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Investment credit availability – bank enterprise relations in Poland

Abstract

The complaints about insufficient private investment are frequent in Poland. Equally often we do hear the criticism of the monetary policy pointing to excessively high interest rates. This paper estimates the speed of upward adjustment of loan rates relative to downward adjustment, accounting for different market segments and products. The empirical results show that for the investment credit upward adjustment is fast, but downward adjustment essentially does not occur. Consumer credit products demonstrate positive values for the speed of both adjustments although still upward changes occur faster than downwards ones. These findings suggest that banks may tend to discriminate entrepreneurs against other types of borrowers. This type of strategy can be only sustainable under insufficient competition or with the behavioral parallelism among the banks.

Keywords: banks, transition, credit rationing.
JEL Classification: G21, G28, P34.

Introduction

As demonstrated by Demirguc-Kunt, Laeven and Levine (2003) in a cross-section survey of countries, concentration is positively and significantly linked with the net interest margins, even controlling for bank specific and country specific factors. However, high degree of concentration is not necessarily equivalent to lower levels of competition. Some researchers suggest that concentration results from more efficient and faster growing banks taking over the less efficient and less rapidly expanding ones. Thus, the alternative hypothesis states that markets become more concentrated precisely due to higher competition accompanied by constantly improving efficiency (Berger and Hannan, 1989). In this case, however, collusion and behavioral parallelism are neglected as potential underpinnings.

Tracing the concentration-retail interest rates nexus, Corvosier and Gropp (2001) analyzed a sample of 10 EU countries for which detailed data about the credit and deposit were offered as well as market shares were available. They found that higher concentration results in collusion – the more concentrated the banking market is, the higher the margins on both deposits and credits are. However, in case of savings and long-term deposits the results were opposite, which may be justified by the differences in the switching costs as well as the availability of information. Nevertheless, some form of boosting the price of banking products following from concentration seems robust across countries and across time in Western Europe.

In this paper we attempt to address the case of Poland with the following motivation. On one hand, one clearly observes private investment relatively low by European and OECD standards – this is rather unexpected in a relatively fast developing transition economy. On the other hand, credit unavailability is always among top concerns of the entrepreneurs, while consumer lending including mortgage is booming. With a history of non-performing investment loans in the beginning of transformation, one could justify this by poor quality of entrepreneurial debtors. However, currently the quality of loans does not fall short of the standard EU values. At the same time, qualitative research suggests that some forms of credit rationing may be observed among banks in Poland, especially vis-a-vis small and medium sized enterprises, SMEs (Akiba and Lisowska, 2006). The main channels were identified as restraining from developing evaluation techniques suitable for SMEs and requiring high or inadequate collateral.

Unfortunately, replicating the studies by Corvoisier and Gropp (2001) or Demirguc-Kunt, Leaven and Levine (2003) is not possible, as the availability of Polish data in this respect is incomparably poorer. This paper resorts to a different approach. We analyze whether the responses of banks to changes in the cost of capital are symmetric. We find that in the short run banks essentially do not respond in investment loans rates to decreases in interest rates. Moreover, this process has no ergodic properties (no mean reversion). When the behavior of investment and consumer loan rates is compared, the latter process seems to exhibit mean reversion patterns within six to seven months after an initial shock, while the asymmetry is significantly less intense than in the case of loans to the entrepreneurs. While suggesting discrimination, these results may be explained on the grounds of behavioral parallelism or insufficient competitive pressure[1]. In the second

[1] In this paper, following Buccirossi (2006) collusion (a cooperation agreement) is distinguished from parallel behavior. In a model of price competition with differentiated products in which demand and costs vary over time Buccirossi demonstrates that in some cases perfect parallel pricing is compatible only with a competitive equilibrium, and therefore provides some evidence that firms did not collude. In addition, the competitive equilibrium is characterized by a higher market share stability than a collusive equilibrium in this framework.

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approach the cointegrating relation between collected deposits and assigned credit is sought in attempt to verify whether shortage of competition can be held responsible for the discriminatory practices. The findings suggest that little or no links can be found between deposits and credits on both sectoral and bank levels.

The paper is organized as follows. Next section discusses the origins and subsequent developments in the Polish banking sector. We further develop a model suitable for analyzing the symmetry of the response to a shock and estimate long-run and short-run equilibria of the investment credit interest rate stochastic processes (ECM) trying to identify their determinants. We also proceed with a second model employed in this paper, linking deposit and credit policies on the basis of implicit market structures. The last section concludes the paper.

1. Polish banking system

The reform of the banking system was one of the most significant steps in originating the transition from centrally planned to market economy. Prior to 1989, banking system was only a part of the command system where interest rates were set administratively and so there were the directions and the policies with reference to credit and deposit activities. Except for the National Bank of Poland (which combined some of the central bank and commercial bank characteristics) four specialized banks not competing with each other operated in the banking system[1]. As of 1989, National Bank of Poland played the role of central bank, while all its over 400 divisions and commercial operations were taken over by 9 newly created banks. In addition, the regulations concerning opening new banks were relaxed in order to allow entry[2]. In 2001 there were as many as 75 commercial banks operating in Poland, out of which one was state-owned and two had state in the role of majority owner. Among ten largest banks in Central and Eastern Europe, five were based in Poland, two of which hold the first and second positions in the ranking[3].

Available data suggest that over the last decade concentration has increased significantly. In 1993, for over a half of the bank population the biggest holding was smaller than 50% (on average it amounted to 28%). Banks with only one shareholder constituted approximately 1/3 of the population. Six years later banks managed through a minority holding constituted only 18% of the population, with average holding increasing to 45% of shares. The majority of the banks (over 56%) have a majority owner (controlling more than 75% of shares). Within the same period the number of banks has dropped by 12%[4].

This progressive concentration may be inferred from both concentration indices and interest spreads by commercial banks. First, with the eventual relaxing of monetary policy, spreads on investment credits (as measured by the differential between credit and deposit rates of the same duration) have increased drastically. This is depicted in Figure 1. An average credit rate was glued to the central bank discount rate until January 2001, while subsequently the credit and simultaneously deposit spreads grew (upper left graph). Since second half of year 2001 credit rate has remained on a disproportionately high level.

