Justifiable Thrift or Feverish Animal Spirits: What Stirred the Corporate Credit Crunch in Poland?

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Abstract

This paper concerns the problem of corporate credit in Poland and tries to determine the sources of banks' unexpected hesitance to provide enterprises with additional liquidity, which was observed during the global financial crisis. It differentiates between fundamental and non-fundamental determinants, which – when combined – reconstruct the course of events that led to the slowdown. A special attention is devoted to variables believed to be behavioral and theoretically inconsistent with the conventional belief of how lending activities are coordinated. A structural vector autoregression (SVAR) is run and impulse response functions are produced to provide a numerical support for the developed theoretical framework.

Keywords: Corporate credit, credit crunch

1. Introduction

The current credit crisis has reminded decision makers of the essential role performed by credit institutions in supplying capital to the economy, principally under financial distress. No major economy is capable of prospering without credit facilities. On the basis of their own resources, enterprises may expand only to a limited extent. According both to the Polish press and to the foreign-based journalists, Eastern European markets generally steered clear of the crisis and the textbook credit crunch did not happen. However, the plain fact is that some form of retrenchment took place.

The research question is formulated clearly: what led to the corporate loans being choked off in a relatively remote economy, far from collateralized debt obligations, where banks did not find themselves anywhere near the verge of bankruptcy and the government did not have to manually safeguard the sector from collapse. In other words, the challenge is to define where the seeds for the crunch were planted, categorize those "seeds" as fundamental or behavioral, and try to apprehend whether these short-term driving forces may potentially differ from the conventional regressors in a long-term model.

The paper is organized as follows. The first section contains introductory material, along with the review of recent literature. The second section is devoted to data analysis and the mechanisms which links the stylized facts with corporate credit volumes. In the third section, behavioral dimension is examined. The fourth section presents and interprets estimations of the structural model's equations. The last section concludes.

1.1. Origination of the Crunch

The crisis was sparked by the collapse of the U.S. subprime mortgages in mid-2007, and continued to affect other countries and markets over the course of the following years. The channels, through which the disease has been streamlined, were the securitized bonds, held by many banks and insurers across the developed world. Lenders essentially sold the debt, including the most insidious subprime mortgages (mortgage-backed securities), almost straight away to the big Wall Street banks. Millions of these mortgage debts were pulled together, into deceiving collateralized debt obligations (CDOs), which, being highly overvalued by rating agencies in a way that did not mirror their actual risk, were later sold on to investors. Meanwhile, in many parts of the United States, house prices were slipping, undermining the value of the collateral (Foley, 2007). A harsh contraction in the availability of bank credit was a direct outcome of this unsustainable environment.

By contrast, neither Japan nor most of emerging markets suffered substantial direct impact. Only a handful of banks in these countries had any exposure to subprime mortgages or junk securities. Virtually no one held them in Poland. Thus, in a way, emerging economies paradoxically benefited from their own backwardness. But in relative terms, the credit crunch, or at least slowdown, took place in the emerging economies as well. It was unquestionably not an aftermath of overinvesting in financial innovations, but rather the effect of decreased demand for exports and limited access to external funding (Brzoza-Brzezina and Makarski, 2010: 8). The country's economic landscape instructs that Poland is less prone to a credit crunch and more prone to a plunge in external demand. (Brzoza-Brzezina and Makarski, 2010: 40).

1.2. Background of the Domestic Slowdown

In general, the credit crunch moved outward from rich-world financial centers in the second half of 2008. By which channels the crisis radiated out from the well-developed economies and exacerbated into a sort of nerve-racking disease in Poland?

The crunch of 2009 did not emerge as an unexpected shock. But its magnitude confused not only the optimists. The corporate lending decreased by more than 4 percent throughout the 2009 and, what is more, failed to improve its standing throughout the whole 2010, while decreasing further by 1.6 percent. Lending in foreign currencies was even more affected. The only major bank that overcame the widespread aversion and managed to sustain the growth in corporate lending was the fully Polish "national champion" PKO BP (Więcław, Kurasz and Stypułkowski, 2011), which undermines the allegedly stabilizing role played by the foreign banks. In each quarter in 2008 and 2009 PKO BP issued from 2 to 4 bn PLN of new corporate loans (Bratkowski and Myjak, 2009: 25-26). No doubt that this significantly alleviated the impact of the contraction. However, the Polish Financial Supervision Authority (Komisja Nadzoru Finansowego, later referred to as KNF) has made it clear that only one third of Polish banks have reduced lending, while the other ones have not. This, though, may not hold for corporate lending exclusively (Bratkowski and Myjak, 2009: 6).

