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The Determinants of the Interest Rate Margins of Czech Banks*

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Abstract
We examine the determinants of the interest rate margins of Czech banks by employing a bank-level dataset at quarterly frequency in 2000–2006. Our main results are as follows. We find that more efficient banks exhibit lower margins and there is no evidence that banks with lower margins compensate themselves with higher fees. Price stability contributes to lower margins. Higher capital adequacy is associated with lower margins, contributing to banking stability. Overall, the results indicate that the determinants of the interest rate margins of Czech banks are largely similar to those reported in other studies for developed countries.

1. Introduction

Czech banks have undergone massive changes since the fall of communism. The banks were state-owned at the outset of the transition and it took more than a decade for commercial banks to be privatized. The 1990s were characterized by abrupt changes in credit conditions, from relatively soft conditions in the first half of the 1990s to rather tight conditions, credit rationing, accumulation of bad loans, and bank failures in the second half (Kreuzbergová, 2006). Podpiera and Weill (2008) and Podpiera-Pruteanu and Podpiera (2008) claim that deterioration in cost efficiency rather than bad luck was behind the accumulation of bad loans and bank failures. Gradually, the Czech banking industry has been characterized by increasing foreign ownership presence (Haselmann, 2006), greater stability, and less government intervention (Turnovec, 1999).

Drakos (2003) puts forward that a fall in interest rate margins represents a success of the market-oriented reforms implemented in transition countries. In this paper, we investigate the determinants of bank interest rate margins. Among the determinants, we examine both bank-specific and macroeconomic variables. While the former may have policy implications for bank supervision, such as how different market structures affect financial intermediation, the latter may convey useful information on how macroeconomic policies in general may contribute to the stability of the banking industry. In consequence, we may compare the results to evidence on other Central European countries provided by Claeys and Vander Vennet (2008) or to evidence on developed countries.

We examine the interest rate margins of Czech banks in 2000–2006 within the dynamic panel data framework. In contrast to the majority of empirical applications in this stream of literature, we base our results on quarterly rather than annual

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data by employing a unique Czech National Bank dataset on financial statements of Czech banks. Anticipating our results, we find that more efficient banks exhibit lower interest margins and that banks want to be compensated for more risky activities. Price stability positively contributes to lower margins, thus enhancing financial intermediation and subsequently fostering economic growth. This finding is in line with Boyd et al. (2001), who document a negative impact of the level of the inflation rate on financial sector performance.

The paper is organized as follows. In section 2, we briefly review related literature. Section 3 contains the data description and empirical methodology. Section 4 presents the results and section 5 offers concluding remarks.

2. Related Literature

The pricing policies of banks have traditionally been a focus of economists' attention. Typically, it has been emphasized that bank margins are a result of banking structure, regulatory issues, and the macroeconomic environment. There is immense evidence on the determinants of interest rate margins in developed countries (e.g. Ruthenberg and Elias, 1996; Angbazo, 1997; Wong, 1997; Demirguc-Kunt and Huizinga, 1998; Saunders and Schumacher, 2000; Demirguc-Kunt et al., 2004, and others).

Large cross-country evidence on the determinants of interest rate margins is provided by Demirguc-Kunt and Huizinga (1999), who analyze it using weighted least squares in 80 countries in the 1988–1995 period. Besides taking into account the bank and macroeconomic conditions, they analyze the role of taxation, deposit insurance, financial structure as well as legal and country-level institutional indicators such as indexes on the rule of law, corruption, and contract enforcement. Similarly, Gelos (2009) investigates interest rate spreads in 85 countries with a focus on Latin America. He finds that higher interest rates, bank efficiency, and regulatory requirements contribute to higher spreads in Latin America.

Saunders and Schumacher (2000) analyze the bank interest rate margins in six European countries building on a model developed by Ho and Saunders (1981). They follow a two-step process. First, they control for the effects on net interest margins of various imperfections that cannot be built directly into the model (i.e., implicit interest, the opportunity costs of reserves, and capital requirements) so as to isolate estimates of the pure spread in each country each year. Second, they undertake an analysis of the determinants of these pure spreads (e.g. market structure and interest rate volatility). They find that bank market structure, interest rate volatility and bank capitalization matter for the spreads.

Another piece of evidence is provided by Hawtrey and Liang (2008), who investigate bank interest rate margins in a set of OECD countries and focus on bank-specific characteristics. They find bank market structure, cost efficiency, risk aversion, and interest rate volatility to be among the main determinants of margins. A similar set of countries and similar results are presented by Valverde and Fernandez (2007).

