How related are interbank and lending interest rates? Evidence on selected EU countries

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How Related are Interbank and Lending Interest Rates? Evidence on Selected European Union Countries[#]

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Introduction

Interest rates on loans are crucial in terms of profitability of banks. Particularly in times affected by the financial crisis they should be given a considerable degree of attention. From the profit's point of view we should see interest rates in two ways. First, we can distinguish a positive impact on operating results of commercial banks. Second, lending interest rate influence costs of borrowers and can be destructive for many companies today.

This article aims to trace the relationship between interbank market interest rates and interest rates on loans for business companies. The paper also investigates development of banks' profit margin during the financial crisis. The development is demonstrated in selected euro area countries (Austria, Belgium, France and Italy) that are home countries of owners of the largest banks that dominate the Czech banking sector (Česká spořitelna, Československá obchodní banka, Komerční banka and UniCredit Bank).

The paper is divided into several sections. The introduction is followed by a brief overview of recent relevant scientific findings. Next the characteristics of data and methods used in the paper are presented.

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Then the empirical part follows and, finally, discussion on empirical results along with the conclusion close the paper.

1 The last recent scientific information overview

Interest rates in converging economies are more unstable than in the euro area, hence interest rate risk in these countries is likely to be significantly elevated during periods of financial markets distress (Orlowski, 2010). Another problem is that national real interest rates can differ from the euro area average for considerable periods. The loss of monetary independence may imply differential transmission dynamics towards a common steady-state. This may result in sub-optimal economic stabilization and other costs, as the welfare implications of ultimately transitory yet persistent real interest rate differentials are unknown but significant (Arghyrou et al., 2009).

We should also discuss the role of monetary policy and its interest rates, even though the impacts of policy measures may be different during financial crises. Orlowski (2010) shows that changes in the euro area short-term interest rates strongly drive adjustments in the central banks' reference interest rates. Gerlach and Rudolf argue that monetary policy is typically formulated with a very short-term interest rate, while longer rates matter in the transmission mechanism. They show that financial market shocks impact less on the macroeconomy if policy is set with a longer rate. The financial crisis of 2007/08 according their opinion has shown that the market interest rate used the central bank to formulate monetary policy displays comparatively little variation in response to financial shocks (Gerlach – Rudolf, 2010).

Kasman et al. examine bank net interest margins in EU member countries. They use also bank-level data for all EU countries in the sample were obtained from the Bank-Scope database for period 1996 – 2006 (Kasman et al., 2010). It is logical that we cannot use bank-level data for period affected by financial crises to examine development of bank gross margins (it means credit profitability, render down), for the present (April 2010). Since prices and marginal costs may be affected differently by technical change, interest rates, the business cycle and other macroeconomic influences (Valverde – Fernandez, 2007), we interested in only on credit profit margin, as spread between lending rate and interbank offer rate.

2 Data and methodology

We use EURIBOR and PRIBOR as interest rate of the euro area and the Czech Republic interbank market respectively. The lending rate is defined as the interest rate of loans granted in three maturity categories of each country (short maturity < 1 year, medium maturity 1 – 5 years, and long maturity > 5 years). All data are used in a monthly frequency and cover the period from January 2004 to March 2010. All the data are taken from the European Central Bank and Czech National Bank online databases. Methods our used in this article are based on statistical testing. The empirical methods applied in the paper are standard and has been widely used in literature. Therefore, we do not provide a detail description of the methodology. The long-term interactions between the interest rates are examined using Johansen Cointegration Test. Next, the short-term interactions are analyzed using Granger Causality Test. All the empirical testing is processed in EViews 7 software package.

The majority owners companies of the Czech largest banks that dominate the Czech banking sector are presented in Table 1. The market shares are measured on total assets of the Czech banking sector as of August 2010. The numbers reported clearly show that the Czech banking sector is highly concentrated as more than 60% of the banking sector's assets are held by four largest banks.

Tab. 1: Concentration and ownership of the Czech banking sector

	Market	**Majority owner**
ČSOB	19.76%	KBC group, N.V.
Česká spořitelna	19.67%	Erste Group Bank,
Komerční banka	15.99%	Société Générale, S.A.
Unicredit bank	6.09%	Unicredit, S.p.A.
Total	**61.50%**	

Source: Authors calculation from the Czech National Bank Online Database.

3 Empirical results

3.1 Test for Stationarity and Cointegration Analysis

The first step in empirical analysis is testing for stationarity of the time series used. For this purpose, we applied the Augmented Dickey-Fuller Test (ADF). The results are reported in Table 2. When we made the first step, unit roots (using ADF tests on first difference level, intercept include in test equation), now we can make the Johansen System Cointegration Test.