Table 1. Number of commercial banks

Type of bank	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Majority state ownership	29	29	27	24	15	13	7	7	7	5	3	2	1
Majority private ownership	58	53	54	57	68	70	70	67	65	63	55	47	37
Polish ownership	48	42	36	32	39	31	20	17	13	9	6	6	5
Foreign ownership	10	11	18	25	29	31	29	47	48	41	38	35	31

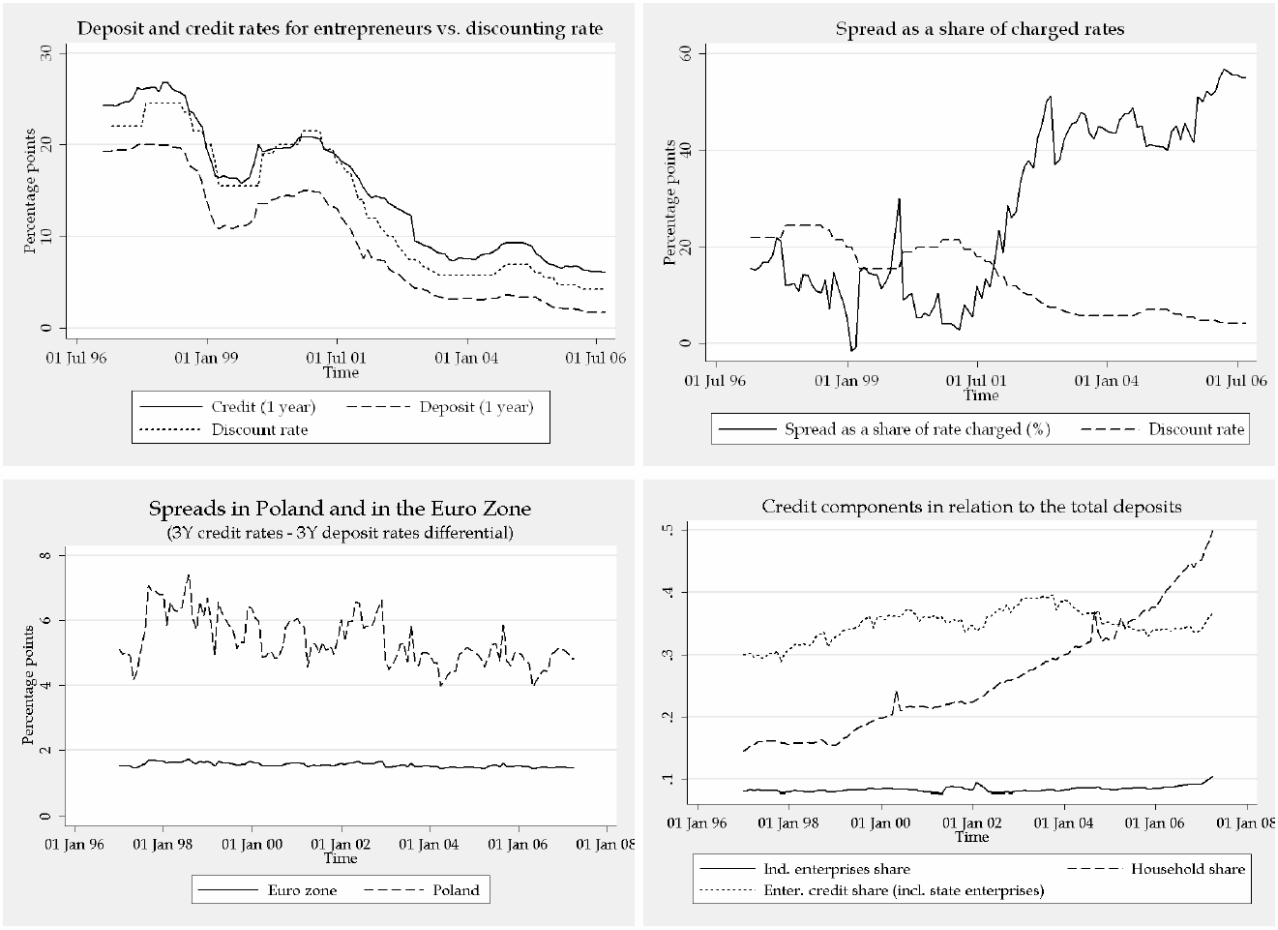
Note: without banks undergoing the bankruptcy procedures or liquidation.
Data source: Central Bank of Poland (NBP).

[1] One bank served international commercial operations, the second one specialized in private international operations, the third one collected private deposits and the last one practically conducted no operations between 1945 and 1989. In addition, in 1987 National Bank of Poland, Ministry of International Cooperation, Ministry of Finance, two of the already existing banks and foreign trade agencies originated a fifth bank to provide mutually needed services. All these banks continued operations as universal banks following the transition, enjoying the first mover advantage. In addition, there were 1663 small mutual banks, serving the needs of local farmers and/or artisans.

[2] Banks can operate as state-owned, mutual or private institutions, once necessary capital and facilities are gathered – the license was initially awarded by the President of the central bank and subsequently this prerogative was allocated to the Superintendence of the Banking System.

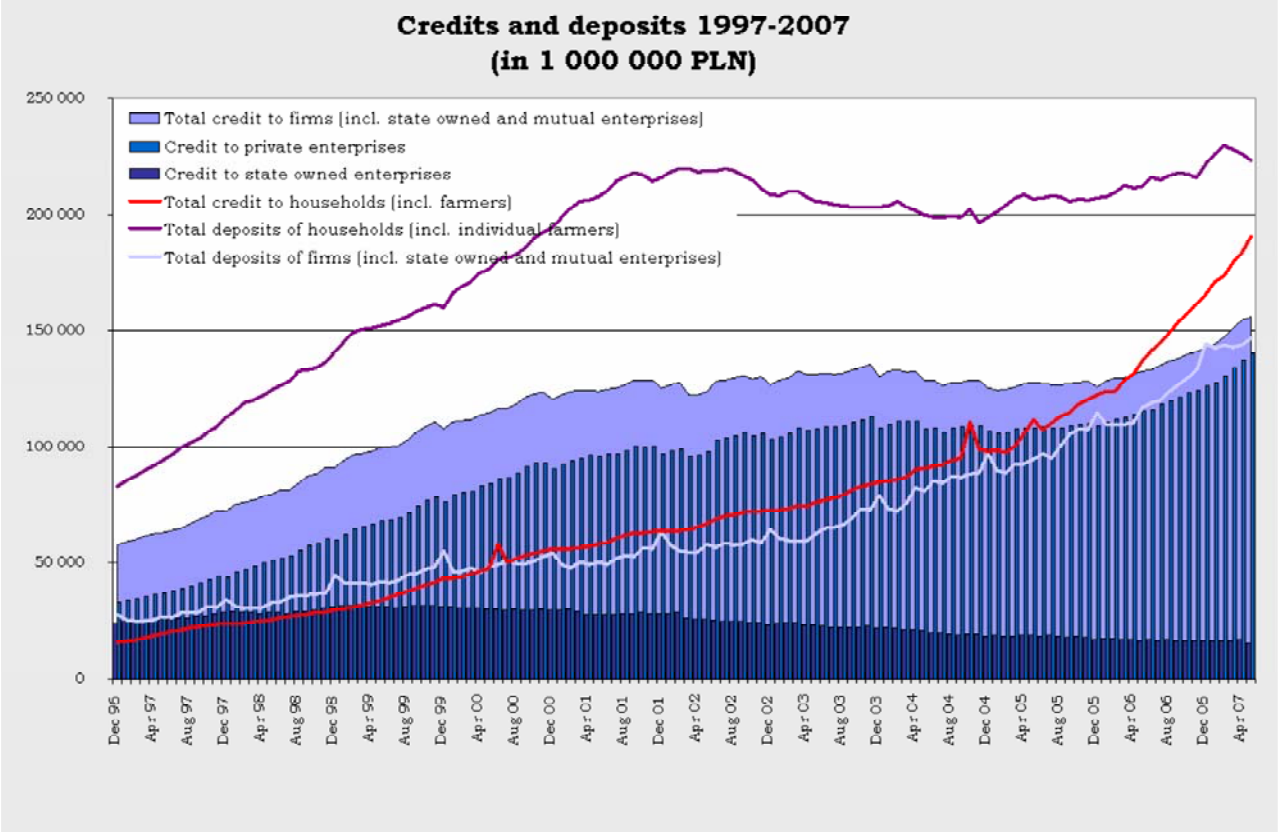
[3] Measured by both the size of deposits acquired and the amount of loans granted. See: KBC 2003 report to the stockholders.

