Determinants of the Interest Rate Margins of Austrian Banks

David Liebeg,
Markus S. Schwaiger[1]

Bank interest rate margins have been declining in most EU Member States over the last decade. Drawing on a unique sample of supervisory data for the Austrian banking system from 1996 to 2005, this paper investigates the determinants of bank interest rate margins. The main factors driving the reduction of Austrian banks' interest rate margins are decreasing operating costs, the growing importance of foreign currency lending combined with a rising share of noninterest revenues as well as increasing competition. In contrast to findings in the literature we document a positive effect of relationship banking on margins, with the erosion of relationship banking being another reason for the decline in interest margins.

1 Introduction

All across the EU-25, many banking markets have seen a reduction in their interest rate margins (see e.g. ECB, 2006, for euro area banks). In fact a look at the Bureau van Dijk Bankscope Database reveals that only 5 out of 25 EU Member States (the Czech Republic, Greece, Hungary, Slovakia and the U.K.) have seen a stable or (slightly) increasing interest margin since 1999.[2] Austria is no exception in this regard. The interest rate margin of Austrian banks has decreased substantially over the last ten years.[3] This paper investigates the major determinants of banks' interest rate margins in Austria and identifies the reasons behind the decrease of margins over the last decade.

With interest income still accounting for nearly one half of Austrian banks' operating income, the observed margin reduction is relevant both from a micro (or single bank) perspective as well as from a macro (or financial stability) viewpoint. From a microeconomic perspective, identifying – and predicting the evolution of – the drivers behind decreasing margins should enable us to assess prospective changes in the margin reduction process. Regarding the financial stability aspect, the reduction of the interest rate margin is of double importance. On the one hand, bank managers may have an incentive to expand other, potentially more risky business activities in order to shore up profitability. On the other hand, from a monetary policy point of view, it is interesting for regulators to know whether the reduction in the interest rate margin (IRM) is predominantly attributable to microeconomic reasons or, quite contrarily, to macroeconomic developments.

---

[2] Maudos and Fernández de Guevara (2004) furthermore document declining margins for a sample of five major EU Member States for the earlier period of 1993 to 2000.

[3] Moreover, a look at the ECB interest rate statistics shows that the margins Austrian banks charge on new loans and deposits have been consistently lower than the average margin charged by euro area banks since the beginning of these statistics in 2003.

So far, the literature has documented a number of factors that affect the size of bank margins. Macroeconomically, the state of the business cycle (see e.g. Bikker and Hu, 2002), the term structure/volatility of interest rates (see e.g. Ho and Saunders, 1981), or the influence of judicial efficiency (Laeven and Majnoni, 2005), were shown to be important. In terms of micro (i.e. bank-specific or industry-specific) factors, operating costs (see. e.g. Demirgüc-Kunt and Huizinga, 1998), interest rate risk (see Ho and Saunders, 1981), default risk (see Angbazo, 1997), bank size (see. e.g. Athanasoglou et al., 2005), market structure/competition (collusion vs. efficiency hypothesis, see e.g. Goddard et al., 2004), or risk aversion (see e.g. Maudos and Fernández de Guevara, 2004) matter.

In this respect, the Austrian banking system itself has seen several noteworthy phenomena that accompanied the continuous reduction of the IRM over the last ten years. In line with a development seen in many other EU Member States, Austrian banks have witnessed a sharp rise in the importance of noninterest revenues. The median bank saw the share of noninterest revenues in operating revenues rise by more than 50% over the last decade. Besides the successful expansion to Central and Eastern European (CEE) banking markets, it is the rising dependence on commission income which drives noninterest revenues.

Furthermore, Austria is unique – at least within the euro area – with respect to the importance of foreign currency lending. Indeed, the share of foreign currency loans (FCL) in overall lending to nonbanks has more than tripled since 1996 to roughly 20% at present. Additionally, the Austrian banking system can still be characterized as a typical universal banking system with a strong emphasis on the German-style "Hausbank" principle (see. e.g. Elsas, 2005). If relationship banking indeed drives up interest rate margins (see e.g. Boot, 2000, and Thakor, 2000), reduced margins could also be the consequence of a decrease in the importance of relationship banking in the past years.

In this paper we want to address the reasons behind the decline of Austrian banks' IRM. Although other papers have dealt with the overall profitability of Austrian banks (see e.g. Arpa et al., 2001, Hahn, 2005a and 2005b, and Rossi et al., 2006) or included data on selected Austrian banks into a cross-country sample (see e.g. ECB, 2000 and 2006b), to the best of our knowledge, our paper is the first to address the determinants of Austrian banks' interest rate margin in a comprehensive way. Based on the modeling approach by Maudos and Fernández de Guevara (2004) and the estimation of a dynamic panel data model, the decrease of Austrian banks' IRM is found to be mainly attributable to decreasing operating costs, an increasing prominence of foreign currency lending accompanied by a rise in noninterest revenues as well as stronger competition. Adding to that, an erosion of relationship banking wears down interest rate margins further.