We choose Intercept (no trend) in CE – no intercept in VAR, and choose 12 lags show long-runs between interest rates of loans and interbank interest rates (Table 3). Trace test together with Max-eigenvalue test indicates most often one cointegrating eqn(s) at the 5% level (at rejection of the hypothesis) with one and twelve lags.

Tab. 2: Unit root tests for loans and interbank interest rates

Loans interest rate	Loan maturity < 1 year		Loan maturity 1 < 5 years		Loan maturity > 5 years	
	level	*1st dif.*	*level*	*1st dif.*	*level*	*1st dif.*
Austria	–1.93	–5.23*	–1.91	–2.56**	–2.17	–2.06**
Belgium	–0.81	–6.03*	–0.84	–	–0.71	–3.80*
Czech Republic	–1.61	–10.17*	–2.12	–10.12*	–2.19	–13.33*
France	–0.50	–5.98*	–0.09	–6.88*	0.75	–10.73*
Italy	–1.26	–3.58*	–1.65	–2.71*	–2.00	-2.65*

Interbank interest rate	1 month		3 months		6 months		12 months	
	level	*1st dif.*	*level*	*1st dif.*	*level*	*1st dif.*	*level*	*1st dif.*
EURIBOR	–0.85	–4.86*	–1.42	–3.45*	–1.69	–3.20*	–1.76	–3.28*
PRIBOR	–1.12	–5.50*	–0.98	–5.28*	–1.44	–5.75*	–1.53	–5.86*

Source: Authors calculation.

Legends: * and ** means significance on 1 and 5% level.

3.2 Granger Causality Test

The Granger Causality Test approaches to the question of whether growth of the interbank interest rate causes growth of business loans lending interest rate. There is to see how much of the current change of growth of lending interest rate can be explained by past values of them and then to see whether adding lagged values of growth of interbank interest rate can improve the explanation. Change of corporate lending interest rate is said to be Granger-caused by change of interbank interest rate if change of interbank interest rate helps in the prediction of change of lending interest rate, or equivalently if the coefficients on the lagged change of interbank interest rates are statistically significant. Note that two-way causation is frequently the case: change of interbank interest rate Granger causes change of lending interest rate and change of lending interest rate Granger causes change of interbank interest rate.

It is important to note that the statement for example 'growth of interbank interest rate Granger causes growth of lending interest rate' does not imply that growth of lending interest rate is the effect or the result of growth of interbank interest rate. Granger causality measures precedence and information content but does not by itself indicate causality in the more common use of the term.

The null hypothesis is that change of interbank interest rate does not Granger-cause change of interest rate loans granted in the first regression and that change of loans interest rate does not Granger-cause change of interbank interest rate in the second regression (in rate of growth of course). For our example, we cannot reject the hypothesis that growth of lending interest rate does not Granger-cause growth of interbank interest rate but we do reject the hypothesis that growth of interbank interest rate does not Granger-cause growth of lending interest rate. Therefore it appears that Granger causality runs one-way from growth of interbank interest rates to growth of corporate lending interest rates in all our selected countries and not the other way (Table 4). [1]

[1] Theoretical basics of our used empirical methods are described in e.g. Econometrics Theory and Applications with EViews, Vogelvang (2005), or in EViews User Guides.

Tab. 1: Johansen Cointegration Tests

C	T	Long-run relationship	α	
AUSTRIA	Maturity < 1 year	AUS1 = 2.880435 α - 4.051611	EURIBOR 1m	
		(-0.44136) (-1.31815)		
		AUS1 = 0.919365 α + 1.416607	EURIBOR 3m	
		(-0.05269) (-0.17812)		
		AUS1 = NO COINTEGRATION	EURIBOR 6m	
		AUS1 = 0.292929 α + 3.441247	EURIBOR 12m	
		(-0.13144) (-0.46991)		
	Maturity 1 < 5 years	AUS5 = 2.375921 α - 2.843769	EURIBOR 1m	
		(-0.43694) (-1.36118)		
		AUS5 = 1.150072 α + 0.630052	EURIBOR 3m	
		(-0.17156) (-0.59157)		
		AUS5 = NO COINTEGRATION	EURIBOR 6m	*NO ME*
		AUS5 = -0.161107 α + 5.11165	EURIBOR 12m	
		(-0.18902) (-0.68973)		
	Maturity > 5 years	AUS5x = 2.085225 α - 2.12893	EURIBOR 1m	
		(-0.31272) (-0.98245)		
		AUS5x = 1.22264 α + 0.149927	EURIBOR 3m	
		(-0.19866) (-0.70631)		
		AUS5x = -0.251687 α + 5.431061	EURIBOR 6m	
		(-0.18689) (-0.67964)		
		AUS5x = 0.055015 α + 4.247469	EURIBOR 12m	
		(-0.10209) (-0.37361)		