[4] Cfr. Kopczewski, Pawlowska, Rogowski (2000).



Data source: NBP and ECB.

Fig. 1. Developments in the Polish banking sector



Data source: NBP.

Fig. 2. Creditors and lenders in the Polish banking sector

Although performing any verifications of economic causality would be methodologically doubtful given the data limitations, higher concentration and higher spreads undoubtedly coexist in time suggesting at the very least a decreasing degree of competition in the Polish banking sector. Similar conclusion can be made basing on the relation between spread and effective economy interest rates, i.e. considering obligatory reserve rates and systemic risk (upper right graph). Spreads in Poland are related to WIBOR (Warsaw Interbank Offering Rate) corrected for reserve ratio. As of 2001 a definite change in trend is visible. Although this is the moment of an economic slowdown in Polish economy, similar outlooks characterized Euro Zone economies. Thus, even though systemic risk might have risen in this period due to the slowing down of the economy, one seems to find little justification for this range of change. This measure evidently underestimates the systemic risk in Polish economy, nonetheless, it seems a fair indication of changes thereof (lower left graph). Polish spreads show definitely higher variation than in the Euro Zone, but also pertain to astonishingly high levels, remaining in a fairly stable band of 4-6 percentage points for the past five years[1].

Finally, as depicted by the graph in the lower right panel, consumer credit has consistently become more important use of deposits allocation. Over the past seven years, the share of consumer credit has risen from 15% to over 35%, while no changes can be observed in allocations to small and medium enterprises. Large enterprises, among which state-owned are, becoming less important due to the progress of privatization, maintained a regular increase of approximately 5 percentage points over this period. Interestingly, as depicted in Figure 2 household credits growth rate by far exceeds deposits growth rate. Consequently, households' deposits and credit levels are currently becoming increasingly alike. At the same time, despite vivid economic growth, entrepreneurs have become net lenders.

Small and medium enterprises in Poland (among which individual enterprises outnumber all other types, providing employment to nearly 25% of working age population) are at the core of Polish economic recovery after 1989. The rapid growth of SMEs was initially financed from private uninstitutionalized savings and remittances. This trend has continued despite the gradual development of the banking sector. However, some researchers point to the fact that currently most of SMEs are financially constrained due to purposeful credit policy choices by most of the banks. Following the survey among 11 biggest Polish banks in early 2005[2] by Akiba and Lisowska (2006) the channels of this institutional credit rationing are identified to include restraining from developing evaluation techniques suitable for SMEs[3] or requiring high or inadequate collateral. Surveys demonstrate that purposefully required collateral is set in order to discourage SMEs. In internal guidelines banks perceive a bill of exchange as only quasi-guarantee. Similarly, submission to bank enforcement title, although regularly stipulated by credit contracts, is not highly priced by the banks. What the banks value is the mortgage on industrial property (not residential, while SMEs rarely possess their own real estate or it is hardly separable from the property of the firm owner), followed by registered pledge on machinery (with the assignment of rights from the insurance contract), assignment of receivables and pledge on stock. Finally, they typically force transfer of ownership (to be withheld and/or used several times).

Table 2. Panzar and Rosse estimates of market structure competitiveness

Study	Commercial banks	Retail banks	Corporate banks	Total
Pawlowska (2006):				
Poland 1997-1999	0.78	0.72	0.61	0.70
Poland 1999-2003	0.49	0.64	0.45	0.51
Hungary 1997-2003	n.a.	n.a.	n.a.	0.65
Czech Republic 1997-2003	n.a.	n.a.	n.a.	0.58
Gelos and Roldos (2002): 1994	n.a.	n.a.	n.a.	0.54
Claessens and Laeven (2003): 1994-2001	n.a.	n.a.	n.a.	0.77

Notes: hypotheses of perfect competition (H = 1) and monopoly (H = 0) are rejected at 0.1% confidence levels. The difference between 1997-1999 and 1999-2003 estimates is statistically significant at 0.01% level. Gelos and Roldos (2002) and Claessens and Laeven (2003) base on BANKSCOPE data. Pawlowska (2006) bases on the whole of the Polish banking sector. Data for Hungary and Czech Republic are basing on BANKSCOPE data.
Source: Pawlowska (2006), Gelos and Roldos (2002), Claessens and Laeven (2003).

[1] Because these patterns hold, in the following analysis we assume that even though the cost of credit to bank cannot be measured externally, directions of changes may be proxied by some economic indicators external to the bank itself (e.g., central bank's interest rates, interbanking rates or sector-wide deposit rates).

[2] Combined market shares of these 11 banks exceed 70% both in credit and in deposit markets.

[3] In Poland, SMEs enjoy less demanding accounting standards under tax regulations (namely, they are entitled to a lump sum tax and/or allowed to maintain inflow/outflow ledgers instead of complete accounting documentation). Consequently, contemporary computerized evaluation methods cannot be applied to a majority of SMEs. In addition, these advantages are essentially at the expense of a credit tax shield.

Such discriminating policies are only sustainable if other banks fall short of the competitive pressure. In the analysis based on Panzar and Rosse (1987) methodology, Pawlowska (2006) demonstrated that perfect competition hypothesis is unanimously rejected for Polish banking sector as a whole as well as for each of the separate groups of banks. These findings are consistent with Gelos and Roldos (2002) as well as Claessens and Laeven (2003), but extend the bank sample beyond BankScope as well as account for bank specialization.

The extent of competitive pressure within Polish banking sector is becoming less intense over time, while monopolistic competition seems to be characteristic for CEECs as a whole. Nonetheless, collusion hypothesis seems rather unlikely. First of all, following Bikker (2004) and Hempell (2002) this conclusion can be extended to Europe at large, while Panzar and Rosse estimates for EU countries all fall into the range of 0.55 for Spain to 0.89 for Belgium. As suggested by empirical analyses, it is rather the hypothesis of behavioral parallelism that finds support in data. Banks tend to replicate the same pattern not because an agreement has been made between them, but because such behavior guarantees the highest payoffs subject to effort minimization criterion (Akibe and Lisowska, 2006).

