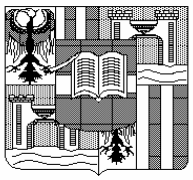

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JOHANNES KEPLER UNIVERSITY OF LINZ

The cyclicality of interest rate spreads in Austria: Evidence for a financial decelerator?

by

Johann Burgstaller

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Johannes Kepler University of Linz
Department of Economics
Altenberger Strasse 69
A-4040 Linz - Auhof, Austria
www.econ.jku.at

johann.burgstaller@jku.at
phone +43 (0)70 2468 - 8706, - 28706 (fax)

The cyclicality of interest rate spreads in Austria: Evidence for a financial decelerator?

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Johann Burgstaller *
Johannes Kepler University Linz

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Abstract: This study explores an important aspect of how the Austrian banking sector contributes to the propagation of aggregate shocks. Time series data for the 1995-2003 period are applied to examine the cyclical variations in interest rate spreads. Differentials between interest rates on loans and savings are not found to shrink in economic upturns, so there is no financial mechanism emanating from bank markups that would entail an amplification of macroeconomic fluctuations. But also the evidence for Austrian banks dampening the business cycle (a financial de-celerator) is not striking as the increases of interest rate spreads after shocks in the growth rate of real GDP are practically small.

Keywords: Interest rate spreads, business cycles, financial accelerator, impulse response analysis.

JEL classification: E 32, G 21.

*Johannes Kepler University, Department of Economics, Altenberger Str. 69, A-4040 Linz, Austria.
Phone: +43 70 2468 8706, Fax: +43 70 2468 28706, E-mail: johann.burgstaller@jku.at.
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1 Introduction

Cyclical variations of price-cost margins in goods markets have received considerable attention as they represent an important channel through which aggregate shocks are propagated. Several authors argue for shrinking markups in economic upturns. Countercyclical collusion - oligopolists behave more competitively in periods of high demand - is the rationale in Rotemberg and Saloner (1986) and Rotemberg and Woodford (1991, 1992). Chevalier and Scharfstein (1995, 1996), on the other hand, argue that capital-market imperfections (liquidity constraints) lead to varying markups over the business cycle. In recessions, firms have low cash flow and more difficulties to raise external funds, so they try to boost current profits (by raising prices) to meet their liabilities and finance investment.[1] As a third reason for countercyclical markups of price over marginal cost, Chevalier and Scharfstein (1996) quote procyclical demand elasticities. Imperfectly competitive firms therefore raise markups in recessions. The empirical evidence on the issue, however, is mixed.[2]

Comparable analyses of markups in the banking industry are scarce. This is surprising, having in mind the enormous relevance of loans in corporate financing. A somewhat related strand of the literature emphasizes the cyclicality of "markups" in firms' external financing conditions as a propagation channel of real and monetary shocks. The financial accelerator hypothesis (Bernanke, Gertler and Gilchrist 1996) argues that the external finance premium (the wegde between the cost of funds raised externally and the opportunity cost of funds raised internally) changes endogenously with aggregate fluctuations. As the financial position of borrowers moves procyclically, the agency cost premium in external financing shrinks in economic upturns and provokes an amplification of macroeconomic fluctuations through its effects on the spending decisions of borrowers. In empirical applications, the external finance premium is mostly measured by the yield difference of corporate and government bonds. Many authors examine its predictive power for macroeconomic fluctuations (Gertler and Lown 1999, de Bondt 2004, Mody and Taylor 2004).

Movements in interest rate spreads can be related to arguments of both parts of the literature as there are spreads that may be understood as banking markups or external finance premiums. Additionally, spending decisions of households over the cycle may be affected by endogenous variations in spreads between interest rates on consumer credit and deposits. The common empirical literature on bank "markups" has two attributes. First, mainly ex-post measures are analyzed (for panels of banks or banking sectors), like the net interest margin (net interest income divided by total or interest-earning assets) and implicit spreads (average lending less average borrowing rates) calculated by using data from bank income statements and balance sheets. Compared to (ex-ante) spreads involving contractual retail interest rates, these measures have severe drawbacks as proxies for financing conditions of firms and households as they do not solely represent price (interest rate) developments. Among other things, variations in balance-sheet volumes and structure (changes in the sources of interest income and expenses or even between different kinds of credit, for example) as well as nonperforming loans can make it hard to tell why margins actually rose or fell. Ex-ante spreads

are rarely analyzed. Exceptions are Dueker and Thornton (1997) and Corvoisier and Gropp (2002), whose findings point to spreads moving countercyclically. Second, some authors apply GDP (growth) or another measure of aggregate demand as a control variable, but the results are generally not related to the cyclicality literature.[3] The grand exception is Dueker and Thornton (1997). Their model with capital market frictions (i.c. switching costs) predicts that a risk-averse and profit-smoothing bank management sets a countercyclical markup of lending rates over the cost of funds.

In this paper, the cyclical behavior of quarterly Austrian interest rate spreads over the period 1995-2003 is analyzed. Compared with the previous literature on bank margins and spreads, this involves the following advantages. As we calculate spreads from contractual interest rates, they are almost (as also other conditions in loan and deposit contracts may change) immediately interpretable as bank markups and financing premiums. The use of quarterly data enables a genuine examination of bank markup cyclicality because short-term cycles are not hidden as in the numerous analyses of yearly panel data. On the other hand, there is no need to search for proxy variables of the business cycle as with higher-frequency data (as in Dueker and Thornton 1997). Unless the single-equation models of most studies, our methodological framework addresses simultaneity and identification issues. Examining the relations for a single country a priori precludes cross-country differences to perturb the results in an unintended way.

Austria is a perfect candidate to be analyzed because of the strong bank dependence in external corporate financing and because the conduct of the Austrian banking sector is sometimes presumed dampening the business cycle. Braumann (2004) argues that a long-time state influence, liquidity-providing bank networks, the high share of non-profit banks and the maintenance of pronounced bank-customer relationships led the Austrian banking sector to even contribute to a financial *decelerator* in the past. According to the notion that a financial accelerator should be associated with narrowing spreads when credit growth is high, he shows that, for the difference between loan and deposit interest rates, the opposite is the case in Austria.[4] Our findings confirm Braumann (2004) as the examined interest rate spreads rise in economic upturns. While this, in principle, is against a financial accelerator mechanism pertinent to the Austrian banking sector, responses of interest rate spreads to shocks in GDP growth turn out to be practically small and statistically insignificant in most cases.