C	T	Long-run relationship	α	
BELGIUM	Maturity < 1 year	BEL1 = 0.844793 α + 1.959344	EURIBOR 1m	
		(-0.06408) (-0.19653)		
		BEL1 = 0.755732 α + 2.077796	EURIBOR 3m	
		(-0.05479) (-0.18121)		
		BEL1 = 0.758705 α + 1.975985	EURIBOR 6m	
		(-0.06502) (-0.22381)		
		BEL1 = 0.737326 α + 1.945274	EURIBOR 12m	
		(-0.0762) (-0.27224)		
	Maturity 1 < 5 years	BEL5 = NO COINTEGRATION	EURIBOR 1m	*NO ME*
		BEL5 = NO COINTEGRATION	EURIBOR 3m	
		BEL5 = NO COINTEGRATION	EURIBOR 6m	
		BEL5 = NO COINTEGRATION	EURIBOR 12m	
	Maturity > 5 years	BEL5x = 0.255468 α + 4.022398	EURIBOR 1m	
		(-0.08602) (-0.28085)		
		BEL5x = 0.186726 α + 4.189036	EURIBOR 3m	
		(-0.06553) (-0.23084)		
		BEL5x = 0.135012 α + 4.351936	EURIBOR 6m	
		(-0.06146) (-0.22334)		
		BEL5x = 0.104005 α + 4.448615	EURIBOR 12m	
		(-0.06371) (-0.23832)		

C	T	Long-run relationship	α	
FRANCE	Maturity < 1 year	FR1 = 0.716905 α + 2.371966	EURIBOR 1m	
		(-0.01969) (-0.05972)		
		FR1 = 0.655589 α + 2.417773	EURIBOR 3m	
		(-0.01248) (-0.03989)		
		FR1 = 0.643033 α + 2.388303	EURIBOR 6m	
		(-0.01573) (-0.05158)		
		FR1 = NO COINTEGRATION	EURIBOR 12m	
	Maturity 1 < 5 years	FR5 = NO COINTEGRATION	EURIBOR 1m	
		FR5 = NO COINTEGRATION	EURIBOR 3m	
		FR5 = NO COINTEGRATION	EURIBOR 6m	
		FR5 = 1.565243 α - 0.767998	EURIBOR 12m	
		(-0.30841) (-1.07561)		
	Maturity > 5 years	FR5x = -53.68466 α + 176.1154	EURIBOR 1m	
		(-14.6822) (-46.8038)		
		FR5x = NO COINTEGRATION	EURIBOR 3m	
		FR5x = NO COINTEGRATION	EURIBOR 6m	
		FR5x = NO COINTEGRATION	EURIBOR 12m	

C	T	Long-run relationship	α	
ITALY	Maturity < 1 year	IT1 = NO COINTEGRATION	EURIBOR 1m	*2TS NO ME*
		IT1 = 1.163827 α + 1.656177	EURIBOR 3m	
		(-0.18937) (-0.63857)		
		IT1 = -1.806205 α + 12.04938	EURIBOR 6m	
		(-0.62512) (-2.22329)		
		IT1 = -0.567554 α + 7.706568	EURIBOR 12m	*2TS & 2ME*
		(-0.32462) (-1.1752)		
	Maturity 1 < 5 years	IT5 = 2.285244 α - 1.71618	EURIBOR 1m	
		(-0.46968) (-1.28743)		
		IT5 = NO COINTEGRATION	EURIBOR 3m	
		IT5 = NO COINTEGRATION	EURIBOR 6m	
		IT5 = NO COINTEGRATION	EURIBOR 12m	
	Maturity > 5 years	IT5x = 1.41982 α + 0.621151	EURIBOR 1m	
		(-0.13913) (-0.38452)		
		IT5x = 0.890963 α + 1.842301	EURIBOR 3m	*2TS & 2ME*
		(-0.01887) (-0.05978)		
		IT5x = 0.479529 α + 3.183922	EURIBOR 6m	
		(-0.08487) (-0.28429)		
		IT5x = 0.625605 α + 2.556912	EURIBOR 12m	
		(-0.05749) (-0.19681)		

