)
neata	-0.028	-0.067	-0.016	-0.087	-0.014	-0.061	-0.015	0.033
	(0.181)	(0.013)	(0.562)	(0.006)	(0.660)	(0.101)	(0.626)	(0.148)
eta	0.153	0.209	0.196	0.358	0.365	0.362	0.060	0.021
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.300)	(0.638)
R2	49.6	31.4	36.6	29.1	34.2	10.9	7,4	25.3

US(103 Commercial Banks)

	1988	1989	1990	1991	1992	1993	1994	1995
Intercept	1.604	2.109	1.49	1.145	-0.432	2.156	3.922	2.930
	(0.000)	(0.000)	(0.068)	(0.032)	(0.478)	(0.0172)	(0.000)	(0.000)
Feepr	0.778	0.564	0.564	0.600	0.996	0.258	0.255	0.564
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.029)	(0.000)
neata	-0.023	-0.065	-0.013	-0.017	0.028	-0.040	-0.015	0.026
	(0.181)	(0.019)	(0.641)	(0.581)	(0.344)	(0.267)	(0.622)	(0.252)
eta	0.149	0.202	0.182	0.236	0.301	0.293	0.022	0.009
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.689)	(0.826)
R2	48.3	30.2	32.3	32.7	42.8	7.9	3.9	16.4

FeePr: (Non Interest Expense-Other Operating Income)to Average Assets
Eta: Equity to Assets
Neata: Non Earning Assets to Total Av Assets
p-value between brackets

TABLE 4

GROUPWISE REGRESSIONS: ESTIMATOR 2 STEP GLS
Dependent Variable: Pure Margin (Intercepts from cross sectional regressions in Table 3)
Without Country Dummies

				Tests Against Homoskedasticity		Tests Against Cross Group Correlation		Log Lik. Function
	CONSTANT	SHORT	LONG	Wald(*)	Likelihood Ratio(*)	Lagrange Multiplier(*)	Likelihood Ratio(*)	
Groupwise Heteroskedastic Regression	0.218 (0.130)	0.300 (0.139)		2513.9	44.7			-51.7
Groupwise Heteroskedastic Regression	0.220 (0.128)		0.306 (0.155)	2694.4	44.7			-51.1
Adjusted for Cross Correlated Residuals	0.252 (0.000)	0.240 (0.000)				27.8	72.58	-15.38
Adjusted for Cross Correlated Residuals	0.212 (0.000)		0.312 (0.000)			27.7	67.3	-17.5

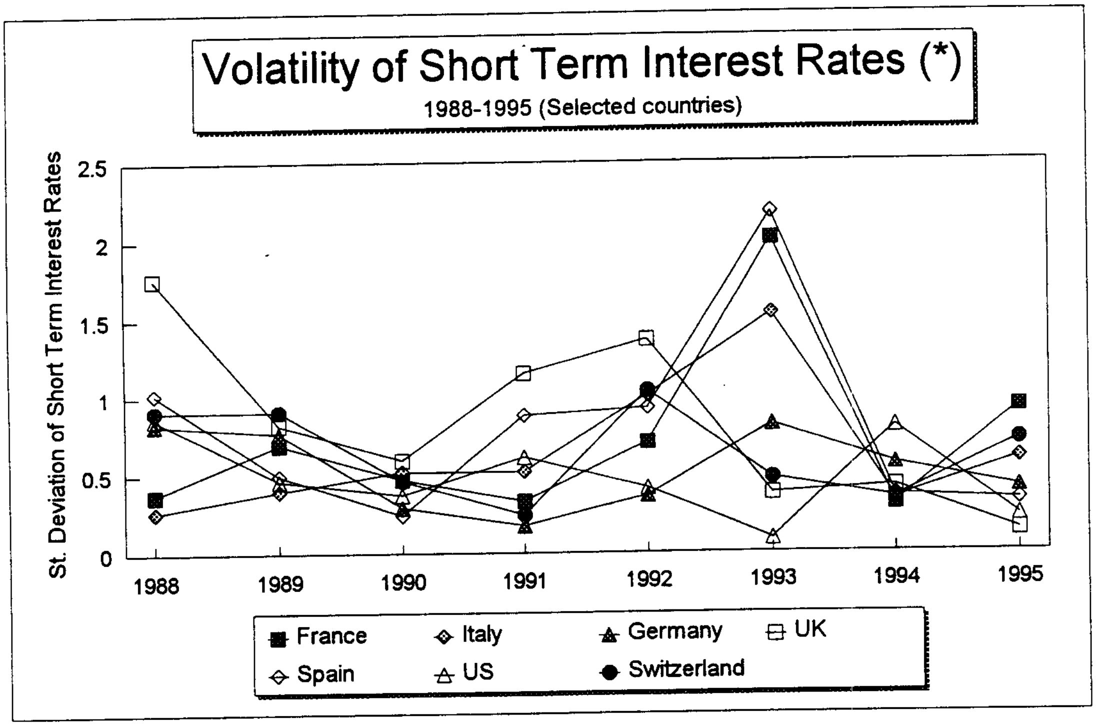
(*) Chi-Squared (6)
p-values between brackets