The following second section describes the development of the IRM in Austria over time. Section 3 outlines the underlying theoretical model, section 4 specifies the empirical application, section 5 presents our results, and section 6 concludes.

2 Bank Interest Rate Margins over Time

The median interest rate margin of the Austrian banking system (defined as net interest income over total assets) declined by more than 36% from 3.04% in 1996 to 1.94% in 2005 (see chart 1). It is noteworthy that the reduction in interest rate margins spanned the entire observation period and was not confined to any subperiod with a particular general economic condition such as the asset price boom years up to 2000. Furthermore, IRM reduction was not confined to any subgroup of banks (large or small, joint stock or cooperative, etc.), but occurred – at different speeds – across the entire banking system.

Chart 1

Median Interest Rate Margin of Austrian Banks over Time

%

Source: OeNB.
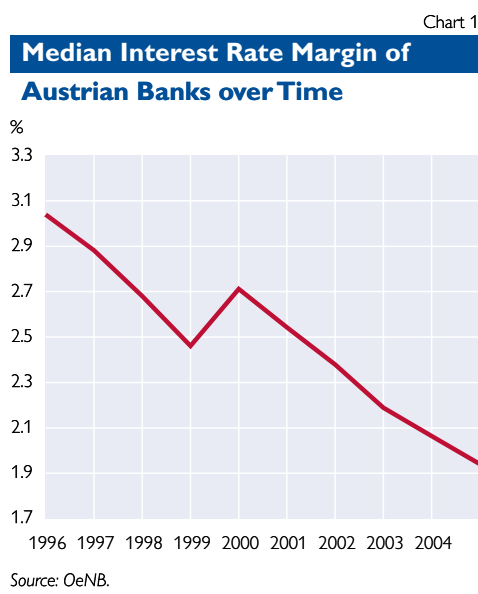
3 Determinants of Bank Interest Rate Margins

In this paper we employ the well-accepted dealership model in the line of Ho and Saunders (1981) to investigate the determinants of banks' interest rate margins. The original Ho and Saunders model views banks as risk-averse intermediaries between lenders and borrowers. In this process, banks are exposed to competitive pressures and interest rate risk which determine their interest rate margins. The original model has been extended to include different kinds of loans/deposits (see Allen, 1988) and the volatility of money market interest rates (see McShane and Sharpe, 1985), credit risk (see Angbazo, 1997) and operating costs (see Maudos and Fernández de Guevara, 2004).

In the following, we apply the Maudos and Fernández de Guevara (2004) extension of the original Ho and Saunders model of IRM. Intuitively Maudos and Fernández de Guevara's model works in the following way: Banks are risk-averse agents that take deposits and grant loans, both of which arrive randomly, with the probability of arrival depending on the margin the bank charges and the elasticity of the demand for loans/supply of deposits. The random character of deposit supplies and loan demands exposes them to interest rate risk. Suppose a deposit is taken by a bank and invested in the money market for lack of concurrent loan demand. In such a case, the bank faces a reinvestment risk because of the stochastic nature of its investment return. But if an incoming loan demand is refinanced on the money market, the bank faces a refinancing risk because of the stochastic nature of its refinancing costs. Given that the return on said loan is uncertain (as it is uncertain in advance whether the loan is going to be repaid or not), the bank also faces credit risk – in addition to the interest rate risk mentioned above. A risk-averse agent therefore will demand a higher margin for higher credit risks. Maudos

and Fernández de Guevara (2004) argue that the intermediation role of banks is furthermore reflected in their operating costs since even in the absence of market power and of any kind of risk, banks will have to cover their operating costs, which are a function of deposits taken and loans granted. Thus banks operating at higher cost levels will need to charge higher margins. As in a perfectly competitive environment the prices are set by the market – a process which simply results in the market exit of banks with high expenses, some doubts about this line of argumentation are justified. We nevertheless include operating costs in our analysis, as higher costs may be the result of product differentiation due to higher service and/or higher marketing expenses and therefore enable a bank to charge higher interests rates for loans and offer lower interest rates for deposits. The model further predicts the IRM to be an increasing function of the average size of a bank's operations because in this case more risk is concentrated in a single customer.

To sum up, the theoretical model of Maudos and Fernández de Guevara (2004) lists the following determinants of a bank's IRM and their predicted directions of influence:
— A bank's degree of *risk aversion*: The higher the risk aversion, the higher the IRM.
— The *competitive structure* of the banking market: The lower competition, the higher the IRM.
— *Interest rate risks:* The more volatile money market rates, the higher reinvestment and refinancing risks, which in turn results in higher IRM for risk-averse agents.
— *Credit risks:* The higher credit risks, the higher the IRM.