C	T	Long-run relationship	α	
CZECH REPUBLIC	Maturity < 1 year	CZ1 = -0.063594 α + 3.612964	EURIBOR 1m	*2TS & 2ME*
		(-0.22616) (-0.63771)		
		CZ1 = 2.660549 α - 4.274428	EURIBOR 3m	
		(-0.57158) (-1.71953)		
		CZ1 = 3.877483 α - 8.317848	EURIBOR 6m	
		(-0.96407) (-3.02007)		
		CZ1 = 0.258072 α + 2.694928	EURIBOR 12m	*2TS & 2ME*
		(-0.12505) (-0.41026)		
	Maturity 1 < 5 years	CZ5 = 0.034718 α + 3.973353	EURIBOR 1m	
		(-0.15171) (-0.45335)		
		CZ5 = -0.242084 α + 4.839467	EURIBOR 3m	
		(-0.20065) (-0.63885)		
		CZ5 = -0.235067 α + 4.869282	EURIBOR 6m	
		(-0.19988) (-0.65769)		
		CZ5 = -0.098315 α + 4.454094	EURIBOR 12m	
		(-0.15636) (-0.53538)		
	Maturity > 5 years	CZ5x = NO COINTEGRATION	EURIBOR 1m	*2TS NO ME*
		CZ5x = NO COINTEGRATION	EURIBOR 3m	*2TS NO ME*
		CZ5x = NO COINTEGRATION	EURIBOR 6m	*2TS NO ME*
		CZ5x = NO COINTEGRATION	EURIBOR 12m	*NO ME*

C	T	Long-run relationship	α	
CZECH REPUBLIC	Maturity < 1 year	CZ1 = 1.182649 α + 0.522266	PRIBOR 1m	
		(-0.04483) (-0.11629)		
		CZ1 = 1.05379 α + 0.73579	PRIBOR 3m	
		(-0.02578) (-0.07195)		
		CZ1 = NO COINTEGRATION	PRIBOR 6m	*NO TS*
		CZ1 = 0.995796 α + 0.64893	PRIBOR 12m	
		(-0.02309) (-0.07066)		
	Maturity 1 < 5 years	CZ5 = NO COINTEGRATION	PRIBOR 1m	*NO ME*
		CZ5 = NO COINTEGRATION	PRIBOR 3m	*NO ME*
		CZ5 = NO COINTEGRATION	PRIBOR 6m	*NO ME*
		CZ5 = NO COINTEGRATION	PRIBOR 12m	
	Maturity > 5 years	CZ5x = 1.127474 α + 1.842147	PRIBOR 1m	
		(-0.103) (-0.27076)		
		CZ5x = NO COINTEGRATION	PRIBOR 3m	
		CZ5x = NO COINTEGRATION	PRIBOR 6m	
		CZ5x = NO COINTEGRATION	PRIBOR 12m	

Explanatory: *C* means country, *T* means type of interest rate loans (dependent variable), *α* is interbank rate (explanatory variable), *TS* means Trace test, *ME* means Max-eigenvalue test.

Source: Authors calculation.

Table 2: Pairwise Granger Causality Tests (2 Lags)

Interest rate in AUSTRIA (loan maturity < 1 y)	1m EURIBOR		**3m EURIBOR**		6m EURIBOR		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	30.9894	3.E-10	47.7995	**1.E-13**	46.0590	3.E-13	31.2854	3.E-10
Interest rate does not Granger Cause EURIBOR.		0.08263	0.9208	0.44468	**0.6429**	0.64314	0.5289	0.88641	0.4170

Interest rate in AUSTRIA (loan maturity 1 < 5 years)	1m EURIBOR		**3m EURIBOR**		6m EURIBOR		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	39.9837	4.E-12	43.3070	**1.E-12**	38.5330	8.E-12	27.2363	2.E-09
Interest rate does not Granger Cause EURIBOR.		0.50113	0.6081	1.29067	**0.2819**	1.30924	0.2769	1.64901	0.2001

Interest rate in AUSTRIA (loan maturity > 5 years)	1m EURIBOR		**3m EURIBOR**		6m EURIBOR		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	39.5682	5.E-12	46.5610	**2.E-13**	41.6745	2.E-12	30.3188	5.E-10
Interest rate does not Granger Cause EURIBOR.		0.06115	0.9407	0.18177	**0.8342**	0.25076	0.7790	0.60919	0.5468

Interest rate in BELGIUM (loan maturity < 1 y)	1m EURIBOR		3m EURIBOR		**6m EURIBOR**		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	27.7998	2.E-09	29.2464	8.E-10	29.8697	**6.E-10**	25.2441	7.E-09
Interest rate does not Granger Cause EURIBOR.		0.26357	0.7691	0.05863	0.9431	0.28270	**0.7547**	1.13017	0.3291

Interest rate in BELGIUM (loan maturity 1 < 5 years)	1m EURIBOR		3m EURIBOR		**6m EURIBOR**		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	7.95234	0.0008	15.5965	3.E-06	18.2342	**5.E-07**	15.1498	4.E-06
Interest rate does not Granger Cause EURIBOR.		1.00374	0.3720	0.21428	0.8077	0.27393	**0.7612**	0.43055	0.6520