The rest of the article is organized as follows. Section 2 contains a review of the empirical literature on the cyclical behavior of interest rate spreads and the determinants of net interest margins and spreads. Details about the data are to be found in section 3, and section 4 describes the methods used. Our results are reported in section 5, and section 6 concludes.

2 Literature review

Dueker and Thornton (1997) examine the differential between the prime lending rate and the rate on 180-day certificates of deposit as an aggregate loan markup in the U.S. banking industry. As

the corresponding data (for the 1973-1993 period) is weekly, common business cycle indicators do not apply. By using the spread between the commercial paper rate and the Treasury bill rate as an alternative measure, they find evidence for a countercyclical behavior of the loan markup. The theoretical reasoning provided is that because of switching costs, banks have some market power over their customers. For the bank, a trade-off emerges between enlarging its market share and monopoly pricing of the existing customer base, and the business cycle affects this trade-off if banks prefer smooth profit streams. For either this reason, or because of the adverse selection of loan applicants they would face otherwise, banks opt for relatively high markups in cyclical downturns instead of a larger market share. Dueker and Thornton (1997) conclude that by mitigating these capital market imperfections an attenuation of business cycles would be possible.

Also the results of Corvoisier and Gropp (2002) point to countercyclicality of interest spreads. With yearly data (1995-1999) on contractual interest rates from 11 euro area countries, they study the determinants of lending spreads (lending rates less a money market rate) and deposit spreads (the money market rate less the respective deposit rate). As higher producer confidence lowers deposit spreads and higher consumer confidence lowers loan spreads, their results suggest a countercyclical behavior of the loan-deposit rate differential.[5]

There is an extensive literature on the (empirical) bank or banking-sector related determinants of interest spreads. A popular starting point is the so-called dealership model of Ho and Saunders (1981) in which banks are seen as dynamic dealers in loans and deposits. According to this theory, the demand for loans and the supply of deposits arrive asynchronously at random time intervals. For every planning period, the representative (risk-averse) bank selects optimal loan and deposit rates which should minimize the risks of excessive demand for loans or insufficient supply of deposits (Angbazo 1997). As emerging from the theoretical model, the main determinants of the optimal differential between the loan and deposit rate are the extent of competition in the markets, the interest rate risk to which the bank is exposed, the degree of risk aversion of the bank management and the size of bank transactions. Several authors have extended the basic framework of the dealership model, including Allen (1988) who introduced different types of bank products and Angbazo (1997) who added credit default risk as an additional explanatory factor. Another model of the interest rate spread is provided by the firm-theoretical approach explored in, for example, Wong (1997). In this (static) setting, loan and deposit markets are simultaneously cleared by demand and supply adjustments.[6] Although the model of Wong (1997) yields implications which are quite similar to those from the dealership model, some additional explanatory factors emerge, as regulation, operating costs and equity capital.

In empirical analyses, the preferred measures to be explained are not interest rate spreads but net interest margins (NIM, net interest income divided by total or earning assets) as used in e.g. Angbazo (1997), Demirgüç-Kunt and Huizinga (1999), Saunders and Schumacher (2000), Maudos and de Guevara (2004) and Gischer and Jüttner (2003). Returns on assets (ROA) or equity (ROE) make up the dependent variable in Goddard, Molyneux and Wilson (2004), Chirwa (2003), but also in Demirgüç-Kunt and Huizinga (1999) and Gischer and Jüttner (2003). Furthermore, most empirical

studies have applied annual panel data for banks or countries' banking sectors. As a consequence, their results cannot be directly compared to the ones we will report in section 5. The determinants of interest margins from these articles shall nevertheless be quoted in the next paragraphs, as they will be used as control variables in our analysis.[7]

According to the structure performance hypothesis, an increase in banking sector concentration leads, through lower costs of collusion, to an extraction of rents via higher interest spreads. On the other hand, the efficient structure hypothesis proposes a negative relation, because the increase in concentration is due to the growth of the most efficient banks (having lower spreads) or these banks taking over the less efficient ones (Corvoisier and Gropp 2002). The share of the top 3 banks in total assets is found to positively affect the ROA in Demirgüç-Kunt and Huizinga (1999), whereas the individual bank's market share and the ROE are negatively related in Goddard et al. (2004).[8] Herfindahl indices (the sum of squared market shares) also reflect changes in the market structure between smaller banks. A positive relation is found by Corvoisier and Gropp (2002) to the difference between contractual lending rates and money market rates, and a negative one for some differentials calculated with deposit rates (money market less deposit rates).

The generation of non-interest income, reflecting the importance of fee-based services, is supposed to occur partly at the expense of interest income (Bikker and Haaf 2002). Indeed, Demirgüç-Kunt, Laeven and Levine (2004) find a negative relation to net interest margins, and Bikker and Haaf (2002) observe that the interest income, relative to total assets, shrinks following increases in other income. Rising operating costs (overheads) are passed on to the customers in the form of higher margins according to Demirgüç-Kunt and Huizinga (1999) who observe a positive relation of margins to the operating-expense ratio (the share of operating expenses in total assets). Maudos and de Guevara (2004) argue that the cost-income ratio (operating costs divided by total income) represents the quality of management in selecting highly profitable assets and low-cost liabilities. With increasing management quality in this sense, lower operating costs are required in order to generate one unit of income, hence margins are supposed to be higher. Maudos and de Guevara (2004) find the cost-income ratio to be highly negatively significant for the net interest margin.