2. Asymmetry of the response to a shock

Some analysts claim that increasing the credit rates immediately after the central bank decision to raise the interest rates constitutes already a proof for uncompetitive market structure. However, prices in competitive markets should reflect the opportunity cost of the inputs and not the accounting cost of acquiring it, which makes this argument easy to dismiss. On the other hand, an asymmetry in the response time (immediate in the case of increases and delayed in the case of decreases) provides a strong proof for the claim of insufficient competition.

To estimate the rate at which prices adjust to changes in the underlying fundamentals, we assume a simple linear long-run relationship between central bank interest rates and the cost of credit, $R = \phi_0 + \phi_1 C$, where R and C denote the credit rate charged and the cost of capital, respectively. While we recognize that the adjustment is not instantaneous, we assume that the adjustment function is time-invariant during our sample period and is monotonous in the absolute magnitude of the change in the interest rates. Defining $\Delta C_t = C_t - C_{t-1}$ and $\Delta R_t = R_t - R_{t-1}$ the adjustment could be modeled as:

$$\begin{aligned}
\Delta R_t^t &= \beta_0 \Delta C_t \\
\Delta R_{t+1}^t &= \beta_1 \Delta C_t. \\
&\vdots \quad \vdots \\
\Delta R_{t+n}^t &= \beta_n \Delta C_t,
\end{aligned}$$

where the superscript on ΔR indicates that it is solely the change resulting from the period t change, and n is the number of periods it takes for retail prices to complete adjustment to the period t change[1].

Under these assumptions, the total change in retail prices in any period t will depend on the price changes in the previous n periods.

$$\Delta R_t = \Delta R_t^t + \Delta R_t^{t-1} + \Delta R_t^{t-2} + ... + R_t^{t-n} = \sum_{t=0}^{n} \beta_i \Delta C_{t-i}. \quad (1)$$

This equation, however, imposes symmetric responses in the case of decreases and in the case of increases. Recognizing that the processes of increases and decreases can differ in nature is the crucial part of the model.

Therefore, it is refined to:

$$\begin{aligned}
&\Delta R_t^t = \beta_0 \Delta C_t && \Delta R_t^t = \gamma_0 \Delta C_t \\
&\Delta R_{t+1}^t = \beta_1 \Delta C_t. && \Delta R_{t+1}^t = \gamma_1 \Delta C_t. \\
&\quad . \quad . && \quad . \quad . \\
&\quad . \quad . && \quad . \quad . \\
&\quad . \quad . && \quad . \quad . \\
&\Delta R_{t+n}^t = \beta_n \Delta C_t, && \Delta R_{t+n}^t = \gamma_n \Delta C_t, \\
&if \ \ \Delta C_t > 0. && if \ \ \Delta C_t \le 0.
\end{aligned} \quad (2)$$

Defining $\Delta C_t^+ = \max\{\Delta C_t; 0\}$ and $\Delta C_t^- = \min\{\Delta C_t; 0\}$ the adjustment of retail credit prices may be rewritten as:

$$\Delta R_t = \sum \left(\beta_t \Delta C^+ + \gamma_t \Delta C^- \right). \quad (3)$$

This specification adapts model by Borenstein, Cameron and Gilbert (1992) to the banking sector. The main innovation of this paper is that we distinguish among the products offered by the banks. Apart from the investment loans, banks also offer liquidity credits to firms as well as a variety of credit products to consumers (e.g., mortgages, credit cards, holiday loans, etc.). Consequently, one might ask whether the response patterns are alike among the segments of the market and products. To be able to account for this, we consider different bank products and attempt to distinguish both the time of the response and its magnitude.

2.1. Empirical specification. A number of econometric issues must be addressed before proceeding

[1] For the purpose of clarity we ignore here the systematic drift in the interest rates in Poland. However, we do control for it in the econometric specification.

with estimation of an equation similar to (3)[1]. Concerning the restrictions imposed on the lag response pattern, the additive lag structure allows for non-monotonicity, thus stipulating little implicit requirements. It also allows for a certain intertemporal independence that may be non-standard. For instance, if the interest rate increases by 25 base points in month *t* and decreases by the same amount in month *t* + 1, this model would not necessarily cause the direction of adjustment to reverse when the interest rate does. The retail price could continue to rise in month *t* + 1[2]. This contrasts with a standard partial adjustment model and advocates in favor of additive lag structure.

The real challenge is to provide a method allowing distinguishing between responses to positive and negative price shocks. Bacon (1991) tests for asymmetry in adjustment rates by including a quadratic term in the adjustment process:

$$R_t - R_{t-1} = \beta_1(\phi_0 + \phi_1 C - R_{t-1}) + \beta_2(\phi_0 + \phi_1 C - R_{t-1})^2, \quad (4)$$

so that the test of $\beta_2 = 0$ is the test of whether adjustments to increases and decreases occur equally quickly. However, this approach is essentially equivalent to a partial adjustment model, imposing equal proportional adjustments towards the new equilibrium in all periods after a shock to interest rates. Furthermore, Bacon's method for diagnosing asymmetry with a quadratic term imposes a structure on the asymmetry, implying that the asymmetry becomes proportionally larger as the difference between the current retail price and the long-run equilibrium price increases. On the other hand, the principle advantage of the partial adjustment model over the lag adjustment model presented above is that equation (3) neither takes account of the long-run relationship between the prices of the upstream and downstream goods, nor incorporates the tendency to revert towards that relation.

To address these problems, we estimate equation (3) as an error correction model (ECM). The error correction term is the one-period lagged residual from the regression:

$$R_t = \phi_0 + \phi_1 C_t + \phi_2 MO_t, \quad (5)$$

where MO_t is a time trend. The monthly regression is therefore given by:

$$R_t - R_{t-1} = \theta_0 + \sum_{i=0}^{n}(\beta_i \Delta C_{t-i}^{+} + \gamma_i \Delta C_{t-i}^{-}) + \\ + \theta_1(R_{t-1} - \hat{\phi}_0 - \hat{\phi}_1 C_{t-1} - \hat{\phi}_2 MO_t). \quad (6)$$

The constant term included accounts for the fact that the margins may have systematically changed during our sample period, either due to deflation or any other factors. Evidently, this specification is not a canonic form error correction model due to the $\sum_{i=o}^{n}(\beta_i \Delta C_{t-i}^{+} + \gamma_i \Delta C_{t-i}^{-})$ decomposition on the right hand side. However, the asymptotic properties of the estimates are unlikely to be affected by this deviation (Verbeek, 2001). The drawback of applying this methodology is that the results obtained are difficult to interpret in economic terms – it is not possible to state by how much is the cost of credit inflated as a byproduct of the insufficient competitive pressure.