Interest rate in BELGIUM (loan maturity > 5 years)	1m EURIBOR		3m EURIBOR		**6m EURIBOR**		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	6.02980	0.0039	8.57897	0.0005	10.5761	**0.0001**	9.08218	0.0003
Interest rate does not Granger Cause EURIBOR.		0.31118	0.7337	1.11006	0.3356	1.57675	**0.2143**	1.40310	0.2531

Interest rate in FRANCE (loan maturity < 1 y)	1m EURIBOR		3m EURIBOR		**6m EURIBOR**		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	19.9182	2.E-07	24.3661	1.E-08	26.3981	**4.E-09**	22.9325	3.E-08
Interest rate does not Granger Cause EURIBOR.		1.53361	0.2233	0.64491	0.5280	0.48952	**0.6151**	0.83159	0.4399

Interest rate in FRANCE (loan maturity 1 < 5 years)	**1m EURIBOR**		**3m EURIBOR**		6m EURIBOR		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	19.3597	**2.E-07**	19.7798	**2.E-07**	19.0572	3.E-07	14.3567	7.E-06
Interest rate does not Granger Cause EURIBOR.		4.11031	**0.0208**	3.14707	**0.0495**	3.00840	0.0562	2.33135	0.1051

Interest rate in FRANCE (loan maturity > 5 years)	**1m EURIBOR**		3m EURIBOR		6m EURIBOR		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	13.9037	**9.E-06**	13.4155	1.E-05	12.1751	3.E-05	9.60270	0.0002
Interest rate does not Granger Cause EURIBOR.		0.23644	**0.7901**	0.31285	0.7324	0.33995	0.7130	0.46342	0.6312

Interest rate in ITALY (loan maturity < 1 y)	1m EURIBOR		3m EURIBOR		**6m EURIBOR**		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	24.3343	1.E-08	35.6172	3.E-11	40.8697	**3.E-12**	29.1565	8.E-10
Interest rate does not Granger Cause EURIBOR.		0.54337	0.5834	1.31312	0.2759	2.98034	**0.0577**	3.49492	0.0361

Interest rate in ITALY (loan maturity 1 < 5 years)	1m EURIBOR		3m EURIBOR		**6m EURIBOR**		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	9.39920	0.0003	20.4266	1.E-07	26.9439	**3.E-09**	22.1809	4.E-08
Interest rate does not Granger Cause EURIBOR.		1.32270	0.2734	0.00606	0.9940	0.16740	**0.8462**	0.41558	0.6617

Interest rate in ITALY (loan maturity > 5 years)	1m EURIBOR		3m EURIBOR		**6m EURIBOR**		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	19.9669	2.E-07	24.2487	1.E-08	26.0105	**5.E-09**	22.4117	4.E-08
Interest rate does not Granger Cause EURIBOR.		0.55322	0.5777	0.06876	0.9336	0.03985	**0.9610**	0.20828	0.8125

Interest rate in CZECH REPUBLIC (maturity < 1 year)	1m PRIBOR		**3m PRIBOR**		6m PRIBOR		12m PRIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
PRIBOR does not Granger Cause interest rate.	71	4.34478	0.0169	9.44448	**0.0002**	8.41055	0.0006	5.83181	0.0047
Interest rate does not Granger Cause PRIBOR.		0.14546	0.8649	0.21450	**0.8075**	0.83900	0.4367	1.08363	0.3443

Interest rate in CZECH REPUBLIC (maturity 1 < 5 years)	**1m PRIBOR**		3m PRIBOR		6m PRIBOR		12m PRIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
PRIBOR does not Granger Cause interest rate.	71	5.26378	**0.0076**	4.69066	0.0125	3.76345	0.0283	3.17759	0.0481
Interest rate does not Granger Cause PRIBOR.		0.78012	**0.4625**	0.46598	0.6296	0.50310	0.6070	0.70618	0.4972

Interest rate in CZECH REPUBLIC (maturity > 5 years)	1m PRIBOR		**3m PRIBOR**		6m PRIBOR		12m PRIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
PRIBOR does not Granger Cause interest rate.	71	5.83148	0.0047	5.92945	**0.0043**	5.88383	0.0045	5.74708	0.0050
Interest rate does not Granger Cause PRIBOR.		1.03310	0.3616	0.69908	**0.5007**	0.15383	0.8577	0.20982	0.8113