Among fears that foreign-based parent banks, being in trouble, would drain their Polish affiliates from capital resources, the KNF decided to employ a repelling strategy, and warned foreign affiliates that any attempt to transfer disproportionately high portion of profit abroad, will result in counteractions forged by the KNF. However, contrary to those fears, these were foreign institutions which substantially increase their engagement in Poland. The intention might be to stimulate lending activity, but more probably the bulk of money from abroad was designed to take advantage of higher interest rates in Poland.

Figure 1: Net foreign assets in the Polish banking industry. Negatives indicate that the outflows are overwhelmed by inflows.

Source: National Bank of Poland.

Apart from considerable share of foreign players in the Polish banking sector, its another interesting feature is excess liquidity. Typically, even a small-scale depression, in the age of economy understood as a system of communicating vessels, may trigger a chain reaction and spread quite efficiently, e.g. through the banks' liquidity constraints, with all its consequences. However, due to excess liquidity, this danger might be alleviated in Poland, as pointed out by Pietrzyk (2005), Pietryka (2010), Wilkowicz (2011a), and indirectly also by Grodzicki, Hałaj and Żochowski (2010: 21), who remind that most of Polish banks are foreign-owned and, when in need, may effortlessly obtain extra funding. Undeniably, the liquidity remained lavish even during the crunch, since banks were able to invest much in debt instruments. However, the situation of individual banks might have been highly polarized.

Re-entering into the main topic, the magnitude of collapse was most notable in operating loans (decrease by 10.5 percent), while there was a slight rise in investment and real estate credit, by 0.9 percent and 2.8 percent respectively. However, one must notice that the latter are typically long term and the sustained growth might result from the release of consecutive stages of financing, while the credits themselves had been accepted yet before the crisis broke out.

In 2010, when the initial panic has evaporated, the situation still resembled a deadlock, caused by the mismatch between supply side and demand side preferences. Those who might be issued a credit, did not need to apply for it, whereas those who desperately needed it, did not meet banks' sophisticated criteria. The press wrote that it is "credit clench" which substituted credit crunch (Twaróg, 2010). In response to this situation, enterprises started to accumulate capital and either postpone investments or finance them with their own funds. Banks, on the contrary, struggled to drain the swamp of unwanted excess liquidity by crediting local government entities (Olczak, 2010). A deficient substitute in the long run.

According to the Polish Financial Supervision Authority (2010: 13) the demand-led factors were central. The available data concerning the policy of domestic enterprises indicate the reduction of both firms applying for credit (from 38 percent in 2Q 2008 to 19 percent in 2Q 2009), and entities planning to do so (from 36 to 25 percent, respectively). The regulatory body seems to overlook, however, that the reduced demand might be prompted by the increased cost of credit, already known to (or anticipated by) enterprises before submitting an application. Moreover, it is usually assumed in corporate credit that demand-side factors are less prevailed, since enterprises are usually interested in acquiring additional liquidity. This is in line with Wdowiński's (2011) finding that increased NPLs decrease the demand for consumer credit, but respective deterioration in corporate credit does not produce analogical reaction of corporates. As a side note, one may reminder that it is more often than not assumed that the term "credit crunch" describes a contraction of credit, which results solely from supply-side elements. This is in accordance with the definition of Bernanke and Lown (1991: 207), which states that a credit crunch is 'a significant leftward shift in the supply curve for bank loans, holding constant both the safe real interest rate and the quality of potential borrower'. However, what if

the supply curve shifts leftwards for risky loans, but rightwards for decent opportunities? Conceivably, this is the situation we are witnessing. The set of good credits is limited, though, therefore the cuts are made on the inferior set of subprime exposures.