Regarding Central and Eastern Europe, there is much less evidence. Claeys and Vander Vennet (2008) analyze the determinants of bank interest rate margins in Central and Eastern European countries in comparison to Western Europe in 1994–

–2001 (a sample of 2,279 banks from 36 countries). Generally, they examine the role of country-specific bank market characteristics, country-specific macroeconomic conditions, bank-specific characteristics, and regulatory features in influencing interest rate margins.

One of the hypotheses Claeys and Vander Vennet (2008) raise in their study is whether interest rate margins are driven by either structure conduct performance or the efficient structure hypothesis. Structure conduct performance postulates a positive relationship between margins and market structure, reflecting non-competitive pricing behavior in concentrated markets. An attendant theory is the relative-market-power hypothesis, i.e., only banks with large market shares are able to exercise market power in pricing and consequently earn higher margins. On the other hand, the efficient structure hypothesis states that differences in interest margins are attributable to differences in operational efficiency across banks. There are two versions of this hypothesis. The X-efficiency version points out that banks with superior management or production technologies have lower costs and subsequently can offer more competitive interest rates on loans and/or deposits, leading to a negative relationship between operational efficiency and interest margins. Since these firms are also assumed to gain larger market shares, the market may become more concentrated as a result of competition. Hence the correlation between market structure and margins is spurious (runs via higher efficiency). One way to deal with this is to include market concentration, market share, and operational efficiency simultaneously in the regression. Second, the scale-efficiency version emphasizes that some firms simply produce on a more efficient scale, resulting under competition in smaller margins. Again, these firms are assumed to increase their market share, leading to higher market concentration.

3. Data and Econometric Approach

The data available to us cover the financial statements of 25 banks (nearly all the Czech banks) at quarterly frequency from 2000:1 to 2006:1. The source of the data is the Czech National Bank's internal dataset of financial statements on commercial banks and building societies. The fact that data for two banks in the sample are not available for all periods renders the panel unbalanced. The number of observations is 562.

In general, our empirical model follows the literature (Claeys and Vander Vennet, 2008; Valverde and Fernandez, 2007).

$$NIM_{i,t} = \delta \cdot NIM_{i,t}(-1) + \beta_1 \cdot FEES_{i,t} + \beta_2 \cdot CAD_{i,t} + \beta_3 \cdot LOANS_{i,t} + \beta_4 \cdot ADMIN_{i,t} + \\ + \beta_5 \cdot SIZE_{i,t} + \beta_6 \cdot HERF_{i,t} + \beta_7 \cdot INFL_t + \beta_8 \cdot GDP_t + \Sigma\, \alpha_t \cdot (time\ dummy) + \eta_i + \upsilon_{it}$$

for $i = 1, \ldots, N$ and $t = 1, \ldots, T$

where the variables are described in *Table 1*. As a result, we include bank-specific variables to tackle inherent bank heterogeneity, market structure, and macroeconomic conditions as potential determinants of interest rate margins. $\eta_i \sim IID(0, \sigma_\eta^2)$ and $\upsilon_{it} \sim IID(0, \sigma_\upsilon^2)$ are independent of each other and among themselves, η_i being individual effects. As stated above, we have $N = T = 25$. Descriptive statistics of our variables are presented in *Table 2*.

As the model is primarily empirical, we also tested other determinants such as the interest rate level, stock market capitalization, corporate income tax, and a govern-

Table 1 Description of Variables

Notation	Variable description
NIM	net interest margin, i.e. net interest income/assets
FEES	fees income/assets
CAD	capital adequacy
LOANS	total loans/assets
ADMIN	administrative costs/assets
SIZE	assets/median assets in the banking sector
HERF	Herfindahl index (higher number implies less competitive environment)
INFL	current inflation rate
GDP	real GDP growth

Table 2 Summary Statistics[a]

Variable	Mean	Std. dev.	Variable	Mean	Std. dev.
NIM	0.00506	0.00341	*ADMIN*	0.00499	0.00349
FEES	0.00204	0.00223	*SIZE*	3.21615	5.53045
CAD	28.1953	38.3449	*HERF*	0.14991	0.01397
LOANS	0.71429	0.19216	*INFL*	2.54533	1.59944
GDP	3.73536	1.63834	---	----	---

Note: [a] These are unweighted statistics, hence e.g. mean *CAD* is high due to some small banks with a secure portfolio and high capital adequacy.

ment ownership dummy, but failed to find them significant. These results are available upon request.