The equity ratio is usually supposed to measure the risk aversion of banks. According to this reasoning, banks want to be highly capitalized and, on account of this, lend more prudentially. Consequently, interest income could become lower, via lower-risk lending with lower interest rates. However, more infrequently occuring loan defaults counteract this effect. A high equity ratio might be an indication of banks operating over-cautiously, ignoring potentially profitable diversification or other opportunities (Goddard et al. 2004). Another view, also leading to propose a negative relation of the equity ratio with interest margins, is that a reduction of the equity share means that the insolvency risk increases. Shareholders therefore demand higher returns and banks increase their interest margins to compensate them accordingly. Opposed arguments highlight that high equity capital stocks increase the average cost of capital. Maudos and de Guevara (2004) accentuate the role of equity capital to insulate banks from expected and unexpected (credit) risk. As holding equity

capital is relatively costly compared to debt (because of tax and dilution of control reasons), banks with high capital ratios for regulatory or credit reasons seek to recover some of these costs in the form of higher net interest margins (Saunders and Schumacher 2000, Angbazo 1997, Drakos 2003). Some theories also suggest that well-capitalized banks face lower expected bankruptcy costs and hence may have lower funding costs. According to this view, higher bank equity ratios imply larger net interest margins when loan rates vary only slightly with bank equity (Demirgüç-Kunt et al. 2004). A positive relation of the equity ratio to interest margins and profits is found in Demirgüç-Kunt and Huizinga (1999), Saunders and Schumacher (2000), Maudos and de Guevara (2004), Angbazo (1997), as well as in Drakos (2003). The influence of the capital ratio on the ROE is negative in Goddard et al. (2004), illustrating that banks that take more risk have higher profits, which is in accordance with portfolio theory. However, in view of the regulations on minimum equity, results obtained using the equity ratio as a measure of risk aversion should be interpreted with caution (Maudos and de Guevara 2004).

The implicit taxation associated with reserve and liquidity requirements is also an often-proposed determinant of interest margins and spreads. Measures of liquidity used in the literature differ by which items they include (cash, central bank balances, interbank claims). If more assets are to be held in cash, reserves or liquid assets, interest income goes down because of the lower risk of and lower interest rates on these assets. However, banks may like to restore interest income by passing the respective losses in interest income on to their customers in the form of higher margins. The first (negative) effect is found in Demirgüç-Kunt and Huizinga (1999) for reserves divided by total deposits. Cash and due (used as a proxy for reserves) is positively related to the NIM in Maudos and de Guevara (2004). The share of loans in total assets is often also understood as an illiquidity measure or, if data on loan loss provisions is unavailable, as a proxy for credit risk (Maudos and de Guevara 2004). Besides illiquidity and risk premiums, a higher loan ratio should be associated with higher interest margins because loans are the interest-bearing assets with the highest rates. The empirical relation to the NIM is mostly found to be positive (Demirgüç-Kunt and Huizinga 1999, Chirwa 2003, Maudos and de Guevara 2004). However, Demirgüç-Kunt and Huizinga (1999) report a negative relation to the return on assets.

Also the importance of the banking sector or, respectively, the structure of the financial system is supposed to have an influence on interest margins, spreads and banking profits. Demirgüç-Kunt and Huizinga (1999) find a negative relation of the ratio of bank assets to GDP with the NIM and the ROA, supposed to reflect more intense interbank competition in countries with larger markets. The same variable has a positive effect on interest rate differentials in Corvoisier and Gropp (2002). A positive effect on the NIM is found for the ratio of stock market capitalization to GDP in Demirgüç-Kunt and Huizinga (1999), supporting a complementary relation between stock market and bank finance (but they also report a negative influence of stock market capitalization to banking assets). Ex-ante interest rate differentials seem to be negatively affected by stock market capitalization to GDP (Corvoisier and Gropp 2002). Implicit interest payments (IIP, appearing also in Ho and Saunders

1981 and Angbazo 1997) are a measure for "free" banking services that are offered instead of explicitly charging extra interest on deposits (Maudos and de Guevara 2004). However, for these services banks could not only charge through a lower remuneration of liabilities, but also via higher lending rates or both. The effect of a rise in IIP is found to be indeed positive on the NIM in Saunders and Schumacher (2000) and Maudos and de Guevara (2004). The reason for this is that the trend towards more explicit pricing of services (by fees and commissions) has reduced the IIP and therefore reduced margins.

Some macroeconomic determinants of banks' interest margins and profits shall also be discussed. Daily or weekly interest rates are often used to calculate measures of interest rate volatility and the associated risk. Effects on the net interest margin are typically positive (Saunders and Schumacher 2000, Maudos and de Guevara 2004). Although GDP per capita (as a measure of economic development, but also banking technology) is found to have no statistically significant relation to the NIM in Demirgüç-Kunt and Huizinga (1999), the ROA increases with GDP per capita. Using real GDP growth as a demand side indicator, Goddard et al. (2004) find a positive relation to the return on equity. GDP growth is insignificant in Demirgüç-Kunt and Huizinga (1999), but negatively associated with the net interest margin in Demirgüç-Kunt et al. (2004). Other potential determinants (not used as often) in net interest margin and profitability regressions are, for example, the importance of off-balance-sheet business (Goddard et al. 2004), the ratio of non-interest-earning to total assets (Saunders and Schumacher 2000), the inflation rate (Demirgüç-Kunt and Huizinga 1999), the share of problem loans (Corvoisier and Gropp 2002), and the real interest rate (Demirgüç-Kunt and Huizinga 1999). Bank size is also an issue because of economies of scale, but its supposed positive effect may be partially offset by greater ability to diversify resulting in lower risk and a lower required return (Chirwa 2003). Nevertheless, a positive relation to the NIM is found by Demirgüç-Kunt and Huizinga (1999). In cross-country studies other factors still play a role, such as whether there is a deposit insurance scheme, the explicit taxation of the banking sector, (interest rate) regulation, as well as legal and institutional factors. Across banks, it might be of significance whether a bank is state-owned or foreign.

3 Data issues and variable selection

3.1 Remarks on the data and recent developments in Austrian banking

Retail rates used in calculating interest rate spreads come from the national interest rate statistics and were, in this form, compiled from 1995 until June 2003 (see appendix A for detailed information about the data used in this study). Data on profit and loss account items for the Austrian banking sector comes from quarterly bank reports and balance sheet data from monthly balance sheet reports (almost all banks operating in Austria have to report on the legal basis of the Austrian Banking Act). In general (exceptions as indicated in appendix A), the data source is the Austrian Central Bank (the

Oesterreichische Nationalbank, OeNB), and the sample period ranges from the first quarter of 1995 to the second quarter of 2003.