The last potential econometric obstacle is the problem of endogeneity. Does the credit policy of the commercial banks influence the decisions of the monetary authority? As long as the analysis of the central bank official decision criteria is concerned, this does not seem to be the case. However, one may not exclude this option over the whole sample due to the young age of this institutional design. For example, excessive consumption and consumption credit were identified officially as main reasons for increasing interest rates in the second half of 2000 by the monetary authorities. Thus, endogeneity seems to introduce potentially serious problems from the technical point of view. At the same time, it is a problem without any solution. In this specification, using lagged variables as instruments may not be considered while no other potential instruments arise.

Summarizing, equation (5) reflects the long-run equilibrium, while the ECM form equation (6) describes the adjustment dynamics. The constant term in this equation informs about the part of the deviation corrected within one period. Further, the error correction term suggests whether one can effectively talk about a cointegration in this respect, while β's and γ's assess the symmetry of the response to the change in the underlying fundamentals.

2.2. Data and results. Data used in this section are taken from the Central Bank of Poland and cover the time span of December 1996 to April 2007. This is a period of gradual inflation rate decreases. Despite some temporary economic slowdowns no recession occurred over the entire period. Thus, it would be difficult to identify any systemic sources of credit risks justifying the reluctancy of banks to engage in lending activity.

In the analysis we employed monthly observations on reported credit interest rates for different types of loans of differentiated durations (one to three and more years). Low frequency data are used for

[1] The issues we discuss here arise during the estimation of all downstream price transmissions. Extensive literature on pass-through mechanisms may serve as a good example.

[2] This would occur if $\beta_t > \gamma_{t-1}$.

two main reasons. First, some stickiness in the rates charged is forced by institutional arrangements[1]. It seems worth to emphasize that investment credit rates we used in these models are not the official rates put in advertisement leaflets or commercials, but effective yields earned on given credits. Thus, we observed de facto bank behavior. Second, unlike higher frequency data, these time series are publicly available, which makes it feasible to replicate the findings.

For the same reason, throughout this section the modelling relies mainly on aggregate banking system data. If some patterns of response to a shock in upstream prices prove to be characteristic for sector as a whole, results could be interpreted as a general tendency within the system. If no statistically significant patterns are found either the expected pattern does not exist or banks are so differentiated in their individual responses that on average the effect cancels out. This study would benefit significantly if individual bank data could be used, mainly due to the fact that there might persist significant discrepancies in the behavior[2]. Unfortunately, bank-specific data are not accessible for the whole sector. When possible, the analysis employs data from BANKSCOPE to provide more insights.

For each of these series we constructed a model as described by equation (6). Since this model is based by definition on changes and not on levels, seeking a proxy for C one can resort to variables that should in principle reflect the directions of changes in the cost of capital available for lending. These variables include: the central bank's interest rate, WIBOR and the costs of deposits (i.e., the deposit rate). None of these measures should be identified directly with the cost of capital to the banks, but they may be considered as a reasonable indication of changes thereof[3]. All these are taken on annual basis with durations adequate to the loans analyzed and corrected for the obligatory reserve rates. The conclusions remain essentially unaffected by the choice of proxy. The results for investment credit are presented in Table 3.

Table 3. Short- and long-term investment credit as a dependent variable (LR equilibrium)

A: Short-term investment credit (sectoral data)						
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Monthly trend	-0.05***	-0.03***	-0.04***	-0.04***	0.007*	0.04***
CB's interest rates	0.73***					
Obligatory reserves	-0.14*		-0.22		-0.31	
Effective CB' rates		0.71***				
WIBOR			0.85***			
Effective WIBOR				0.88***		
Deposit rates					1.07***	
Effective deposit rates						1.28***
Constant	7.96***	7.64***	5.43***	5.76***	4.77***	2.76**
AIC	227.2	212.6	228.1	211.8	216.9	208.7
N_0 of observations	124	124	124	124	124	124
F-statistics	1529.4	1570.7	1704.4	1822.9	1981.9	1888.9
B: Long-term investment credit (sectoral data)						
Monthly trend	-0.07***	-0.04***	-0.05***	-0.05***	0.03*	0.02**
CB's interest rates	0.65***					
Obligatory reserves	-0.12*		-0.11		0.08	
Effective CB' rates		0.66***				
WIBOR			0.77***			
Effective WIBOR				0.79***		
Deposit rates					1.01***	

[1] Namely, clients need to be notified in advance of how much they are expected to pay in the next installment.

[2] Small banks specializing in some segments of the market follow different monetary and economic signals than large universal banks strategically giving preference to one segment of the market over another due to country-wide rentability and foreign headquarters guidelines. Observing individual banks effect could help to answer whether such a diagnosis is correct and thus provide more precise and adequate estimates of the behavioral patterns. Gambacorta (2004), for example, finds on a sample of Italian banks that the size is never relevant for pricing strategies, while the pass-through heterogeneity depends mostly on liability structure.

[3] One could suggest that a direct measure of the cost of capital should be applied. However, little data are available in this respect. Despite some efforts to apply Capital Asset Pricing Model to the banking sector (Kochaniak, 2003), analyses are based on relatively low quality data and burdened with the limitations following from the assumption about the benchmark. Equity cost or required risk of return (measures obtained so far in the literature) do not reflect the cost of mobilizing deposits but the ability of a bank to make produts on its current operations, which is not of interest here.

Table 3 (cont.). Short- and long-term investment credit as a dependent variable (LR equilibrium)

Effective deposit rates						1.19***
Constant	11.6***	9.33***	5.43***	5.76***	4.86***	2.76**
AIC	196.2	182.9	196.8	178.4	197.1	181.2
N_0 of observations	124	124	124	124	124	124
F-statistics	1003.5	1485.8	1805.9	1912.9	2185.4	1704.9
C: Long-term investment credit (bank level data)						
Monthly trend	-0.06***	-0.04***	-0.04***	-0.04***	0.03***	0.02**
CB's interest rates	0.61***					
Obligatory reserves	-0.10		-0.09		0.05	
Effective CB' rates		0.72***				
WIBOR			0.78***			
Effective WIBOR				0.84***		
Deposit rates					1.03***	
Effective deposit rates						1.24***
Constant	9.33	8.76***	5.21***	5.33***	4.12***	3.14**
AIC	111.33	108.3	113.4	107.1	117.2	108.2
N_0 of observations	1736	1736	1736	1736	1736	1736
F-statistics	8763.5	8951.8	8599.9	9112.6	9885.4	9706.2

Notes: in panels A and B GLS estimation with Newey-West estimates of error terms are presented. All variables are I(1). Residuals are found to be I(0). In panel C there are random effects GLS panel estimators with Newey-West estimates of error terms (random effects confirmed by Hausman test). All series are found to be I(1), the panel version of ADF test rejected I(1) in residuals. WIBOR durations are 12 months for panel A and 3Y for panels B and C. Central bank interest rate refers to a discount rate of a 12-month duration. Deposit rate refers to a sector wide deposit rate in all panels, with durations of 12 months for panel A and 3Y for panels B and C.
***, ** and * denote statistical significance at 1%, 5% and 10% levels respectively.
Data source: Central Bank of Poland (NBP) for panels A and B, and BANKSCOPE for panel C.