— The *interaction* between credit and interest rate risks: Higher interest rate risks will ceteris paribus increase the default probability of loans.
— Bank's *operating costs:* The higher the operating costs, the higher the IRM a bank has to – or may – charge.
— The *average size* of bank operations: The higher the average size of operations, the higher the risk concentrated in single customers and the higher the IRM a risk-averse agent demands.

Literature refers to the IRM explained by these factors as the "pure" or model-based interest rate margin. From an empirical point of view, a number of other drivers reflecting market imperfections, bank specific components or macroeconomic influences might divert empirical interest rate margins from these "pure" margins. The *payment of implicit interest* in the form of loan- or deposit-related commissions obviously has to be considered in this context (see Saunders and Schumacher, 2000). Given a large dispersion in the relative size of banks and the degree of bank efficiency, it would not be surprising to see that *economies of scale* (see Athanasoglou et al., 2005) or the *quality of management* (see Angbazo, 1997) have an effect on empirical margins. In the same way, the different extent to which banks make use of relationship banking in a market has been identified as a potential driving force behind bank margins (see e.g. Ergungor, 2005). Stiroh (2004) furthermore documents interplay between noninterest and interest revenues that could hinge on *income diversification*. Last but not least, changing *general economic conditions* (see Bikker and Hu, 2002) could also wield an influ-

ence in this respect. In an empirical model of bank margins, these factors have to be captured, too.[4]

Thus, the observed interest rate margin of bank i at time t, IRM_{it}, is given by:

$$IRM_{it} = f\left[PIM_{it}(\bullet), X_{it}, Y_t\right]$$

where PIM_{it} is the pure interest rate margin, X_{it} is a vector of bank specific control variables and Y_t is a vector of industry-specific and macro control variables.

4 Empirical Approach

4.1 Data

Our original data set consists of year-end data of all 1,119 banks that held an Austrian banking license between 1996 and 2005. As not all of these banks operated throughout the whole period and as data are missing for some banks' variables, the final sample consists of 903 banks and covers 8,286 observations altogether. We draw on a unique data set based on banks' regulatory report to the Oesterreichische Nationalbank (OeNB) in accordance with the Austrian Banking Act.[5] This data set has three major advantages compared to data used in similar studies: First, it includes all banks in the market, contrary to most other studies, which include only partial samples and exclude many small banks. Second, all the banks are subject to the same accounting and regulatory regime, which means that the potentially dis-

torting influence of differing accounting standards can be avoided. Third, the reporting data are far more detailed throughout the sample than in commercial databases, thus allowing us to find better suited empirical variables such as the average size of customer loans as a measure of the average size of (loans) operations, the Herfindahl-Hirschman index of a bank's loan portfolio as a measure of diversification and the share of small loans as a measure of the degree of relationship banking.

Daily interest rate data are derived from Thomson Financial Datastream, annual GDP data on Austria are again provided by the OeNB.

4.2 Empirical Model

To capture the persistence of bank profits over time that numerous other studies (e.g. Athanasoglou et al., 2005, Goddard et al., 2004) find to be attributable to e.g. impediments to competition or informational opacity, we perform a dynamic panel data approach, using the one-step GMM estimator introduced by Arellano and Bond (1991).[6] Our empirical specification therefore takes the form

$$IRM_{it} = const + \delta IRM_{it-1} +$$

$$+ \sum_{k=1}^{K} \alpha_k PIM_{kit} + \sum_{l=1}^{L} \beta_l X_{lit} + \sum_{m=1}^{M} \gamma_m Y_{mt} + u_{it}$$

$$\text{and } u_{it} = \mu_i + v_{it},$$

---

[4] The distinction between an empirically observed IRM and a pure margin that induces the need for control variables is common to dealership models in the line of Ho and Saunders (1981). In this context, see also Angbazo (1997), Saunders and Schumacher (2000) or Maudos and Fernández de Guevara (2004).

[5] Balance sheet data stem from the monthly balance sheet report (MAUS), profit and loss data are derived from the quarterly profit and loss report (QUAB).

[6] Note that the estimation of a static fixed or random effects model would result in biased and inconsistent parameter estimates for a dynamic relationship. Given the fact that such a bias decreases with T and the time dimension T=10 of our sample, we estimated a fixed effects model to check for the robustness of our results – a Hausmann test provided evidence for the use of an FE model instead of an RE model. Although biased, the FE model by and large underscores the results of this paper.

where δ is the coefficient of the lagged dependent variable, α_k are the K coefficients of the variables determining the pure interest rate margin PIM_{it}, β_l are the L coefficients of the bank-specific control variables and γ_m are the M coefficients of the industry-specific and macro control variables that are constant over all banks in a given year. u_{it} consists of the individual effect μ_i and the residual term v_{it}.[7]

Empirically, the *interest rate margin* is net interest income in relation to total assets. The determinants of the pure interest rate margin discussed above are proxied empirically by the following variables:

- The *degree of risk aversion* is captured by the regulatory capital ratio. A higher ratio means a greater distance to regulatory minimum standards and thus higher risk aversion.