1.3. Literature Review

As the subject matter covered by this paper is relatively recent and the market put under investigation is still quite remote from anywhere adjacent to the hearts of financial markets, there is certainly insufficient scientific coverage of the latest developments. The summaries below are intended to delineate the theoretical concepts that surround corporate lending.

Considerable amount of literature was researched while elaborating the lending channel theory impact. The traditional framework educates that monetary policy influences the economy exclusively through the interest rate channel. Restrictive monetary policy increases the cost of capital, thus reducing firms' investment activity and consumers' spending, which consequently reduces aggregate demand and the inflationary pressure. However, such an approach is not comprehensive any more. The lending channel is nowadays viewed as an indirect amplification mechanism that works in tandem with the conventional monetary policy transmission mechanism. It holds that monetary policy adjustments that affect the short-term interest rate are amplified by affecting the cost of raising additional capital by banks (see Łyziak, 2001: 4). The bank lending channel also theorizes that changes in monetary policy will shift the supply of intermediated credit. If the supply of loanable funds banks possess is affected for some reason, then so too should be the borrowers who are dependent on banks' funds for business operations. The strength and the speed of adjustment of different economic variables to policy makers' decisions remain vague and country-specific. The logic of the Polish banking sector cast doubts on the efficiency of bank lending channel. Since the level of internationalization within the sector is considerable, the National Bank of Poland has only limited influence on the lending institutions policies. This is confirmed e.g. by Ewa Wróbel in Grabek et al. (2008) and Pietrzyk (2005: 4).

Bernanke and Blinder (1988) were the first ones who defined what is now known as the bank lending channel, pointing out that the monetary policy can influence not only the demand for bank loans, but the supply as well. The paper of Matousek and Sarantis (2007) is particularly valuable source of considerations referring to monetary transmission mechanism, as it focuses on the Central and Eastern European (CEE) countries that joined the European Union in May 2004. The empirical results, performed on a large panel of disaggregate data for individual banks, have shown that there is a significant bank lending channel in all CEE states, though the strength of it varies across countries. Looking at the model's results, with each bank's explanatory characteristic for monetary transmission isolated from the others:

- Bank size is significant but has a negative sign in Poland, which is inconsistent with the theory; within the complete model, bank size becomes significant in all countries, but negative sign for Poland remains
- Liquidity has the anticipated positive effect in all countries except Poland
- Capitalization shows the significant positive coefficient only for Poland; overall, the evidence suggests that capitalization is not as important in distinguishing banks' reactions to changes in the stance of monetary policy.

As it may be derived from the above, Poland seems to be considerably peculiar on its lending channel performance and it is actually difficult to decipher what are accelerators and inhibitors for the internalization of monetary policy by Polish banks.

Bijapur (2010) in his paper entitled "Does monetary policy lose effectiveness during a credit crunch?", comes up with a positive answer. He tests whether 'the impact of cuts in policy rates on GDP growth has been more muted during episodes of shortages of credit in the US economy'. Indeed, this impact becomes diminished under crunch, and the relationship between interest rates and outstanding credit also weakens.

Cetorelli and Goldberg (2008), researching this issue in the U.S. market, point out two observations. First, banks with a global outreach are better positioned to accommodate liquidity shocks, since they are capable of rearranging their resources between their offices worldwide (the concept of "internal capital market"). Second, the mere difference in size of domestic-only and global banks is important, but not critical, which reinforces the advantages to globalization that insulate bank networks from domestic monetary policy shifts. The results obtained by Havrylchyk (2005) are generally reliable, but she finds the magnitude of bank lending channel smaller than in the similar studies performed for the EU, as virtually all regressors are insignificant. It means that 'during monetary contraction (expansion) Polish banks decrease (increase) their lending by far less than their counterparts in the current EMU member states'. Łyziak, Przystupa and Wróbel (2008) found only weak evidence on the credit channel in Poland, by which they only confirm precedent findings. After the monetary policy tightening banks appear to trim down short-term lending, while the longer term loans for investment display lower semi-elasticities with respect to the interest rate. The authors interpret the fact that banks protect investment loans more than the credit in the current account as a cherry-picking process and a flight to quality. Additional insight is provided by Chmielewski (2006). According to his study, banks' reaction to excessive zeal in monetary policy is weak as regards long term lending to important corporate customers, even if the loans issued beforehand to them are of poor quality. This reveals a certain significance of relationship management in the domain of corporate (but not SME) lending. The most recent econometric paper devoted to crediting in Poland is that of Wdowiński (2011), with the newest observations dated 2Q 2010. His findings generally indicate that corporate credit is considerably inert. Its volume reacts weakly in response to the analyzed regressors, as compared to mortgages and consumer loans.