Interest rate in CZECH REPUBLIC (maturity < 1 year)	1m EURIBOR		3m EURIBOR		**6m EURIBOR**		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	7.27863	0.0014	11.9127	4.E-05	12.6915	**2.E-05**	12.0266	4.E-05
Interest rate does not Granger Cause EURIBOR.		1.60785	0.2081	2.48389	0.0912	3.21352	**0.0466**	3.58076	0.0334

Interest rate in CZECH REPUBLIC (maturity 1 < 5 years)	1m EURIBOR		**3m EURIBOR**		6m EURIBOR		12m EURIBOR	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	5.03019	0.0093	6.07136	**0.0038**	5.60029	0.0057	5.54426	0.0059
Interest rate does not Granger Cause EURIBOR.		0.78346	0.4610	0.11327	**0.8931**	0.15320	0.8583	0.61146	0.5456

Interest rate in CZECH REPUBLIC (maturity > 5 years)	1m EURIBOR		3m EURIBOR		6m EURIBOR		**12m EURIBOR**	
Null Hypothesis:	Obs	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
EURIBOR does not Granger Cause interest rate.	71	4.28347	0.0178	3.60675	0.0326	3.90325	0.0250	4.44352	**0.0155**
Interest rate does not Granger Cause EURIBOR.		2.12060	0.1281	1.51313	0.2278	1.82510	0.1692	1.75577	**0.1807**

Note: The most significant relationships between interbank rates and interest rates of corporate loans are highlighted in bold.
Source: Authors calculation.

4 Discussion on empirical results

As we can see, both long-run and short-run causalities between interbank interest rates and interest rates on corporate loans do really exist. Johansen Cointegration Tests show us that long-run interactions does not exist between all categories of interest rates, but short-run interactions with Granger Causalities are proven between all.

Graphs in Appendix 1 depict the development of actual interest rates in the selected countries. During the time when the financial crisis is reflected in full, interbank rates decreased very quickly and then they are at low levels. It is caused by lower supply and demand and greater degree of risk in the money market. The development of lending interest rates differs across the maturity categories as well as countries. The Czech Republic is described twice in graphs, because we use two interbank rates. Obviously, we use the Czech PRIBOR but EURIBOR is also used as the reference interest rate for lending in the Czech Republic. Due to the categorization system used, the lending interest rate is sometimes lower than the interbank interest rate. It can be explained by the fact that this situation exists because in our three lending rate categories, there are less foreign currency loans.

Graphs in Appendix 2 depict the development of credit profit margins of banks. We define the credit margin like a difference between the interest rate on corporate loans of each category according to the loan maturity and the interbank interest rate respective for each country. In the case of the Czech Republic, we only report the credit margin calculated using PRIBOR rates. The paper suffers from unavailability of information on the total amount of loans granted in individual maturity categories in some countries. Hence, we are not able to recognize how important is each maturity category for the lending operations of banks and what´s the contribution of each category to the total profit margin. Nevertheless, one can see that all three measures of credit margins rise up during the period affected by financial crisis. Banks follow this way to avoid losses arising from providing bad (non-performing) loans.

It is impossible to report cash flows between the parent banks and their subsidiaries but correlations between interbank and loan interest rates show some interesting insights. Table in Appendix 3 contains the correlation coefficients between changes in the interbank interest rates and changes in the bank profit margin. We expect negative coefficients

because a growth of the interbank interest rate should cause a decrease in the profit margin. Interestingly enough, the correlation coefficients in the Czech Republic are not only much closer to zero than in remaining countries but some coefficients even reach positive values (especially for a combination of lending interest rates and PRIBOR). This demonstrates that the scope for margin payments between subsidiaries and their parent banks could actually exist.

Conclusion

The aim of the paper was to trace the relationship between interbank market interest rates and interest rates on loans for business companies, and also investigating profit margin of bank's active operations during the financial crisis.

In the first part of this paper we demonstrated long term causalities among some interest rates on corporate loans and interbank interest rates in all our selected countries. Short term causalities between all of interest rates do exist which means that interbank market affect to some extend lending rates also during the financial crises in these countries.

Next part of the paper aimed to demonstrate the opinion that foreign owners of the Czech largest banks could affect development of the Czech credit margin to secure a sufficient margin of the subsidiaries to offset their financial losses. Based on correlation values between interbank interest rates and bank credit margins we only demonstrated that it could be possible. Our results, although of incremental nature, prove that this problem makes sense and should be examined in more details in a forthcoming research. The next step could be the analysis of development of net banking margins using financial data of individual banks (taken e.g. from the BankScope database).