- The *competitive structure* of the market is captured by the average Lerner index for the banking market in a given year and is calculated according to Angelini and Cetorelli (2003). The Lerner index is the relative markup of price over marginal costs, i.e. the difference between price and marginal costs in relation to price. To obtain the Lerner index, the following system was estimated simultaneously[8] for each year from 1996 to 2005.

$$\ln c_i = k_0 + s_1 \ln x_i + \frac{s_2}{2}(\ln x_i)^2 +$$

$$+ \sum_{j=1}^{3} k_j \ln \omega_{ij} + \sum_{j=1}^{3} s_{j+2} \ln x_i \ln \omega_{ij} +$$

$$+ k_4 \ln \omega_{i1} \ln \omega_{i2} + k_5 \ln \omega_{i1} \ln \omega_{i3} +$$

$$+ k_4 \ln \omega_{i2} \ln \omega_{i3} + \sum_{j=1}^{3} k_j (\ln \omega_{ij})^2$$

$$p_i = s_0 +$$

$$+ \frac{c_i}{x_i}\left(s_1 + s_2 \ln x_i + \sum_{j=1}^{3} s_{j+2} \ln \omega_{ij} \right),$$

where c_i are total costs, x_i are total assets, ω_{i1} are the costs of funding (interest expenses in relation to deposits), ω_{i2} are the costs of labor (personnel expenses in relation to the number of employees) and ω_{i3} are the costs of physical capital (operating expenses net of personnel costs in relation to total assets) of bank i. The first equation thereby is the translog cost function used to obtain marginal costs, the second equation is the first order condition of profit maximization used to obtain the markup over price (captured by s_0). p_i is the sum of interest revenues and fee-based income in relation to total assets. The average degree of competition in a given year is calculated by dividing the estimation of s_0 by the average p over all banks in a year.

---

[7] *Given the presence of large differences in the size of individual banks, heteroskedasticity could be a problem in our sample. We control for this by using a robust estimator of the variance-covariance matrix of the parameter estimates. Furthermore, to make sure nonstationarity does not affect our data, we performed the panel data unit root test according to Maddala and Wu (1999), which results in the rejection of the null hypothesis of nonstationarity. The respective test statistics can be obtained from the authors upon request.*

[8] *Because of the endogeneity of the cost and price variables, c_i and p_i, we used instrumental variables in a framework of a three-stage least-squares estimation.*

— *Interest rate risks* are captured by the standard deviation of daily short-term money market rates over a year, our choice being the three-month Euribor (or Vibor before 1999). Alternatively, we will check for the robustness of our results using the slope of the term structure (the difference between a year's average of ten-year government bond yields and the three-month Euribor) and the standard deviation of ten-year government bond yields as interest rate risk proxies.

— *Credit risks* are captured by the ratio of loan loss provisions to customer loans or (again as a robustness exercise) by the ratio of risk-weighted assets to total assets.

— The *interaction of credit risks and interest risks* is covered by introducing an interaction term between the respective interest rate risk and credit risk specifications.

— The *operating costs* are simply operating expenses in relation to total assets.

— The *average size of operations* is captured by dividing the amount of customer loans by the number of customer loans and complemented by the diversification of the loan portfolio measured by the Herfindahl-Hirschman index over each bank's individual loan portfolio for every bank in every year.[9]

In order to capture empirical deviations from pure margins we account for the following factors: *Payments of implicit interest rates* are calculated by dividing fee income on credit operations by total assets, the *quality of management* is proxied by the cost/income ratio, *economies of scale* are captured by a bank's market share in a given year, the *importance of noninterest revenues* is calculated by the ratio of noninterest revenues to total assets or, alternatively, — and again as a robustness check — to total revenues, and the change in *economic conditions* is proxied by the deviation of Austria's real GDP growth rate in a given year from its average over the sample period. To obtain a useful proxy for the *degree of relationship banking*, we use the sum of customer loans with a volume below EUR 500,000 (below EUR 360,000 before 2002) in relation to total assets. The underlying rationale for this choice is the argument that the kind of information asymmetries typically encountered with relationship loans will likely decrease with the size of loans (see also Ergungor, 2005, in this context).[10] Since foreign currency lending is a unique feature in Austrian banking and gained particular importance during the observation period

[9] *Our diversification measure is based on OeNB's Major Loans Register, which has the shortcoming that only loans in excess of EUR 350,000 are reported; thus, the picture for small banks that have only a few (or even only one) loan above this threshold is potentially distorted. Estimation results based on a subsample that excludes these smaller banks (with total assets below EUR 70 million), however, do not alter the results. Therefore, we include diversification in addition to the average size of operations in order to capture information on the granularity of the loan portfolio.*

[10] *We acknowledge that, despite drawing on a unique database, this indicator is relatively crude. We are aware of the fact that not all small loans are relationship loans and not all relationship loans are small. However, we follow the argument that the larger the company is, the lower the resulting information asymmetry is (not least owing to more sophisticated and documented management systems) — a fact which results either in capital market financing or transaction-based bank lending.*

described here, we also control for the *influence of foreign currency loans* by using the share of foreign currency loans to all loans granted to customers for each bank.