Obligatory reserves are mostly insignificant, confirming the general observation that compulsory reserves are only a minor part of banks actual capital adequacies measures. In columns (1) and (2) central bank's discount interest rate is used as a proxy for the capital cost. Columns (3) and (4) demonstrate a similar effect if WIBOR is used as the capital cost proxy. As we may observe, the short-term investment credit rates (1 year) consistently decrease in time (negative coefficient by *Monthly trend* variable). However, this is mainly due to general lowering of interest rates in time. This is especially evident in the results in columns (5) and (6), where deposit rate proxies the cost of capital to the banks. The sign of *Monthly trend* variable turns positive and statistically significant. This may be interpreted as a support for the claim of increasing spreads, as previously suggested. Furthermore, since deposit rates are far below economy observed interest rates, coefficients in columns (5) and (6) exceed unity.

Since all variables in this model are non-stationary, results of this regression cannot be interpreted in terms of causality (although the residuals were found to be I(0) for all series, suggesting that they cointegrate well). Consequently, an error-correction model (ECM) is estimated with residuals of this regression as an error correction term. For clarity, only results from columns (2), (4) and (6) were used, as no significant economic differences between augmented and straight proxies of capital cost may be observed, while the former exhibit better statistical properties (lower values of AIC). Results are presented in Table 4.

Table 4. Short-run dynamics in investment credit rates

A: Short-term investment credit (sectoral data)			
Independent variables	(1)	(2)	(3)
Constant	-0.07	-0.07	-0.08
ΔC^+	0.29***	0.27***	0.26**
ΔC^-	-0.03	0.02***	0.04
Error correction term	0.22***	0.54***	0.69***
R^2	0.24	0.29	0.38
N_0. of observations	122	122	122
F-statistics	4.98***	6.22***	70.39***
B: Long-term investment credit (sectoral data)			
Constant	-0.07	-0.02	-0.08*
ΔC^+	0.35***	0.30**	0.31**
ΔC^-	-0.05	0.05	0.06
Error correction term	0.17***	0.32***	0.65***
R^2	0.22	0.27	0.38
N_0. of observations	122	122	122
F-statistics	3.91***	4.73***	8.97***
C: Long-term investment credit (bank level data)			
Constant	-0.11	-0.28	-0.11

Table 4 (cont.). Short-run dynamics in investment credit rates

ΔC^+	0.31***	0.34**	0.35**
ΔC^-	-0.11	0.15	0.08
Error correction term	0.22***	0.45***	0.74***
R^2 within	0.21	0.27	0.31
R^2 between	0.44	0.47	0.48
N_0 of observations	1612	1612	1612
F-statistics	41.9***	48.3***	55.7***

Notes: in panels A and B GLS estimation with Newey-West estimates of error terms are presented. All variables are I(0). Panel C presents random effects GLS panel estimators with Newey-West estimates of error terms (confirmed by Hausman test).
***, ** and * denote statistical significance at 1%, 5% and 10% levels respectively.
Data source: Central Bank of Poland (NBP) for panels A and B and BANKSCOPE for panel C. BANKSCOPE data should not be considered representative for the whole sector – in the case of Poland some important banks were not included over some periods of time.

Columns (1), (2) and (3) present results for central bank's interest rate, WIBOR and deposit rates, respectively. Constant insignificance suggests that the adjustment process is far from rapid, with virtually no change within the first month after departure from the long-run trends. This should be interpreted as a very slow equilibrium reversion pattern. Error correction term is statistically significant, while its positive sign suggests persistence above the long-term equilibrium.

The short-term investment credit interest rates seem to react in no way to interest rate decreases (ΔC^- coefficient is insignificant) in the short run, while an immediate reaction to increases in interest rates is strongly confirmed. Since ΔC^+ variables take the value of change in interest rates when it is positive and zero otherwise, investment credit becomes immediately more expensive when market conditions deteriorate. On the other hand, improvement in the market conditions seems to have no impact in the short run[1]. This observation is consistent with the asymmetric response hypothesis.

So far the results demonstrate that banks do not respond – or only marginally respond – to decreases in the economy-wide interest rates when setting investment credit rates. Identical models for consumer credit rates were estimated. The results are presented in Tables 5 and 6.

Table 5. Short- and long-term consumer credit as a dependent variable (LR equilibrium)[1]

A: Short-term investment credit (sectoral data)						
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Monthly trend	-0.11***	-0.13***	-0.14***	-0.14***	0.01*	0.04***
CB's interest rates	035***					
Obligatory reserves	-0.14*		-0.12		-0.19	
Effective CB' rates		0.47***				
WIBOR			0.91***			
Effective WIBOR				0.94***		
Deposit rates					1.22***	
Effective deposit rates						1.29***
Constant	15.22***	14.94***	15.87***	16.69***	24.18***	27.87**
AIC	255.1	212.6	262.6	201.5	246.7	203.2
N_0 of observations	124	124	124	124	124	124
F-statistics	1619.4	1750.5	1788.4	1825.3	1984.5	1888.9
B: Long-term investment credit (sectoral data)						
Monthly trend	-0.09***	-0.08***	-0.09***	-0.11***	0.03*	0.06**
CB's interest rates	0.44***					
Obligatory reserves	-0.11*		-0.10		0.07	
Effective CB' rates		0.56***				
WIBOR			0.68***			
Effective WIBOR				0.77***		
Deposit rates					1.11***	
Effective deposit rates						1.31***

[1] One could suggest that a direct measure of the cost of capital should be applied. However, little data are available in this respect. Despite some efforts to apply Capital Asset Pricing Model to the banking sector (Kochaniak, 2003), analyses are based on relatively low quality data and burdened with the limitations following from the assumption about the benchmark. Equity cost or required risk of return (measures obtained so far in the literature) do not reflect the cost of mobilizing deposits but the ability of a bank to make produts on its current operations, which is not of interest here.