In the last 20 years, the Austrian banking sector has undergone some large structural changes (see also Ali and Gstach 2000, Braumann 2004 and Waschiczek 2005). The most important structural break from deregulation occured in 1994, when Austria joined the European Economic Area (EEA). It is common opinion that the associated removal of entry barriers (freedom of establishment)[9] had substantial effects on bank profitability. Additional changes were, for example, the abolition of the anchor or central interest rate for deposit rates, the implementation of Stage III of the European Monetary Union, changes in capital requirements, financial (technological) innovations, as well as an altered ownership structure of banks (privatization of public sector stakes in Austrian banks, associated with more foreign ownership). Waschiczek (2005) describes the observable disintermediation trend as a process which is driven mainly by enterprises making use of expanded financing options (corporate bonds, share issues, venture capital), but not by a more restrictive corporate sector lending of banks or changes in the investment decisions of households. While the relative importance of bank intermediation has declined, the competitive pressure of euro area banks has remained fairly low to date relating to the physical presence of these banks on the Austrian market (Waschiczek 2005). However, the *potential* increase in competition (due to entry threat) is also important. Gischer and Jüttner (2003) argue that competition in the banking sector is of an increasingly global nature, above all, in wholesale markets, the trading business, as well as in debt securities and share markets. Loans and deposits are not concerned that much because local ties between banks and their customers are important. A higher degree of competition in banking should, via lower monopoly power and an incentive to reduce costs, lead to the reduction of prices with positive effects on investment, growth and welfare (Weill 2004). Waschiczek (2005) lists increased activity in mergers and acquisitions, the cutting of resources and the increased business activities in Central and Eastern European (CEE) countries as the strategic responses of Austrian banks to these changing conditions.

For selected years, Table 1 shows the percentage division of assets and liabilities of the Austrian banking sector (domestic and foreign assets are separated). On the assets side, it can be seen that the shares of cash and central bank balances, interbank claims and loans (despite the rising share of loans to foreign non-banks) have decreased over time. On the other hand, the share of foreign securities and participations increased from 2.5 (1995) to 10 percent (2003). The liabilities side of the balance sheet displays a sharp decrease in non-bank deposits at the expense of foreign issues of secured debt. Structural changes and the subsequent reactions of the Austrian banking sector also guided the variable selection process. The loan ratio, which has been declining at the expense of securities and participations, displays some of the consequences of deregulation and liberalization. Other examples include changes in concentration and openness of the banking sector, as well as an increased relevance of non-interest income. The latter is partly due to the accelerated competition in the interest business from the mid-1990s on, the fact that Austrian firm have increasingly sought non-bank finance and households' heightened investment via capital market instruments.

Table 1: Shares in the total banking sector balance sheet[a]

Balance sheet items	1995	2000	2003
Assets			
Cash and central bank balances	1.6	1.1	1.0
Domestic interbank claims	16.3	17.7	15.8
Loans to domestic non-banks	45.1	38.7	39.7
Domestic securities and participations	12.7	12.1	11.3
Foreign interbank claims	13.4	10.2	10.8
Loans to foreign non-banks	5.0	7.7	8.0
Foreign securities and participations	2.5	9.2	10.0
Liabilities			
Domestic interbank liabilities	17.4	19.1	17.1
Domestic non-bank deposits	38.4	31.0	33.0
Domestic issues of secured debt	13.1	11.2	11.5
Domestic equity capital	4.5	4.5	4.8
Foreign interbank liabilities	12.0	16.0	12.5
Foreign non-bank deposits	5.2	5.2	4.9
Foreign issues of secured debt	4.8	9.1	11.6
Foreign equity capital	0.1	0.1	0.3

[a] Calculations are based on averages of the reported monthly (end-of-month) stocks.

3.2 Interest spreads

Retail interest spreads are ex-ante measures of bank behavior and performance. The main attention will be paid to differences between contractual rates charged on loans and rates paid on deposits (both relating to new business). Due to a comparatively higher correlation with all the lending rates, the loan-deposit spreads are calculated via the the longer-term deposit rate (which is simply termed savings rate in the remainder of the paper). Nevertheless, we will also examine the spreads of lending rates (on commercial, consumer, housing, hypothecary and municipal loans) over the cost of funds in the debt market (the cost of issuing debt, which is proxied by the secondary market yield of bonds issued by Austrian banks). These measures will be called lending rate premiums because they can be interpreted as external bank finance premiums if we assume that bond yields represent the firms' opportunity cost of internally generated funds and that yields of bank bonds evolve similarly to other bond yields. Results for spreads of lending and deposit rates (savings deposits with an agreed maturity of up to or over 12 months) over the cost of borrowing from the central bank or in the interbank market will not be reported.[10] Figure 1 exemplarily shows the development of the commercial credit rate spreads over time. Table 2 shows descriptive statistics for the interest rate spreads and premiums.