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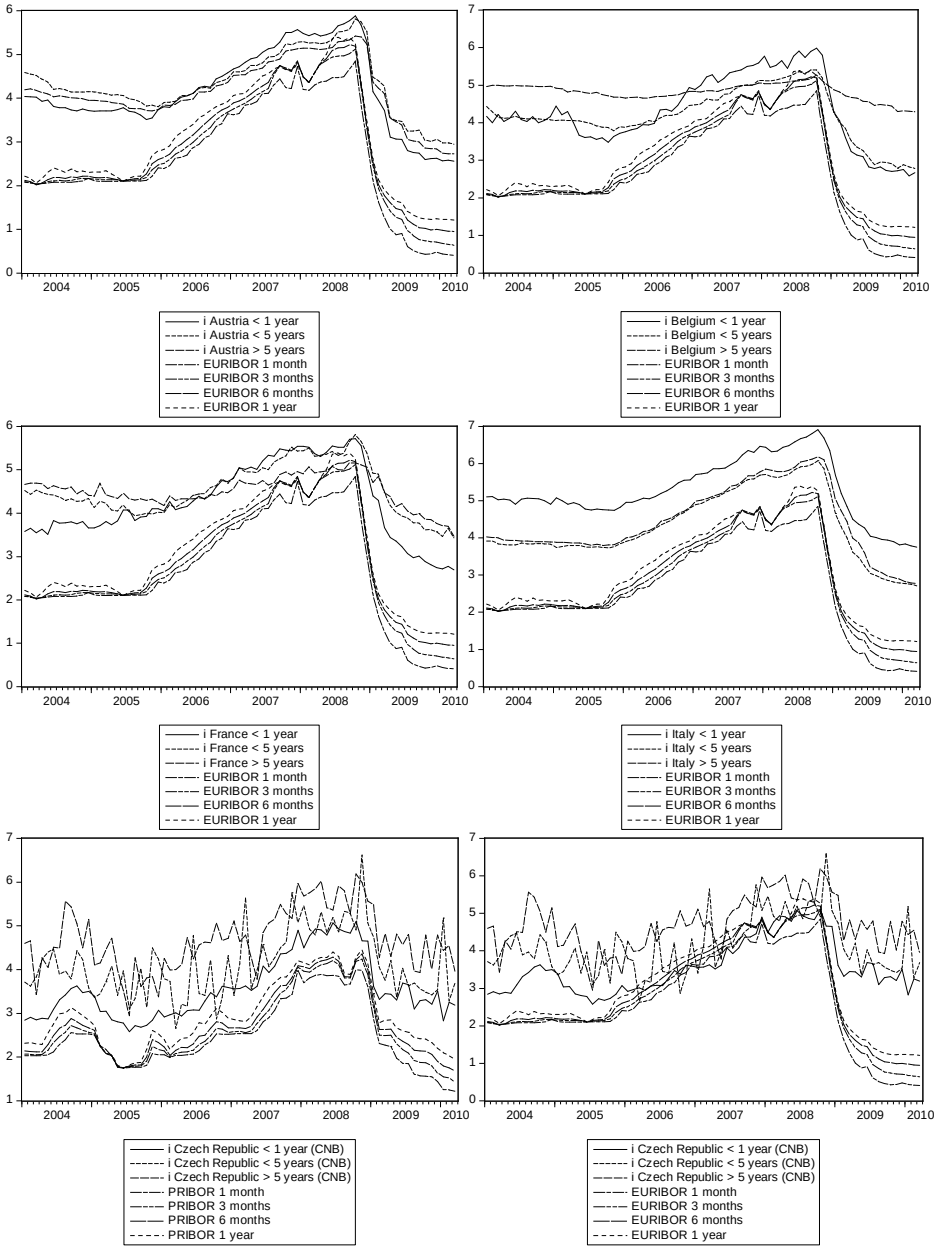
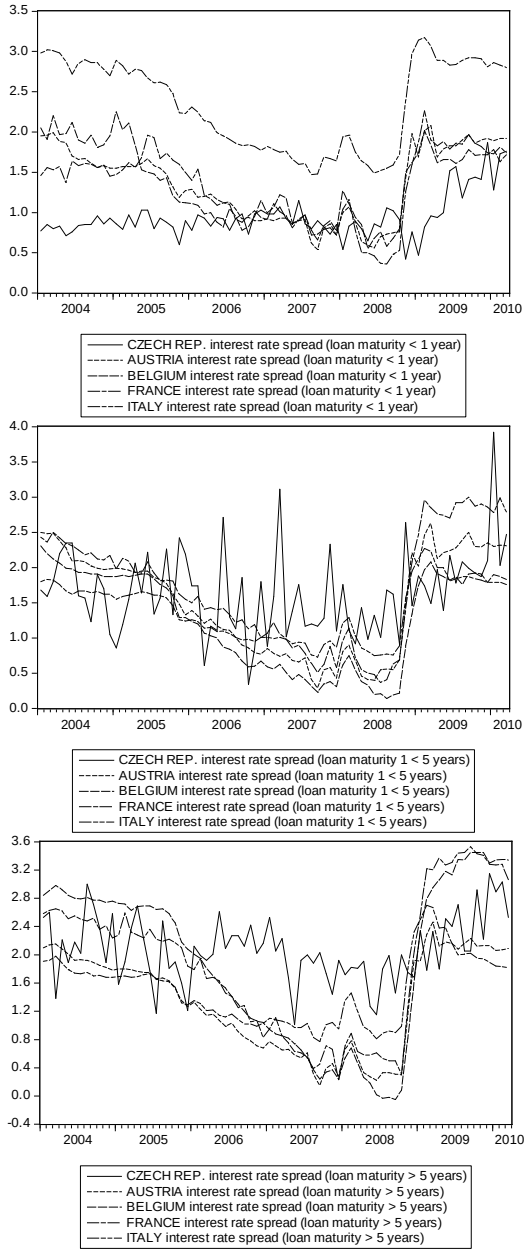
Appendix 1: Development of interest rates in the selected euro area countries and in the Czech Republic