For sensitivity analysis, we also use $CAD_{i,t}(-4)$, i.e., capital adequacy lagged by 4 quarters. This is chosen with regard to the consideration that the riskiness of a banking portfolio as assessed at a given point in time is reflected in interest income only with a certain lag.[1]

Before estimating our empirical model, we tested each series for stationarity based on the panel data unit root tests developed by Maddala-Wu (1999). This test of panel stationarity was used at varying lag lengths using both the ADF and Phillips-Peron statistics.[2] Overall, evidence was found for stationarity of our panel. These results are available upon request.

To deal with endogeneity and the dynamic nature of interest margin determination, we opt for the Arellano and Bond (1991) estimator. This seems to be a suitable dynamic panel estimator for us, as we find that the persistence of the lagged dependent variable is not high.

4. Results

We report the results on interest margin determination in *Table 3* and *4*. Various specifications of equation (1) are reported. The specifications differ based on whether we include the full set of explanatory variables and time dummies and whether the model is carried out with the current or lagged capital adequacy ratio.

[1] Presumably more so than for the other banking variables in the model.

[2] Unlike some other tests, the Maddala-Wu (1999) test does not require a balanced panel.

Table 3 Arellano-Bond (1991) Dynamic Panel GMM Estimation of Interest Margin Determinants

	Specification 1			Specification 2[a]			Specification 3			Specification 4[a]			Specification 5		
Variable:	coeff.	std. err.	*p*	coeff.	std. err.	*p*	coeff.	std. err.	*p*	coeff.	std. err.	*p*	coeff.	std. err.	*p*
NIM(-1)	-0.144	0.170	39.7	-0.144	0.170	39.5	-0.145	0.175	40.8	-0.145	0.175	40.6	-0.140	0.167	40.1
FEES	0.142	0.101	16.1	0.137	0.089	12.4	0.121	0.106	25.1	0.116	0.094	21.7			
CAD	$-7.0x10^{-6}$	$5.1x10^{-6}$	16.9	$-7.0x10^{-6}$	$5.1x10^{-6}$	17.1	$-7.3x10^{-6}$	$5.0x10^{-6}$	14.5	$-7.3x10^{-6}$	$5.0x10^{-6}$	14.9	$-8.6x10^{-6}$	$5.7x10^{-6}$	13.3
LOANS	$8.8x10^{-3}$	$2.4x10^{-3}$	0.0	$8.9x10^{-3}$	$2.3x10^{-3}$	0.0	$9.0x10^{-3}$	$2.3x10^{-3}$	0.0	$9.1x10^{-3}$	$2.3x10^{-3}$	0.0	$8.8x10^{-3}$	$2.3x10^{-3}$	0.0
ADMIN	0.366	0.096	0.0	0.371	0.096	0.0	0.334	0.111	0.2	0.339	0.111	0.2	0.424	0.088	0.0
SIZE	$-1.5x10^{-4}$	$7.6x10^{-5}$	4.5	$-1.5x10^{-4}$	$7.5x10^{-5}$	4.6	$-1.5x10^{-4}$	$7.5x10^{-5}$	4.3	$-1.5x10^{-4}$	$7.4x10^{-5}$	4.5	$-1.5x10^{-4}$	$7.5x10^{-5}$	4.4
HERF	dropped due to collinearity			dropped due to collinearity			0.014	0.008	8.5	0.014	0.008	8.5	dropped due to collinearity		
INFL	$2.1x10^{-4}$	$9.5x10^{-5}$	3.0	$2.1x10^{-4}$	$9.5x10^{-5}$	2.9	$9.0x10^{-5}$	$5.8x10^{-5}$	11.8	$9.1x10^{-5}$	$5.8x10^{-5}$	11.4	$1.9x10^{-4}$	$1.1x10^{-4}$	8.5
GDP	$4.9x10^{-5}$	$1.5 x10^{-4}$	74.8	$4.8x10^{-5}$	$1.5 x10^{-4}$	75.4	$1.2x10^{-4}$	$9.6x10^{-5}$	20.3	$1.2x10^{-4}$	$9.6x10^{-5}$	20.4			
time dum.	yes			yes			no			no			yes		
	df	χ^2(df)		df	χ^2(df)		df	χ^2(df)		df	χ^2(df)		df	χ^2(df)	
Wald test	25	$7.5x10^{8}$	R	25	$1.8x10^{9}$	R	9	91.44	R	9	83.10	R	24	12 504.1	R
Sargan test	1 765	0.22	NR	1 742	0.22	NR	2 063	17.38	NR	2 040	17.40	NR	1467	1.20	NR
	z	p		z	p		z	p		z	p		z	p	
AR(1) test	-2.21	2.7	R	-2.21	2.7	R	-2.13	3.3	R	-2.13	3.3	R	-2.23	2.6	R
AR(2) test	0.94	34.6	NR	0.97	33.4	NR	1.05	29.4	NR	1.08	28.0	NR	0.98	32.7	NR