TABLE 5
GROUPWISE REGRESSIONS:ESTIMATOR 2 STEP GLS
Dependent Variable: Pure Margin (Intercepts from cross sectional regressions in Table 3)
With Country Dummies

	Constant	US	Spain	Italy	France	Switzerland	Short	Long	Tests Against Homoskedasticity Wald(*)	Tests Against Homoskedasticity Likelihood Ratio(*)	Tests Against Cross Group Correlation Lagrange Multiplier(*)	Tests Against Cross Group Correlation Likelihood Ratio(*)	Log Lik. Function
Groupwise Heteroskedastic Regression	0.213 (0.038)	1.521 (0.000)	0.925 (0.000)	0.079 (0.654)	-0.109 (0.587)	0.024 (0.845)	0.189 (0.211)		1272.9	28.7			-38.8
Groupwise Heteroskedastic Regression	0.241 (0.018)	1.494 (0.000)	0.928 (0.000)	0.063 (0.732)	-0.088 (0.664)	0.019 (0.874)		0.153 (0.367)	1520.8	29.8			-38.8
Adjusted for Cross Correlated Residuals	0.207 (0.000)	1.521 (0.000)	0.922 (0.000)	0.078 (0.713)	-0.112 (0.574)	0.023 (0.811)	0.199 (0.000)				34.8	101.6	11.9
Adjusted for Cross Correlated Residuals	0.221 (0.000)	1.489 (0.000)	0.914 (0.000)	0.052 (0.808)	-0.0937 (0.654)	0.012 (0.090)		0.195 (0.000)			32.5	60.4	-8.6

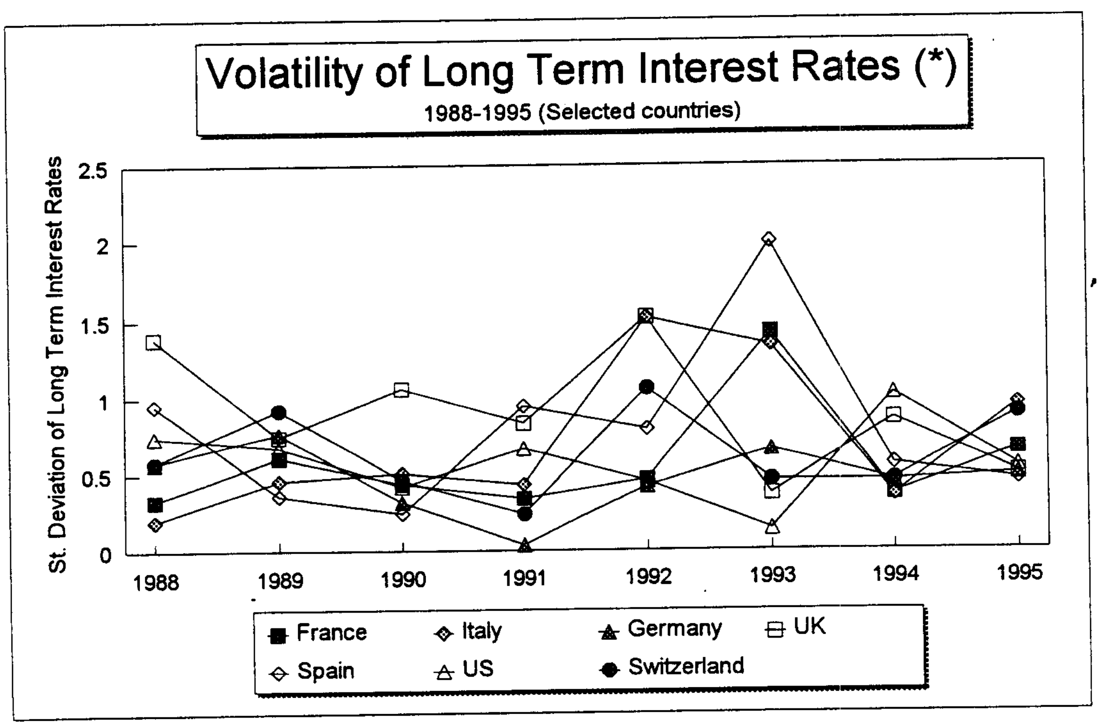
(*) Chi-Squared (6)
p-values between brackets