Appendix 2: Development of credit margin (according to the loan maturity)



Appendix 3: Correlations between interbank interest rates and bank credit margins

	EURIBOR 1 month	*EURIBOR 3 months*	*EURIBOR 6 months*	*EURIBOR 12 months*
AUSTRIA margin (loan maturity < 1 year)	**–0.53**	**–0.58**	**–0.59**	**–0.58**
AUSTRIA margin (loan maturity 1 < 5 years)	**–0.63**	**–0.66**	**–0.68**	**–0.66**
AUSTRIA margin (loan maturity > 5 years)	**–0.74**	**–0.77**	**–0.77**	**–0.74**
BELGIUM margin (loan maturity < 1 year)	**–0.43**	**–0.45**	**–0.46**	**–0.44**
BELGIUM margin (loan maturity 1 < 5 years)	**–0.78**	**–0.84**	**–0.87**	**–0.87**
BELGIUM margin (loan maturity > 5 years)	**–0.90**	**–0.96**	**–0.98**	**–0.97**
FRANCE margin (loan maturity < 1 year)	**–0.59**	**–0.63**	**–0.65**	**–0.65**
FRANCE margin (loan maturity 1 < 5 years)	**–0.75**	**–0.79**	**–0.80**	**–0.77**
FRANCE margin (loan maturity > 5 years)	**–0.87**	**–0.83**	**–0.82**	**–0.78**
ITALY margin (loan maturity < 1 year)	**–0.69**	**–0.72**	**–0.75**	**–0.76**
ITALY margin (loan maturity 1 < 5 years)	**–0.70**	**–0.74**	**–0.77**	**–0.78**
ITALY margin (loan maturity > 5 years)	**–0.70**	**–0.72**	**–0.75**	**–0.76**
CZECH. REP. margin (loan maturity < 1 year)	**0.18**	**0.07**	**0.07**	**0.07**
CZECH. REP. margin (loan maturity 1 < 5 years)	**–0.12**	**–0.10**	**–0.09**	**–0.12**
CZECH. REP. margin (loan maturity > 5 years)	**0.04**	**0.00**	**0.00**	**–0.01**

	PRIBOR 1 month	*PRIBOR 3 months*	*PRIBOR 6 months*	*PRIBOR 12 months*
CZECH. REP. margin (loan maturity < 1 year)	**–0.01**	**–0.19**	**–0.23**	**–0.23**
CZECH. REP. margin (loan maturity 1 < 5 years)	**–0.17**	**–0.10**	**–0.08**	**–0.09**
CZECH. REP. margin (loan maturity > 5 years)	**0.06**	**0.00**	**–0.03**	**–0.02**

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How Related are Interbank and Lending Interest Rates? Evidence on Selected European Union Countries

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ABSTRACT

This paper investigates the nature of the causal relationships among interbank market interest rates and corporate loans interest rates in four countries from the euro area (Austria, Belgium, France and Italy), and in the Czech Republic. The paper also estimates a development of bank credit margin in banking industries of these countries in period from January 2004 to March 2010. Using Johansen cointegration and Granger causality tests on monthly data we investigate long-term as well as short-term causalities between the interest rates. The results suggest that interest rate relationships differ in all selected countries, and also that foreign majority owners of the Czech banks could affect interest rate policy of the subsidiaries to offset losses realized by the parent banks.

Key words: Cointegration; Granger Causality; Interbank Interest Rates; Lending Interest Rates; European Union.

JEL classification: C32, E40, E43, E52, F36.