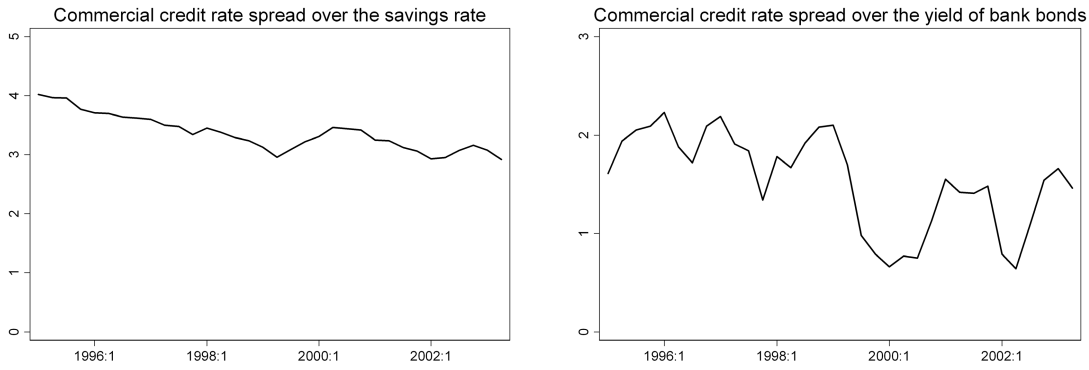

Figure 1: Spread and premium of the commercial credit interest rate

Table 2: Descriptive statistics of interest rate spreads

Variable	Mean	Std.Dev.	Minimum	Maximum
Commercial credit spread	3.37	0.31	2.92	4.02
Consumer credit spread	4.45	0.48	3.85	5.57
Housing credit spread	2.96	0.26	2.57	3.53
Hypothecary credit spread	2.77	0.25	2.37	3.26
Municipal credit spread	1.86	0.35	1.17	2.52
Commercial credit premium	1.54	0.49	0.64	2.23
Consumer credit premium	2.62	0.62	1.60	3.67
Housing credit premium	1.13	0.49	0.20	1.83
Hypothecary credit premium	0.94	0.47	0.08	1.61
Municipal credit premium	0.03	0.49	-0.88	0.84

3.3 Explanatory and control variables

The proposed determinants of interest spreads that enter our analysis (see also Table 3 and appendix A)[11] include two measures applicable for an examination of the spreads' cyclical behavior. GDP growth is our measure of the business cycle and the banks' business opportunities. In studying the effects of macroeconomic fluctuations on bank spreads, interest rate developments should be controlled for in order to avoid that business cycle effects are mingled with reactions to endogenous changes in monetary policy rates. On the other hand, the variation of banking-related measures over the interest rate cycle is rewarding on its own. Our presumptions follow the observation from the interest rate transmission literature (e.g. Sander and Kleimeier 2004) that, in periods of monetary tightening, interest rates on bank liabilities are more sluggish than those on assets and vice versa. Consequently, increases in short-term interest rates should lead to rising spreads between lending and deposit rates. The state in the interest cycle is represented by the overnight money market rate.

The measure of competition used is a concentration ratio, the share of the top 10 banks in total assets. As there is no clear relation of concentration and competition a priori (structure performance vs. efficient structure hypothesis), the literature proposes different other approaches to quantify competition and market contestability. Unfortunately, these methods (the Panzar-Rosse H-statistic or the degree of market power of the average bank calculated via the Breshnahan-Lau method) are not applicable for a single-country analysis with aggregate time series. Gischer and Jüttner (2003) describe the increasingly global nature of competition in banking. As a first related proxy variable, they propose the ratio of fee to interest income, which measures the (deregulation-induced) explicit pricing of services and therefore also replaces the implicit interest payments variable. Bikker and Groeneveld (2000) support the consideration of other income parts (from trading etc.) in relating non-interest income to interest income. These income parts are raised from business which is subject to more intense (and global) competition than the credit business. A summary measure should emerge for the degree to which banks have adjusted to the new financial deregulation environment. In the end, a rise in non-interest income is supposed to represent technological advances, product-mix changes (expansion of low-risk activities) and the banks' exposure to international competition. A negative influence on interest spreads should be exerted if the shift to explicit pricing of services through fees and to other non-interest income narrowed markups in the interest business. Demirgüç-Kunt et al. (2004) argue that well-developed fee income sources will produce lower interest margins due to cross-subsidization of bank activities. We use the share of non-interest income in total operating income, with the non-interest income including net fee and commissions, income from securities and participations and net financial operations income. The second global competition variable applied by Gischer and Jüttner (2003) is the openness of the financial sector which they measure by the share of foreign assets and foreign liabilities of the country in GDP. In this paper, on the other hand, a banking-sector related measure is proposed, which is the sum of foreign assets and liabilites of the banking sector divided by its total assets. The expected sign is also negative.

The share of the book value of equity in total assets is used as the equity capital measure.[12] As mentioned before, there are arguments for effects of the changes in the equity ratio on interest spreads in both directions. Banks that hold a high fraction of liquid assets have lower net interest margins (Demirgüç-Kunt et al. 2004). A measure of liquid assets that includes cash, central bank balances and interbank claims cannot be used along with a loans ratio, because until the end of 1993, the two ratios were almost perfectly collinear (the shares of other assets in total assets were constant). Instead, we use the share of cash and central bank balances in total assets as a potential determinant of interest rate spreads. The respective share of loans in total assets (commercial, consumer, housing, hypothecary or municipal loans) and the cost-income ratio (CIR) make up the remaining explanatory variables. Following common calculation rules for the CIR, expenses include staff, general administration and some other expenses, but no interest and fee-based expenses. The latter are usually deducted from the respective income figures (so that net interest and net fee-based income are added up along with other income).

Table 3: Descriptive statistics of the explanatory variables

Variable	Mean	Std.Dev.	Minimum	Maximum
Commercial loans ratio	22.87	0.85	21.50	24.57
Consumer loans ratio	10.47	0.48	9.89	11.56
Housing loans ratio	7.01	0.40	6.38	7.72
Hypothecary loans ratio	9.69	0.45	9.12	10.55
Municipal loans ratio	1.71	0.20	1.31	1.95
Overnight money market rate	3.53	0.68	2.44	4.84
GDP growth	2.21	1.24	-0.36	4.64
Openness	52.95	5.29	42.98	60.39
Concentration ratio	56.69	1.51	54.47	59.09
Equity ratio	4.80	0.16	4.54	5.09
Cash ratio	1.25	0.23	0.91	1.73
Share of non-interest income in total income	35.64	5.08	26.13	43.63
Cost-income ratio	68.67	2.29	63.63	72.82