Table 1 shows the evolution over time of the explained variable and all the explanatory variables in our sample for the years from 1996 to 2005, with medians used for bank-specific variables. The IRM shows a decreasing trend ranging from just over 3% in 1996 to 1.9% in 2005. During the same period, competition in the Austrian banking system increased markedly, with the Lerner index (LERNER) of the banking system decreasing from 51% to 40%. Along with rising competition, operating costs (OPC) decreased steadily from

2.7% in 1996 to 2.3% in 2005. In terms of interest rate risk, the one-year standard deviation of the three-month Euribor (STD3M) increases until 2000 and decreases thereafter. The slope term (SLOPE) follows a similar pattern, the standard deviation of the ten-year bond yield (STD10Y), however, moves in the opposite direction of the three-month Euribor for most of the years under observation. In contrast to interest rate risk, credit risk, as measured by the loan loss provisions ratio (LLPR), went up during the sample period, a pattern by and large followed by the risk-weighted assets (RWATOTASS). The average size of operations (ASO) augmented steadily from EUR 17,000 to EUR 29,000, and the concentra-

Table 1

Variable Definitions and Sample Medians (for bank-specific variables)

Symbol	Definition	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
IRM, %	Net interest income to total assets	3.039	2.882	2.680	2.461	2.712	2.544	2.379	2.189	2.064	1.941
LERNER, %	Lerner index of market power	51.210	48.396	50.657	47.341	51.948	53.926	47.891	42.354	39.280	40.028
OPC, %	Operating costs to total assets	2.694	2.696	2.653	2.558	2.567	2.515	2.460	2.392	2.321	2.192
RAV, %	Regulatory capital ratio	13.115	13.419	13.283	13.108	13.016	13.084	13.306	13.665	15.113	15.868
LLPR, %	Loan loss provisions ratio	3.260	3.470	3.590	3.662	3.904	4.056	4.228	4.238	4.251	4.319
RWATOTASS, %	Risk-weighted assets to total assets	55.435	56.131	56.776	56.836	57.187	57.329	57.188	56.353	56.904	57.776
STD3M	Standard deviation of three-month Euribor	0.154	0.192	0.084	0.331	0.585	0.530	0.148	0.248	0.046	0.112
SLOPE, %	Difference between ten-year government bond yield and three-month Euribor	2.939	2.173	1.118	1.725	1.158	0.800	1.634	1.796	1.982	0.652
STD10Y	Standard deviation of ten-year government bond yield	0.247	0.145	0.378	0.591	0.151	0.200	0.320	0.263	0.213	0.233
CROSSIRR3	Interaction between LLPR and STD3M	0.005	0.007	0.003	0.012	0.023	0.022	0.006	0.010	0.002	0.005
CROSSIRRS	Interaction between LLPR and SLOPE	0.096	0.075	0.040	0.063	0.045	0.032	0.069	0.076	0.084	0.028
CROSSIRR10	Interaction between LLPR and STD10Y	0.008	0.005	0.014	0.022	0.006	0.008	0.014	0.011	0.009	0.010
CROSSIRR3RWA	Interaction between RWA and STD3M	0.085	0.108	0.048	0.188	0.335	0.304	0.085	0.139	0.026	0.065
ASO, EUR	Average size of customer loans	17,272	18,154	19,623	20,935	22,158	23,420	25,458	26,234	27,471	28,685
DIV, %	Herfindahl index of loan portfolio	..	1.993	2.097	2.240	2.281	2.254	2.285	2.474	2.537	2.432
CIR, %	Cost/income ratio	66.636	68.812	70.553	70.059	64.676	67.632	68.396	69.985	70.858	68.867
SIZE, %	Market share	0.013	0.013	0.012	0.013	0.013	0.013	0.014	0.014	0.014	0.013
FCL, %	Share of foreign currency loans to customers	0.185	0.610	2.980	5.548	7.638	9.208	10.347	11.035	12.076	12.735
NONINTREV, %	Noninterest revenues to total assets	0.952	0.997	1.019	1.071	1.143	1.076	1.108	1.077	1.048	1.107
NONINTREV2, %	Noninterest revenues to total revenues	23.881	25.768	27.812	30.719	29.683	30.268	32.346	33.208	33.805	36.243
IIP, %	Fee income on credit operations to total assets	0.022	0.020	0.019	0.019	0.019	0.019	0.021	0.023	0.021	0.020
RLBLOANS, %	Share of lower-volume loans	43.988	44.444	45.147	44.656	44.904	43.663	45.438	43.914	43.864	42.659
GDP_TREND, %	Difference between a year's GDP growth rate and its mean over all years	0.515	−0.285	1.515	1.215	1.315	−1.285	−1.085	−0.685	0.315	−0.185