Table 5 (cont.). Short- and long-term consumer credit as a dependent variable (LR equilibrium)

Constant	12.8***	19.5***	25.4***	25.8***	34.6***	37.6**
AIC	187.6	163.9	189.8	172.1	187.1	171.4
N_0 of observations	124	124	124	124	124	124
F-statistics	1111.3	1238.2	1408.5	1519.2	1806.4	1854.7
C: Long-term investment credit (bank level data)						
Monthly trend	-0.05***	-0.07***	-0.09***	-0.10***	0.01***	0.02**
CB's interest rates	0.62***					
Obligatory reserves	-0.10		-0.43		0.06	
Effective CB' rates		0.78***				
WIBOR			0.85***			
Effective WIBOR				0.96***		
Deposit rates					1.23***	
Effective deposit rates						1.44***
Constant	16.3***	18.5***	25.5***	28.5***	29.1***	33.4**
AIC	154.1	143.3	152.4	137.6	149.2	138.2
N_0 of observations	1736	1736	1736	1736	1736	1736
F-statistics	8555.5	8992.5	8609.4	8805.6	8886.5	8733.6

Notes: in panels A and B GLS estimation with Newey-West estimates of error terms are presented. All variables are I(1). Residuals are found to be I(0). Panel C presents random effects GLS panel estimators with Newey-West estimates of error terms (random effects confirmed by Hausman test). All series found I(1), the panel version of ADF test rejected I(1) in residuals.
WIBOR durations are 12 months for panel A and 3Y for panels B and C. Central bank interest rate refers to a discount rate of a 12-month duration. Deposit rate refers to a sector wide deposit rate in all panels, with deposit durations of 12 months for panel A and 3Y for panels B and C.
***, ** and * denote statistical significance at 1%, 5% and 10% levels respectively.
Data source: Central Bank of Poland (NBP) for panels A and B and BANKSCOPE for panel C.

Obviously, the consumer credit rates are higher than those observed throughout the banking sector for the investment financing (constant estimators are consistently higher than for investment credit data, while these differences are statistically significant). This reflects the differences in the risk associated with these two segments, suggesting that banks are able to adequately evaluate and assess the risk. Conversely, the estimators of monthly trend in columns (1)-(4) are significantly higher and in columns (5) and (6) are significantly lower for consumer credit than for the investment credit. This seems to suggest that more rapid reactions to changes occur in the consumer credit rates while spreads grew slower in this segment of the market. To estimate ECM as in the case of investment credit, the residuals from columns (2), (4) and (6) were considered (AIC values again proved lowest pairwise). Results are reported in Table 6.

Table 6. Short-run dynamics in consumer credit rates

A: Short-term investment credit (sectoral data)			
Independent variables	(1)	(2)	(3)
Constant	0.15***	0.17***	0.16***
ΔC^+	0.29***	0.27***	0.28**
ΔC^-	0.13***	0.15***	0.24***
Error correction term	0.22***	0.45***	0.59***
R^2	0.11	0.16	0.327
N_0. of observations	122	122	122
F-statistics	4.85***	5.47***	8.12***
B: Long-term investment credit (sectoral data)			
Constant	0.17***	0.16***	0.18***
ΔC^+	0.30***	0.30***	0.31***
ΔC^-	0.15***	0.16***	0.18***
Error correction term	0.27***	0.28***	0.26***
R^2	0.16	0.17	0.18
N_0. of observations	122	122	122
F-statistics	5.19***	6.54***	7.98***
C: Long-term investment credit (bank level data)			
Constant	0.11***	0.12***	0.11***
ΔC^+	0.33***	0.37***	0.35***
ΔC^-	0.14***	0.19***	0.18***
Error correction term	0.27***	0.48***	0.55***
R^2 between	0.57	0.62	0.68
R^2 within	0.27	0.33	0.34
N_0. of observations	1612	1612	1612
F-statistics	84.5***	92.8***	95.1***

Notes: in panels A and B GLS estimation with Newey-West estimates of error terms. All variables are I(0). In panel C random effects GLS panel estimators with Newey-West estimates of error terms (confirmed by Hausman test).
***, ** and * denote statistical significance at 1%, 5% and 10% levels respectively.
Data source: Central Bank of Poland (NBP) for panels A and B and BANKSCOPE for panel C.

For consumer credits, constant is positive and significant – reversion to equilibrium occurs within six to seven months (the rate of approximately 15% per month). Both decreases and increases in economy interest rates have significant impact on the rates charged from the clients. This suggests that the consumer credit segment is far more responsive to the changes in capital cost. Comparing ΔC^+ and ΔC^- coefficients reveals that asymmetry occurs even within this segment of the market – banks respond more to increases than to decreases in underlying fundamentals.

Comparing results for consumer and investment credit rates, the former seem to be far more responsive, while the latter exhibit no equilibrium reversion pattern and no reaction to the decreases in the proxies of capital cost. This may be interpreted as a suggestion of implicit discrimination of entrepreneurs. For strategic reasons, banks seem to implement some form of rationing the capital to the firms – some explanation for this phenomenon may be provided by the lazy-banking hypothesis (Banerjee and Dufflo, 2004)[1], consistent with the behavioral parallelism claim.

2.3. Credit-deposit nexus. If a bank fails to maintain a close link between deposits and the allocated credits, with the efficient interbanking market, it would immediately induce the reverse disequilibrium in another bank (or many other banks partially). However, any bank can only afford the discrepancy between the volumes of credits and deposits knowing that either its structure is being mimicked by others or no other bank will pose it a threat on the 'short' position. Lack of links between the volumes of credits and deposits – especially on the aggregate level of the entire sector – may thus be interpreted in terms of insufficient competition.

This reasoning is developed based on Monti-Klein model of a monopolistic bank[2], which finds that if interest rates increase, both credit rates and deposit rates may increase[3]. In particular, deposit and credit rates are not directly interlinked[4]. Recall that Polish banks were found to respond differently to decreases and increases in the interest rates. Although counterintuitive, this result is fully explainable on the grounds of Monti-Klein model of monopolistic bank[5]. In general, prediction of this model can be summarized as follows: deposit and loan volumes should cointegrate in time. This conclusion provides theoretical grounds for the empirical analysis.

We use monthly data for 1996-2005 on a panel of Polish banks. The data were taken from Central Bank of Poland. Model under scrutiny is best described by:

$$\Delta Credits_t = \alpha + \beta \Delta Deposits_t + \varepsilon_t,$$

where ε_t is the error term. First differences were used instead of levels, as original time series were found to be non-stationary.

The hypothesis of monopolistic market structure sector implies that one should expect $\beta = 0$ as a null hypothesis. Rejecting it is equivalent to stating that credits granted and deposits accepted are related to each other, thus suggesting a competitive environment. Should we find β close to unity, we could claim that market outcome is close to perfectly competitive one. Results are presented in Table 7.

Table 7. Changes in loans as function of deposits in Polish banking sector

Independent variables	(1)	(2)
Constant	803.87**	801.23**
ΔDeposits	0.45***	0.48***
R^2	0.32	0.31 (between)
No. of observations	100	587
F-statistics	12.13***	45.82***

Notes: cointegration of first order differences of deposits and loans, robust standard errors. All variables are I(0) stationary. Neither autocorrelation, nor heteroscedasticity found in the cross-sectoral sample, while errors in panel data were robustly estimated. Residuals are determined to be I(0).
In panel regression, bank ID is used as a grouping variable. Random effect results (confirmed by Hausmann test).
***, ** and * denote statistical significance at 1%, 5% and 10% levels respectively.
Data source: Central Bank of Poland (NBP).