4 Methodology

In analyzing time series data for the Austrian banking sector we use vector autoregressive (VAR) models and therefore treat each variable as potentially endogenous.[13] Unsurprisingly, the Schwarz information criterion leads us to chose one lag in each case (see section 5) as a consequence of the small number of observations and the rather large number of variables. In the end, results from impulse response analysis from VAR models where the variables are in levels with a time trend also included (following the recommendations of Ashley and Verbrugge 2004, for the estimation of impulse response functions and confidence intervals for same) are presented. Responses to unit shocks for a maximum time horizon of four quarters will be reported. In obtaining structural responses, the underidentification problem is solved by applying a recursive structure (causal chain) to the contemporaneous relations between our variables. Technically, this amounts to using the so-called Cholesky decomposition of the variance-covariance matrix of the reduced-form VAR residuals to recover the structural shocks. For each spread (and premium), we estimate a reduced-form VAR (with a lag order of one) where, for example, the spread equation is specified as

$$\mathrm{SPREAD_t} = \mu + \sum_{\mathrm{i}=1}^{\mathrm{j}} \alpha_{\mathrm{j}} \mathrm{RHS_{j,t-1}} + \beta \mathrm{GROWTH_{t-1}} + \gamma \mathrm{MMR_{t-1}} + \phi \mathrm{Z} + \epsilon_{\mathrm{t}} \tag{1}$$

where $\mathrm{RHS_j}$ stands for j explanatory variables apart from GDP growth (GROWTH) and the overnight MMR. Z is for additional deterministic terms (e.g. trend, seasonal dummies). The reported impulse response functions θ_{k} (the dynamic impacts of unexpected shocks in time k) come from the vector moving average representation of the VAR

$$X_t = \tau + \sum_{k=1}^{\infty} \theta_k \epsilon_{t-k} \tag{2}$$

where X is the full vector of endogenous variables and the ϵ are the structural residuals to be shocked (identified in the above-mentioned way). Impulse response functions and corresponding error bands are obtained (simulated) via Monte Carlo Integration using the RATS example program *monteva2* (obtained from estima.com). Following Sims and Zha (1999), among other things, fractiles are used instead of standard deviations in computing error bands (we use the 0.05 and 0.95 fractiles to approximate a 90% confidence interval). Generalized impulse response functions (see Koop, Pesaran and Potter 1996 and Pesaran and Shin 1998), which are to be preferred in nonlinear models, were also calculated. In general, qualitative results from these responses are similar to the reported ones.

5 Results

5.1 Preliminary remarks and responses to shocks in the control variables

Our VAR specification consists of banking sector openness, the concentration, equity, loans and cash ratios, the non-interest income share in total income, the cost-income ratio, the overnight money market rate and the growth rate of GDP. As we do not have a full structural model for such a large number of variables, the Cholesky decomposition method is applied in the following form. The respective interest rate spread is the endogenous variable of interest and is therefore always placed at the end. The cycle measures (the overnight MMR and GDP growth) start the causal chain as they are the most exogenous variables in our setting. Balance-sheet variables are positioned before items from the income statement. Openness comes first after GDP growth because it is preferably interpreted as a strategic variable (one of the reactions of the banking sector to deregulation and liberalization). Concentration appears before the three balance-sheet ratios (equity, loans and cash ratio) because it is seen as being partly driven by longer-term decisions as, for example, the acquisition of participations. The first income statement variable in the order is the share of non-interest income in total income (the argument is similar to that used with balance-sheet items for openness) followed by the cost-income ratio.

Table 4 features the results for the five lending rates' spreads over the interest rate on savings deposits, but does not report responses to shocks in the control variables. Due to the low number of observations, hardly any shock in one of the explanatory variables is found to have statistically significant effects on the path of interest rate spreads and premiums, even at the 10% significance level. Interest rate spreads do not significantly deviate from their baseline path (their time path without any unexpected shock to the system) following shocks in the concentration ratio, the respective loans ratio, the share of non-interest income in total operating income and the cost-income ratio.

Table 4: Responses of interest rate spreads

Quarter	0	1	2	4
Responses to shocks in GDP growth				
Commercial credit spread	0.038	0.090 *	0.076	0.047
Consumer credit spread	0.071	0.091	0.064	0.033
Housing credit spread	0.025	0.057	0.056	0.080
Hypothecary credit spread	0.015	0.050	0.044	0.031
Municipal credit spread	0.044	0.049	0.026	0.005
Responses to shocks in the overnight money market rate				
Commercial credit spread	0.382 *	0.147	0.062	0.005
Consumer credit spread	0.320	0.225	0.190	0.183
Housing credit spread	0.241	0.120	0.186	0.187
Hypothecary credit spread	0.376	0.247	0.121	0.088
Municipal credit spread	0.094	0.068	0.002	0.024

With the exception of the one for the commercial credit rate, interest spreads rise somewhat after shocks in the cash ratio in the very short term. Responses to impulses in the equity ratio are mostly negative (significantly for commercial, consumer and municipal credit spreads). Surprisingly, all spreads rise with shocks in banking sector openness (contemporaneous responses are found to be statistically significant). Though these effects are practically small, they may be (as argued above, and in Gischer and Jüttner 2003) due to the fact that the European markets for loans and deposits still are not fully integrated, so that banks try to partly make up for losses in other business by raising interest spreads (at least in the short run).

5.2 Interest rates, GDP growth and the cyclicality of interest rate spreads

The responses of interest rate spreads to shocks in the growth rate of real GDP and the overnight money market rate show how loan-deposit markups vary with the business and interest cycle in the Austrian banking sector. From the first panel of Table 4 we see that all spreads behave procyclically. A unit (one percentage point) shock in GDP growth causes, for example, the spread of the commercial credit rate over the savings rate to increase by 0.09 percentage points in the quarter following the shock. However, no other deviation of a spread from its baseline path is found to be significantly different from zero. Additionally, the spreads' responses are also practically small, having in mind the average level of the spreads and the size of the GDP growth shock the responses were calculated for. Responses to unit (one percentage point) shocks in the overnight money market rate confirm the presumption that such impulses lead to rising lending-deposit spreads in the short run, due to the faster adjustment of loan rates to interest rate changes. Also in this case, most of the responses are not statistically significant and decline over time. Spreads of lending rates to bank bond yields are, as asserted above, interpretable as bank markups over cost of funds as well as external bank finance premiums.[14]

Table 5: Responses of lending rate premiums over the yield of bank bonds

Quarter	0	1	2	4
Responses to shocks in GDP growth				
Commercial credit premium	-0.077	0.020	0.120	0.048
Consumer credit premium	-0.075	0.023	0.129	0.046
Housing credit premium	-0.049	0.118	0.154	-0.082
Hypothecary credit premium	-0.040	0.051	0.148	-0.034
Municipal credit premium	0.007	0.067	0.180	0.095

Although no single response to GDP growth shocks in Table 5 is estimated to be significantly different from zero, we find these responses to be positive in the two quarters following the shock. So also the results for the lending rate premiums do not point to a countercyclical behavior of bank markups in Austria.