Source: OeNB, Thomson Financial.

tion of the loan portfolio (DIV) and banks' regulatory capital ratio (RAV) climbed at a similar rate. As already hinted above, the share of foreign currency loans (FCL) rose sharply over the last decade. During this time period, noninterest revenue (NONINTREV) also significantly gained in importance for the median bank, accounting for 36% of all revenues which corresponds to a 52% increase within the sample period (NONINTREV2). The importance of relationship banking loans (RLBLOANS), however, has decreased slightly, especially since 2002.

5 Results

The second column of table 2 shows the estimation results for our reference model (model (1)). To check for the robustness of these results, models using alternative variable definitions (models (2) to (5)) were estimated, too. Model (2) uses the ratio of risk-weighted assets to total assets instead of LLPR as a proxy for credit risk. Models (3) and (4) use different definitions for interest rate risk – the slope of the term structure and the standard deviation of ten-year government bond yields, respectively; model (5) replaces the ratio of noninterest revenues to total assets (NONINTREV) of the base model by the proportion of noninterest revenue in all bank revenues. Econometrically, the null hypothesis of second-order autocorrelation in the first-differenced residuals can be rejected at common inference levels in all our models.

Turning toward the results of our reference model, we can first of all

see that the coefficient of the lagged dependent variable has a significant positive sign and a value of roughly 0.4, which indicates some degree of market imperfections. The presence of market imperfections is also borne out by our estimates for the Lerner index (see table 1) and the fact that the operating cost coefficient takes on significantly positive values.

Relating our results to the predictions of the theoretical margin model, the Lerner index, operating costs, risk aversion and interest rate risk are significant and display the expected positive signs, i.e. the lower competition and the higher average operating costs, risk aversion and interest rate risk the higher is a bank's IRM. These findings are in line with those of Maudos and Fernández de Guevara (2004). In contrast to the theoretical predictions (as well as to e.g. the results of Maudos and Fernández de Guevara, 2004) credit risk has no significant effect on the IRM.[11] The average size of operations and the co-movement of interest rate and credit risk have no significant impact on the IRM, either.

In terms of our control variables, the extent of relationship banking wields a significant positive influence on interest rate margins. This, however, is surprising given earlier results on this topic e.g. by Ergungor (2005), who finds no effect of relationship banking on bank IRM. Our results, on the contrary, show that an increase in the share of relationship banking loans to total loans by one percent drives up a bank's IRM by more than 2 basis points in the subsequent period and by roughly 4 basis points in

---

[11] This finding, however, is consistent with the conclusion presented by Jäger and Redak (2006) that Austrian banks did not sufficiently price credit risk in the past.

Table 2

Determinants of Interest Rate Margins, 1996–2005 [1]

Dependent variable: Net interest margin (NIM)

	Reference model (1) Coefficient		(2) Coefficient		(3) Coefficient		(4) Coefficient		(5) Coefficient	
IRM t-1	0.4084	***	0.4132	***	0.3931	***	0.3992	***	0.3790	***
LERNER	0.0062	***	0.0057	***	0.0245	***	0.0129	***	0.0038	**
OPC	0.2118	**	0.2051	**	0.2114	**	0.2029	**	0.0965	**
RAV	0.0016	**	0.0023	***	0.0015	**	0.0013	**	0.0017	**
LLPR	−0.0039		−		−0.0028		−0.0013		0.0010	
STD3M	0.3018	***	0.2154		−		−		0.2477	***
CROSSIRR3	−0.8552		−		−		−		−0.2934	
ASO	2.20e−08		4.10e−08		1.43e−08		3.83e−09		−3.85e−08	
DIV	0.0003		0.0005		0.0004		0.0004		0.0004	
CIR	−0.0093	*	−0.0094	*	−0.0097	*	−0.0087	*	−0.0124	***
SIZE	−0.0396	***	−0.0290	*	−0.0447	***	−0.0421	***	−0.0354	**
FCL	−0.0065	***	−0.0064	***	−0.0069	***	−0.0029	**	−0.0059	***
NONINTREV	−0.2018	**	−0.1990	**	−0.2030	**	−0.1952	**	−	
IIP	−0.1718		−0.1792		−0.1737		−0.1808		−0.2280	
RLBLOANS	0.0240	***	0.0210	***	0.0220	***	0.0250	***	0.0215	***
GDP_TREND	0.0217	***	0.0216	**	0.0408	***	0.0463	***	0.0208	**
CONSTANT	−0.0001		−0.0001		0.0002	**	−0.0001		−7.91e−07	
RWATOTASS	−		0.0081		−		−		−	
CROSSIRR3RWA	−		0.0795		−		−		−	
SLOPE	−		−		0.0875	***	−		−	
CROSSIRRS					−0.3021					
STD10Y	−		−		−		−0.4185	***	−	
CROSSIRR10	−		−		−		−0.9378		−	
NONINTREV2	−		−		−		−		−0.0219	***
Number of observations	6,480		6,480		6,480		6,480		6,480	
Number of groups	903		903		903		903		903	
AR(2) [2]	0.4834		0.5112		0.1024		0.2169		0.7062	

Source: OeNB, Thomson Financial.