Notes: Dependent variable: *NIM*.
One-step results with robust standard errors reported, *p* = *p*-value (in %).
time dum. = time dummies, not reported if included; df = degrees of freedom.
R = rejected at 5% significance level; NR = not rejected at 5% significance level.
INFL, GDP and time dummies specified as exogenous; *CAD, LOANS, ADMIN, SIZE, HERF* as predetermined.
[a] = *FEES* specified as endogenous in (2) and (4), while the variable is specified as predetermined in (1) and (3).
AR(*j*) test = Arellano-Bond test that average autocovariance in residuals of order *j* equal to zero.
Sargan test = test of overidentifying restrictions based on two-step Arellano-Bond (1991) GMM estimates.

Table 4 Arellano-Bond (1991) Dynamic Panel GMM Estimation of Interest Margin Determinants

	Specification 1			Specification 2[a]			Specification 3			Specification 4[a]			Specification 5		
Variable	coeff.	std. err.	*p*	coeff.	std. err.	*p*	coeff.	std. err.	*p*	coeff.	std. err.	*p*	coeff.	std. err.	*p*
NIM(-1)	-0.138	0.170	41.6	-0.137	0.170	42.3	-0.138	0.175	42.9	-0.137	0.175	43.6	-0.135	0.166	41.5
FEES	0.142	0.100	15.3	0.141	0.093	12.9	0.125	0.104	22.9	0.123	0.096	20.0			
CAD(-4)	-9.4×10^{-6}	4.8×10^{-6}	5.1	-9.5×10^{-6}	4.9×10^{-6}	5.3	-8.2×10^{-6}	4.9×10^{-6}	9.6	-8.3×10^{-6}	5.0×10^{-6}	9.9	-1.0×10^{-5}	5.6×10^{-6}	6.4
LOANS	8.9×10^{-3}	2.3×10^{-3}	0.0	8.8×10^{-3}	2.3×10^{-3}	0.0	9.0×10^{-3}	2.3×10^{-3}	0.0	8.9×10^{-3}	2.2×10^{-3}	0.0	8.9×10^{-3}	2.3×10^{-3}	0.0
ADMIN	0.370	0.091	0.0	0.374	0.090	0.0	0.334	0.106	0.2	0.338	0.105	0.1	0.432	0.081	0.0
SIZE	-1.6×10^{-4}	7.4×10^{-5}	3.0	-1.5×10^{-4}	7.3×10^{-5}	3.4	-1.6×10^{-4}	7.3×10^{-5}	3.2	-1.5×10^{-4}	7.2×10^{-5}	3.6	-1.6×10^{-4}	7.4×10^{-5}	3.2
HERF	dropped due to collinearity			dropped due to collinearity			0.013	0.009	14.4	0.013	0.009	14.1	dropped due to collinearity		
INFL	2.1×10^{-4}	9.1×10^{-5}	2.3	2.1×10^{-4}	9.1×10^{-5}	2.3	1.0×10^{-4}	5.8×10^{-5}	7.8	1.0×10^{-4}	5.8×10^{-5}	7.8	2.0×10^{-4}	1.1×10^{-4}	6.0
GDP	2.5×10^{-5}	1.5×10^{-4}	87.0	2.4×10^{-5}	1.5×10^{-4}	87.1	1.1×10^{-4}	9.7×10^{-5}	27.0	1.1×10^{-4}	9.7×10^{-5}	27.0			
time dum.	yes			yes			no			no			yes		
	df	χ^2(df)		df	χ^2(df)		df	χ^2(df)		df	χ^2(df)		df	χ^2(df)	
Wald test	26	5.4×10^{9}	R	26	1.8×10^{10}	R	9	82.53	R	9	78.65	R	24	3857.7	R
Sargan test	1 765	0.06	NR	1 742	0.06	NR	2 063	18.87	NR	2 040	19.01	NR	1 467	3.82	NR
	z	p		z	p		z	p		z	p		z	p	
AR(1) test	-2.17	3.0	R	-2.17	3.0	R	-2.09	3.6	R	-2.10	3.6	R	-2.19	2.9	R
AR(2) test	1.10	27.0	NR	1.14	25.3	NR	1.24	21.6	NR	1.29	19.9	NR	1.12	26.4	NR

Notes: Dependent variable: NIM.