6 Summary and conclusions

This paper analyzes the cyclical behavior of interest rate spreads in the Austrian banking sector using time series for the 1995-2003 period. Controlling for the main empirical determinants of interest margins and spreads proposed in the literature, we find that bank interest rate spreads and premiums in Austria move procyclically. Thereby, we can confirm the suggestion of Braumann (2004) that Austrian bank markups do not contribute to a financial accelerator in the propagation of macroeconomic fluctuations. However, there is also no stringent evidence for the opposite, as the positive responses of spreads to shocks in the growth rate of real GDP (our measure of the state in the business cycle) are practically small. Additionally, a clear statement on whether the conduct of the Austrian banking sector dampens the effects of aggregate shocks would also have to examine the cyclicality of supplied credit volumes.

Braumann (2004) argues that specific characteristics of the Austrian banking system cause the absence of a banking-related financial accelerator. Pronounced bank-customer relationships, on the one hand, lead to a reduction of information asymmetries and generate comparative advantages of incumbent banks versus (foreign) competitors, but also step up switching costs for bank customers. Nevertheless, these relations do not imply price wars for market share in booms as well as an extensive exertion of banks' market power in recessions. Effects of assumed interest rate and profit smoothing practices of banks on the level of interest rates and spreads make up another story, but can explain a sparsly pronounced reaction of rates and spreads to cyclical changes in credit risk and collateral values. However, the shrinkage of interest rate spreads in economic upturns, proposed by the financial accelerator, may be impeded also by other factors. Even in booms, the competition from other finance vehicles still might be too low to induce noticeable effects on bank markups, or the banks' incentives to depart from notional collusive arrangements are not sufficient.

Notes

[1]Rising prices lead to increases in profits if prices were below the single-period profit-maximizing level before, for example, because of switching costs and firms trying to "lock in" their customers. By raising prices, firms forgo attempts to build market share. Hence, also in this scenario, price wars are more likely to occur in upturns.

[2]Bloch and Olive (2001) provide some quotations and argue that aggregate and (industry) cost inflation are empirically important determinants of markups. Their results indicate that industry prices (and therefore markups) are negatively related to aggregate demand in high-concentration industries. Galeotti and Schiantarelli (1998) argue that neglected costs of capital adjustment can explain many procyclicality findings in the empirical literature. According to their own findings, markups are negatively related to the current state of demand, but behave procyclically with respect to expectations of future demand changes.

[3]Angelini and Cetorelli (2003), for example, report a negative relation of GDP growth to the "price-deposit margin", which they calculate from income-statement and balance-sheet data and which includes services income.

[4]Scatterplots of yearly data (1955-2000) reveal that spreads and credit growth in Sweden, the USA and Canada feature correlations which are consistent with a financial accelerator (provided that credit growth is procyclical).

[5]However, the effects of short-term cycles are ruled out by using yearly data and cross-country differences might obscure the results on cyclicality (they use country-fixed as well as product-fixed effects in their estimation).

[6]Monopolistic as well as oligopolistic versions of the micro-model of the banking firm can also be found in Freixas and Rochet (1997) or Corvoisier and Gropp (2002).

[7]Furthermore, we will not discuss the relation of our measures and results to some other literature related to the *level* of interest margins and spreads. The latter is often claimed to measure the efficiency with which banks intermediate capital, is related to economic development and growth (Levine 2005), and is an issue in the competition policy of the European Union. As there are arguments in favor of a trade-off with financial stability (Bikker and Groeneveld 2000, Weill 2004), it is not clear whether high margins are good or bad from a social welfare perspective (Saunders and Schumacher 2000).

[8]Goddard et al. (2004) also control for the industry Herfindahl, which has a positive influence on the ROE.

[9]The Austrian banking laws had to be harmonized with the standards of the European Union (EU). The whole process has spurred competition and concentration, and improved efficiency in the banking sectors of the EU (Bikker and Groeneveld 2000).

[10]For the differentials to the overnight money market rate, responses to interest rate shocks simply show that the subsequent adjustment of retail rates is sluggish and not complete in the medium run (which are well-known empirical facts, see e.g. Sander and Kleimeier 2004), with lending rates adjusting faster than deposit rates (at least in the short run). Responses of the loan-deposit spreads (see the results section) could be divided into these reactions. Responses to shocks in GDP growth show that lending rates rise in economic upturns (with endogenous changes in money market rates being controlled for), whereas reactions of deposit and savings rates are smaller, change their sign over time and are not significantly different from zero. We also see that lending rate spreads over money market rates (or lending rates themselves, as we control for the overnight money market rate as an explanatory variable) shrink after shocks in the equity ratio in the first quarters (with deposit rates rather unaffected) and rise afterwards (but deposit rates rise more then), so that the loan-deposit spreads' reactions stay negative.