*Note: ***, **, * indicate significance at the 1%, 5% and 10% level.*

[1] *By using first differences and including the lagged dependent variable, two years − i.e. 1,806 out of the original 8,286 observations − are lost.*

[2] *p-value of the test whether the average autocovariance in residuals of order 2 is 0.*

the long run. At least for Austrian banks, relationship banking enables banks to charge higher margins. Furthermore, our results show that good bank management reduces interest margins, i.e. more efficient banks are apparently able to operate with lower margins than their badly managed counterparts.

Margins also significantly decrease as shares of foreign currency lending and noninterest revenues go up. Although the coefficient is small, the negative impact of foreign currency lending could hinge on the pricing difference these loans exhibit compared with euro-denominated loans. While euro-denominated loans are usually refinanced at least in parts with deposits in the same currency, foreign currency loans are in general refinanced on the interbank market with a mark-up on interbank rates which contributes to interest income. Furthermore, anecdotic evidence suggests that competition in the foreign currency loans market is particularly high as credit intermediaries are strongly involved in the marketing of foreign currency loans. Additionally, foreign currency loans, which are usually bullet loans, involve the sale of a repayment vehicle (life insurance or investment fund) which

offers the possibility of cross subsidies between interest payment and noninterest revenues. This reasoning might also drive the influence of noninterest revenues on bank margins. Since investment funds and pension products are quickly gaining popularity in Austria (see e.g. Ittner and Schwaiger, 2006), the increasing possibility to cross-sell investment or insurance products to loan holders could justify lower margins for banks. Alternatively, the literature also offers income diversification as a reason why risk-averse banks may reduce their margins as they are able to spread risks across several sources of revenues (see e.g. Stiroh, 2004, or Elsas et al., 2006). A look at model (5) indeed suggests that an increase in the share of noninterest revenues in total revenues by 1 percentage point decreases the interest rate margin of a bank by more than 2 basis points in the next period and by roughly 3.7 basis points in the long run.

Our results show, furthermore, that bank size has a significantly negative influence on IRM, whereas GDP growth apparently has a significant positive impact. Implicit interest payments do not have a significant effect on IRM. The results of our reference model are confirmed by the robustness checks we perform in models (2) to (5). The coefficient of interest rate risk is the only major exception. While the slope of the term structure of the interest rate underpins the results based on the standard deviation of three-month interbank rates, replacing the standard deviation of short-term interbank rates by the standard deviation of ten-year government bond yields leads to a change of sign in the interest rate risk coefficient. Since the standard deviations of ten-year government bond yields and

interbank rates obviously behave very differently (see also table 1), this result should not be surprising.

Returning to the initial question of the reasons for the sharp decline of Austrian banks' IRM over the last decade, we now attempt to isolate the most important driving forces. To this end, we may, for example, combine the changes in the median levels of our model variables (see table 1) with the estimated coefficients of the reference model. The result we thus gain shows that the three most important reasons for the decline in margins over the last decade have been the *fall in operating costs*, the *increase in foreign currency lending* and the *increase in competition*. Although the coefficient of foreign currency lending and the Lerner index are small, the change in these variables over the past ten years makes them important drivers of IRM reductions. The increase in noninterest revenues as well as the reduction in relationship banking should, however, not go unmentioned in this respect, either.

6 Summary

Throughout the EU-25, bank interest rate margins (IRM) have been on the decline over the last decade. Austria is no exception in this regard. Based on the theoretical model of Maudos and Fernández de Guevara (2004), we identify the driving factors behind the dynamics of bank IRM. In fact, the marked reduction of Austrian banks' IRM since 1996 can mainly be attributed to decreasing operating costs, increasing foreign currency loans and rising competition. The growing importance of noninterest revenues and a reduction in the extent of relationship banking drove margins further downward. In this respect, we complement the litera-

ture on relationship banking by documenting that relationship banking enables Austrian banks to charge higher margins.

From a financial stability perspective, the reasons behind the margin decrease therefore predominantly emanate from the micro level. The past evolution of the drivers of banks' IRM does not suggest that pressures on margins will ease in the future. To avoid risk-shifting problems, banks therefore certainly face the challenge to compensate the decreasing profitability of their interest rate business with noninterest revenues.