Figure 1



(*) Rates used for these calculations are defined in appendix 2.
Source: Data Stream

Figure 2



(*) Rates used for these calculations are defined in appendix 2.
Source: Data Stream

Appendix 1

The bank solves the following optimization problem:

$$\underset{a,b}{Max} \ [\ \lambda_a E(U(W_T)/deposit) + \lambda_b E(U(W_T)/loan)] \qquad (1)$$

The following definitions apply:

W_T, is the final wealth, after a transaction (loan or deposit) takes place and a there is a shock on the short term (money market) interest rate.

$U(W)$, is a well defined concave utility function of wealth.

$$W_o = I_o + C_o$$

$$I_o = L_o - D_O + C_o$$

I_o, L_o, D_o, C_o are intial inventory, loan, deposit and money market positions

$r_w = r_I \frac{I_o}{W_o} + r \frac{C_o}{W_o}$, is a weighted average interest rate earned by the bank portfolio

Q= is the size of the single transaction in the period (a loan or a deposit)

Expanding around initial wealth when a deposit or a loan takes place and taking expectations:

$$E(U(W_T)/deposit) = U'(W_o)aQ + \tfrac{1}{2}U''(W_o)(\sigma_I^2 Q^2 + 2\sigma_I^2 QI) + U(W_o) +$$

$$+U'(W_o)(r_w W_o + \tfrac{1}{2}U''(W_o)(\sigma_I^2 I_o^2 + 2\sigma_{IY} I_o Y_o + \sigma_y^2 Y_o^2) \qquad (2)$$

and

$$E(U(W_T)/loan) = U'(W_o)bQ + \tfrac{1}{2}U''(W_o)(\sigma_I^2 Q^2 - 2\sigma_I^2 QI) + U(W_o) +$$

$$+U'(W_o)r_w W_o + \tfrac{1}{2}U''(W_o)(\sigma_I^2 I_o^2 + 2\sigma_{IY} I_o Y_o + \sigma_y^2 Y_o^2) \qquad (3)$$

where $U(W_T/.)$ is a second order Taylor expansion around initial wealth.

Plugging (3) and (2) into (1) and solving with respect to a and b to get a* and b*, the optimal spread, s*, is:

$$s^* = a^* + b^* = \tfrac{\alpha}{\beta} + \tfrac{1}{2}R\sigma_I^2 Q$$

where

R = is the absolute coefficient of risk aversion.

$\frac{\alpha}{\beta}$ = represents the market structure

σ_i^2 = is the volatility of the interest rate

APPENDIX 2

Interest Rates used for Volatilities Estimates

	Short Term Interest Rates	Long Term Interest Rates
FRANCE	Money Market 3 Months	Money Market One Year
ITALY	Discount Rate	ABI Prime Rate
GERMANY	Money Market 3 Monts	Treasury Bond 1 year
UK	Interbank Rate - 3 Months	Interbank Rate - 1 Year
SWITZERLAND	Fixed Deposit 3-5 Months	Fixed Deposit 12 Months
SPAIN	Interbank Rate - 3 Months	Interbank Rate - 12 Months
US	Treasury Bill - 3 Months	Treasury Bill