[11]Some of the variables listed in the review of the empirical literature on interest margins and banking profitability are not used in this paper for the following specific reasons. No quarterly data for a quite long time period is available for taxes and loan loss provisions. Gischer and Jüttner (2003) are followed in not including a variable for implicit interest payments. As argued by them, there has been a trend towards explicit pricing of banking services, as implicit interest

payments have been eroded by deregulation, technological advances and increased competition. However, accounting for non-interest income (as will be done in our regressions) amounts to using quite a similar variable. Several arguments exist that lead us to not account for the importance of the banking sector (besides the one that other variables used might also proxy for or be a product of the disintermediation trend). The total banking sector's assets divided by GDP do not show a disintermediation trend as they trend upwards over time. Among others, Demirgüç-Kunt et al. (2004) are in favor of stock market capitalization relative to real GDP as a measure for competition from other segments of the financial system. But the problem is that (also with the Austrian data) stock market developments are largely price-driven. Additionally, there is evidence from the literature that, to a certain extent, bank and stock market finance might be complements rather than substitutes. What would be needed is something like the share of new loans in the total of new bond, share and private equity (venture capital) issues as well as new loans, for the corporate sector only (no government bonds, for example), on a quarterly level, for a fairly long time period. Besides the fact that this data is unavailable, such a measure would, again, only tell half the story, because the changing importance of the banking sector also with respect to deposits and financial investments should be accounted for. A measure like the total assets of investment (mutual) funds relative to deposits at banks would, as it is sharply rising over time, overrate the disintermediation trend. Interest rate volatility (proxied by the standard deviation of the overnight money market rate) is left out because its effects on the variables of interest always are far from getting statistically and practically significant. Finally, the inflation rate is assumed to be captured with the inclusion of nominal interest rates, so that degrees of freedom can be saved.

[12]Equity capital therefore only comprises registered (nominal) capital and disclosed reserves (resulting in core or tier 1 capital), as well as some parts of supplementary (tier 2) capital. Subordinated debt is included, whereas undisclosed reserves do not appear in the balance sheet. The latter, however, account for a large fraction of tier 2 capital. Therefore, our equity measure is not compatible with the capital used in describing (the compliance with) capital adequacy rules. The relation to the regulatory capital requirements measures (which are only available to us from 1998 on) is that the equity ratios used in that respect include supplementary capital (tier 2 capital) in the numerator and divide by risk-weighted assets. Therefore, our equity ratios will be considerably smaller than the ones published and interpreted when capital adequacy is discussed.

[13]Potential endogeneity of explanatory variables is an issue which is typically ignored in existing empirical work on the determinants of net interest margins, spreads and banking profitability measures.

[14]Responses to shocks in the overnight money market rate are not reported as these are obscured by the fact that bond yields tend to partly adjust before the interest rate shock actually occurs. Lending rate premiums therefore rise after impulses in the overnight MMR due to rising lending rates.

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A Data description

General remarks

Retail interest rates come from the national interest rate statistics and were, in this form, compiled from 1995 until June 2003 (from January 2003 on, the national statistics were replaced by a harmonized system for the euro area). Rates are nominal (plus certain fees, but commissions on turnover are not included) and expressed as annual percentages. *Business coverage:* Banks report the interest rate charged most frequently for new business (renewals are not considered). *Institutional coverage:* Sample of 43 Monetary Financial Institutions (had decreased to 37 banks in 2003 because of mergers). As Klein, Schubert and Swoboda (2003) argue, this sample of banks consisted of the major joint stock banks, the state mortgage banks as well as the largest institutions of the savings bank, Raiffeisen credit cooperative and Volksbank credit cooperative sectors. *Aggregation method:* Arithmetic averages excluding 5% of the rates at both ends of the range. *Note:* Interest rates on loans from home savings banks (building and loan associations), which play an important role for housing finance in Austria, were not recorded.

Data on profit and loss account items for the banking sector comes from quarterly bank reports, balance sheet data from monthly balance sheet reports (almost all banks operating in Austria report on the legal basis of the Austrian Banking Act). Balance sheet items are quarterly averages of monthly (of three end-of-month) figures and, as the items from the income statement, in millions of euros.

In general (exceptions as indicated), our data source is the Austrian Central Bank (the Oesterreichische Nationalbank, OeNB), and the sample period ranges from the first quarter of 1995 to the second quarter of 2003.

Interest rates

Monetary policy rate: Overnight VIBOR (Vienna Interbank Offered Rate). The Eonia (Euro Overnight Index Average, source: European Central Bank, ECB) is appended from 1999 on. *Commercial credit rate:* Floating-rate loans to enterprises, usually short-term (up to 1 year). *Consumer credit rate:* Secured consumer loans, but not necessarily secured by mortgage. Usually long-term, but no breakdown by maturity is available. *Housing credit rate:* All loans to households used for purchasing housing space which are not mortgage loans. Rates are floating (variable) and housing loans are typically long-term loans. *Hypothecary credit rate:* Mortgage loans to households and enterprises. Floating-rate loans secured by a mortgage recorded in the land register, usually long-term. *Municipal credit rate:* Loans to public-sector authorities (usually long-term). *Deposit rate:* Savings deposits with an agreed maturity of up to 12 months. *Savings rate:* Savings deposits with an agreed maturity of over 12 months. *Yield of bank bonds:* Secondary market yield of bonds of domestic banks with a fixed rate of interest. Average yield (quarterly averages of daily yields) of all bonds with more than one year to maturity weighted by outstanding volumes (Source: Oesterreichische Kontrollbank, OeKB). *Note:* Quarterly interest rates are simple averages of monthly figures.

Explanatory variables

Banking sector openness: Foreign assets plus foreign liabilities of the banking sector divided by total assets (percentage). *Concentration ratio:* Share of the 10 largest banks' assets in the balance sheet total of the banking sector (percentage). *Commercial loans ratio:* Share of loans to non-financial firms in total banking sector assets (percentage). *Consumer loans ratio:* Share of consumer loans to households in total banking sector assets (percentage). *Housing loans ratio:* Share of housing loans to households in total banking sector assets (percentage). *Hypothecary loans ratio:* Share of mortgage loans in total banking sector assets (percentage). *Municipal loans ratio:* Share of loans to municipal authorities in total banking sector assets (percentage). *Equity ratio:* Share of the book value of equity capital in the balance sheet total (percentage). *Cash ratio:* Share of cash and central bank balances in total banking sector assets (percentage). *Non-interest income:* Share of non-interest income in total operating income (percentage). *Cost-income ratio:* Operating expenses divided by operating income (percentage). *Overnight money market rate:* As explained in the interest rate section of this appendix. *GDP growth:* Growth rate of real GDP (quarterly level) relative to real GDP four quarters ago (percentage). Data source for real GDP: WIFO (Austrian Institute of Economic Research).