One-step results with robust standard errors reported, *p* = *p*-value (in %).

time dum. = time dummies, not reported if included; df = degrees of freedom.

R = rejected at 5% significance level; NR = not rejected at 5% significance level.

INFL, GDP and time dummies specified as exogenous; *CAD, LOANS, ADMIN, SIZE, HERF* as predetermined.

[a] = *FEES* specified as endogenous in (2) and (4), while the variable is specified as predetermined in (1) and (3).

AR(*j*) test = Arellano-Bond test that average autocovariance in residuals of order j equal to zero.

Sargan test = test of overidentifying restrictions based on two-step Arellano-Bond (1991) GMM estimates.

Data for *CAD* available for a longer period than for some other variables, so using *CAD*(-4) does not decrease the number of observations.

Subject to various sensitivity tests, the results suggest that less efficient banks, as proxied by administrative costs, exhibit greater interest margins. This is beneficial for customers, as the finding implies – in line with the theory – that more efficient banks pass lower costs on to their clients in the form of higher deposit or lower lending rates (Claeys and Vander Vennet, 2008). Higher capital adequacy of a bank is associated with lower interest margins. This contrasts with the Ho and Saunders (1981) dealership model, which predicts a positive relationship, as net interest rate margins should increase the capital base as the exposure to risk increases. Our finding is in line with the hypothesis raised by Brock and Franken (2003), who put forward that less capitalized banks have the motivation to accept more risk (associated with a higher spread) in order to receive higher returns. Analogously, more capitalized banks invest more cautiously, as there is more capital at risk (Brock and Franken, 2003).

Interest margins are higher for banks with a higher loans-to-assets ratio. This indicates that banks providing credit for riskier projects require higher margins as compensation (see Maudos et al., 2004, for the attendant European evidence). Income from fees and charges does not seem to have explanatory power and we have not discovered any substitution relationship in which lower interest margins would be compensated by higher fee income and vice versa. Larger banks seem to set lower margins. This is at variance with the supposition that large banks may exercise their market power and exhibit larger spreads. Gelos (2009) also finds that larger banks in Latin America charge lower spreads and hypothesize that this reflects a greater scope for risk diversification within large banks. Similarly, DePrince and Morris (2007) document that the net interest margin is lower in a group of extra large banks in the U.S. This result contrasts with evidence on new EU member states, where no systematic relationship is found (Claeys and Vander Vennet, 2008).

Our measure of competition, the Herfindahl index, is never significant and thus we do not find evidence that market power matters for the interest margin. Although the insignificance of the index may reflect multicollinearity with some other explanatory variables, even simple scatter plots do not indicate any pattern. We also used the concentration ratio for the three largest banks instead of the Herfindahl index, but again failed to find any significant relationship.

Next, the macroeconomic conditions seem to affect margins, too. While GDP growth is not significant (which may reflect the 7-year time dimension of our sample, which may not be sufficient to capture the business cycle fully), banks seem to set higher margins in a higher-inflation environment. Thus, central banks aiming to achieve price stability also contribute to better financial intermediation (Boyd et al., 2001), which is crucial for economic development (Levine, 2005) especially in less financially developed countries (Coricelli and Roland, 2008). Overall, the results indicate that the determinants of the interest rate margins of Czech banks are similar, to a large extent, to those reported in other studies for developed countries.

We also estimated our empirical model by different econometric techniques such as the random and fixed effects panel estimators. While this approach is prone to endogeneity, these results largely support our aforementioned findings and are available upon request.

5. Concluding Remarks

In this paper we investigate the determinants of the interest rate margins of Czech banks based on quarterly data in 2000–2006 using the Arrelano-Bond dynamic panel data estimator. We find that that more efficient banks exhibit lower margins and there is no evidence that banks with lower margins compensate themselves with higher fees. The results support the hypothesis that more efficient banking systems are supportive for financial intermediation and allocation of funds.

Price stability contributes to lower margins and thus enhances financial intermediation, too, and subsequently fosters economic development (Levine, 2005), which is especially important in less financially developed economies (Coricelli and Roland, 2008). This finding can thus be interpreted as additional evidence in support of price-stability-oriented central banking. Larger banks are found to charge lower margins. Higher capital adequacy of a bank is associated with lower interest margins. Our finding is thus in line with the hypothesis raised by Brock and Franken (2003), who put forward that less capitalized banks have the motivation to accept more risk (associated with a higher spread) in order to receive higher returns.

In terms of future research, we believe that it would be worthwhile to build carefully calibrated structural models, which would be useful for financial market stress testing and, more generally, for policy advice in authorities such as central banks dealing with financial stability.

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