Column (1) describes results on aggregate data and column (2) reports panel data results. Estimates are not statistically significantly different across specifications. Both regressions have satisfying statistical properties. Estimates by ΔDeposits variable are

[1] One could also suggest that the consumer credit segment is probably also more profitable, as screening in the case of credit cards or a debit line on private accounts happens automatically as a function of the historical record of a client. Thus, it neither requires case-by-case due diligence, nor understanding of the business outlooks in differentiated sectors of economy as well as analyzing historical balance sheets.

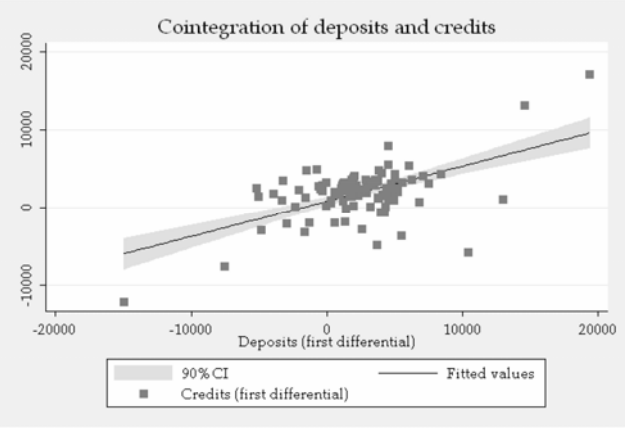
[2] More specifically, a bank is confronted with an upward sloping upply of deposit curve and downward sloping demand for loans curve. The main assumption of this model is that bank decides about quantities of deposits accepted and loans granted, rather than the prices of both. This assumption appears reasonable especially in the case of credits, as these are accorded on case by case basis and not by a general rule of interest rate. It is further necessary to assume that the cost of capital (r) is external to bank (either set by a central bank or determined on international capital markets, i.e. bank is a price-taker of inputs).

[3] See Freixas and Rochet (2002), p. 59 for a proof.

[4] See Freixas and Rochet (2002), p. 47 for a proof.

[5] However, Elyasiani et al. (1995) demonstrate on a sample of American banks that the portfolio separation feature does not accurately characterize bank. Namely, they find that in the presence of simultaneous adjustment costs the banking system loan demand and deposit supply responses to changes in monetary policy are likely to be both lagged and intertwined, resulting in complicated adjustment paths for both the deposit and loan rates. Furthermore, these costs may also influence the optimal size of banking firms and thus the competitive make-up of different banking markets.

positive and seem to be highly statistically significant, thus dismissing the suggestion of uncompetitive market structure. However, graphical representation of these results seems to corroborate rather than undermine the findings of the first model discussed earlier in the paper.



Source: own calculations.

Fig. 3. Relation between deposits and loans

Figure 3 shows that a positive slope of the fitted line (with the angle of approximately 45 degrees) follows solely from a small number of outlying observations. Other than that, the cloud of observations indicates no particular slope, suggesting no cointegration of the series[1]. The extreme negative values of loans and deposits are very difficult to explain in a stable economy – such drastic decreases in volumes of loans and credits are characteristic to credit crunches or currency crises, none of which occurred in Poland in recent years. The very high positive values suggest credit booms associated with deposit booms in the same period – in this study the period is as short as one month (!) – which occur contemporaneously rather seldom in any type of economy. Summarizing, the application of Monti-Klein model to Polish data has confirmed the initial finding of some form of uniform behavior in the Polish banking sector.

Conclusions

In this paper we have addressed a potentially vital problem of the Polish economy. We leave aside the question of bank operating profitability as well as sector stability. Instead, we focus on the extent to which banks may play the role of capital provider to the entrepreneurs (investment credit). In particular we analyze the question of availability of credit with considerable attention devoted to possible discrimination between consumers and entrepreneurs. The privatized sector of commercial banks may actually be one of the inhibitors of faster economic growth. We compare the investment and the consumption credit finding that banks (as firms themselves) have certain preferences among the borrowers, effectively rationing one group at the expense of the other.

We first analyzed whether the responses of banks to changes in the cost of capital (as proxied by differentiated indicators) are symmetric. We observed that in the short run banks essentially do not respond in their investment loans rates to decreases in interest rates. Moreover, this process has no ergodic properties (no mean reversion). We have also analyzed the behavior of the consumer loans rates, finding that for the latter market segment this stochastic process reverts to a long-run equilibrium (within some six to seven months after an initial shock) while the asymmetry is definitely less intense than in the case of entrepreneurial offers.

This study has some limitations following from the nature of problem addressed or data available. Two of these limitations seem to challenge the results mostly.

First of all, Kishan and Opiela (2002) argue that with differentiated population of banks the individual effects may cancel out, turning the aggregate estimates insignificant, thus advocating in favor of using bank-specific data. Whenever possible, this recommendation was implemented. Nonetheless, more micro-level analysis seems necessary in order to disentangle bank-specific effects from the sectoral trends. Elyasiani et al. (1995) and Gambacorta (2003) demonstrate that the adjustment costs may simultaneously influence bank deposit and loan choices, while interest rates with different durations may respond differently across banks depending on the liquidity and capitalization of the banks as well as the duration and convexity of their credit portfolio. All these dimensions could not be explored in this study for the reasons of data availability. The fact that random effects are confirmed in all panel estimations may indicate that heterogeneity may be large indeed. On the other hand, within R2 estimates are fairly high, suggesting that a group of market leaders seems to conform to a uniform pricing strategy.

Secondly, in the paper these findings are attributed to a Banerjee and Dufflo (2004) "lazy banking" basing on discrimination policies hypothesis consistent with behavioral parallelism claim. One could argue, however, that inflexibility of corporate credit when compared to consumer credit should be analyzed in the context of the adverse selection problem assessed as pervasive in the case of Poland. The cost of capital differs across banking products and is considerably higher for investment credits where screening involves considerably more effort than in the case of consumer credits. Nonetheless, since by

[1] Unfortunately, most outliers' tests are not feasible in the case of panel analysis, while identifying them on aggregate data has little applications.

definition banks are institutions specialized in dealing with this sort of diligence, we consider them to be equipped in know-how and tools to solve problems of asymmetric information and moral hazard (Van Cayselee, 2001). Thus, in an efficient institutional design competitive pressure would result in developing dedicated tools for evaluation in all segments of the market. Qualitative analyses (Akiba and Lisowska, 2006) suggest that this is not the case and some segments of borrowers are consistently forgone by the banking sector.

What typically guarantees that entrepreneurs are not forced to compete for capital with consumers is bank specialization. However, in a system populated mostly by universal financial intermediaries, with even mortgage services provided by retail banks, there is little economic rationale for setting up specialized institutions in the discriminated and more demanding segments of the market. Therefore, it seems that without an external incentive scheme this outcome is likely to continue.

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