References

Angbazo, L. 1997. Commercial Bank Net Interest Margins, Default Risk, Interest-Rate Risk, and Off-Balance Sheet Banking. In: Journal of Banking and Finance 21. 55–87.

Angelini, P. and N. Cetorelli. 2003. The Effects of Regulatory Reform on Competition in the Banking Industry. In: Journal of Money, Credit, and Banking 35(5). 663–684.

Allen, L. 1988. The Determinants of Bank Interest Margins: A Note. In: Journal of Financial and Quantitative Analysis 23(2). 231–235.

Arellano, M. and S. Bond. 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. In: Review of Economic Studies 58(2). 277–297.

Arpa, M., I. Giulini, A. Ittner and F. Pauer. 2001. The Influence of Macroeconomic Developments on Austrian Banks: Implications for Banking Supervision. In: BIS Paper 1. 91–116.

Athanasoglou, P., S. Brissimis and M. Delis. 2005. Bank-Specific, Industry-Specific and Macroeconomic Determinants of Bank Profitability. Working Paper Series Bank of Greece 25.

Bikker, J. and H. Hu. 2002. Cyclical Patterns in Profits, Provisioning and Lending of Banks and Procyclicality of the New Basel Capital Requirements. In: Banca Nazionale del Lavoro Quarterly Review 55. 143–175.

Boot, A. 2000. Relationship Banking: What Do We Know? In: Journal of Financial Intermediation 9. 7–25.

Crespo Cuaresma, J. and A. Gschwandtner. 2006. The Competitive Environment Hypothesis Revisited: Non-Linearity, Nonstationarity and Profit Persistence. In: Applied Economics 38. 465–472.

Demirgüc-Kunt, A. and H. Huizinga. 1998. Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence. Working Paper.

Elsas, R. 2005. Empirical Determinants of Relationship Lending. In: Journal of Economics & Business 14. 32–57.

Elsas, R., A. Hackethal and M. Holzhäuser. 2006. The Anatomy of Bank Diversification. Working Paper.

Ergungor, E. 2005. The Profitability of Bank-Borrower Relationships. In: Journal of Financial Intermediation 14. 485–512.

ECB – European Central Bank. 2000. EU Banks' Margins and Credit Standards. ECB Working Paper. December.

ECB – European Central Bank. 2006a. Financial Stability Review. June.

ECB – European Central Bank. 2006b. Report on differences in MFI interest rates across Euro area countries. ECB Working Paper.

Goddard, J., P. Molyneux and J. Wilson. 2004. The Profitability of European Banks: A Cross-Sectional and Dynamic Panel Analysis. In: The Manchester School 72(3). 363–381.

Hahn, F. 2005a. Testing for Profitability and Contestability in Banking. WIFO Working Papers 261/2005.

Hahn, F. 2005b. Determinants of Bank Profitability in Austria. A Micro-Macro Approach. WIFO Monograhpien 7/2005.

Ho, T. and A. Saunders. 1981. The Determinants of Bank Interest Margins: Theory and Empirical Evidence. In: Journal of Financial and Quantitative Analysis 16(4). 581–600.

Ittner, A. and M. S. Schwaiger. 2006. Disintermediation und die Rolle von Banken in Österreich. Bankarchiv 3/2006. 1–14.

Jäger, J. and V. Redak. 2006. Austrian Banks' Lending and Loan Pricing Strategies against the Background of Basel II. In: Financial Stability Report 12. Vienna: Oesterreichische Nationalbank.

Leaven, L. and G. Majnoni. 2005. Does Judicial Efficiency Lower the Cost of Credit? In: Journal of Banking and Finance 29. 1791–1812.

Maddala, G. and S. Wu. 1999. A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test. Oxford Bulletin of Economics and Statistics 61. 631–652.

Maudos, J. and J. Fernández de Guevara. 2004. Factors Explaining the Interest Margin in the Banking Sectors of the European Union. In: Journal of Banking and Finance 28. 2259–2281.

McShane, R. and I. Sharpe. 1985. A Time Series/Cross Section Analysis of the Determinants of Australian Trading Bank Loan/Deposit Interest Margins: 1962–1981. In: Journal of Banking and Finance 9(1). 115–136.

Rossi S., M. S. Schwaiger and G. Winkler. 2006. Does Diversification Impact the Managerial Behaviour of Banks? Working Paper.

Saunders, A. and L. Schumacher. 2000. The Determinants of Bank Interest Rate Margins: An International Study. In: Journal of International Money and Finance 19. 813–832.

Stiroh, K. 2004. Diversification in Banking: Is Noninterest Income the Answer? In: Journal of Money, Credit, and Banking 36(5). 853–882.

Thakor, A. 2000. Relationship Banking. In: Journal of Financial Intermediation 9. 3–5.