Last but not least, an interesting paper on the recent crisis, in context of the emerging economies, was published by Kamil and Rai (2009). Although they examined Latin America and the Caribbean, their empirical results seem to plausibly correspond with the Polish story. In the authors' opinion, the global crisis has there been cushioned by the peculiar nature of foreign banks' presence in the region. Local affiliates performed expansionary domestic currency lending, rather than direct cross-border lending in foreign currencies. Moreover, local affiliates' funding mostly originated from a mounting domestic deposit base, rather than from parent banks or offshore wholesale markets, which would be by definition more volatile during the crisis. These characteristics muted the diffusion of external shocks.

A certain amount of literature on behavioral issues was also researched. However, the downside here is the insurmountable richness of approaches in the realm of behavioral finance and, unfortunately, difficulties arise when it comes to extract valuable insights in these particular aspects of banking that are addressed within the framework of this work. The narrowness of the subject of corporate lending in an emerging state is the source of a problem.

2. Data Analysis
2.1. In Search of Rational Interdependencies

Out of the numerous hindrances that accompanied a long-lasting effort made until both theoretically and empirically plausible interactions between variables were acknowledged, the most important one is the unavoidable risk of reverse causality. It not only makes perfect quantitative orthogonalization unworkable, but also hampers theoretical reasoning. This phenomenon may practically refer to vast majority of links.

Apart from the interdependencies considered below in more detailed manner, a number of hypotheses was rejected quite instantly, e.g. the one that foreign-based parent banks asked their Polish affiliates to cease lending, the one about stagnant deposit base or – on the demand side – that borrowers flew to foreign markets or took advantage of alternative sources of capital.

Crisis of Confidence in the Interbank Market
Banks lend and borrow liquid reserves kept on their current accounts in the central banks. They consist of obligatory reserves and the assets accrued voluntarily. This is why the market enables liquid credit institutions to lend their funds to banks that struggle to make ends meet. The interest rate (Warsaw Interbank Borrowing rate, WIBOR) is determined by supply and demand. This cost of funding has increased rapidly in 2008, i.e. much before the contraction became visible in the data sets. In the effect, interbank market came to a halt, as the average turnout has fallen down from nearly 6,5 billion PLN daily at the end of 2007 to less than 2 billion PLN at the beginning of 2009.

As depicted by Murphy (2009: 105), knowing that liquidity directly affects repo funding and that repos are only a safe form of lending if the lender can be sure that the collateral is reliable, if the collateral becomes illiquid, then it is hard to be confident that the loan is collateralized. The author punchlines that interbank repo funding therefore tends to dry up when bond liquidity falls. In the Polish case, a pure supposition that the other banks' assets may be contaminated sufficed. Referring to Szpunar (2010: 9), surplus liquidity in the Polish financial sector exists, but it is 'concentrated in a small group of banks' and its re-distribution through the interbank market is vital.

Richard Mbewe (2009) says that banks may have 'a desire to accumulate as much cash as possible in order to be well positioned when the market thrives'. This would be quite innovative premise, indicating that neither austerity nor risk aversion placed the most sinister stamp on banks' low-key policies, but instead of it, lucid business calculations were in place. Brunnermeier (2009: 95) has no doubts on that, too: 'the troubles in the interbank lending market in 2007–2008 are a textbook example of precautionary hoarding by individual banks'.

Contractionary Monetary Policy
The very hypothesis that the NBP forged a contractionary policy is highly disputable. It seems that this time central banks all over the world orchestrated growth-oriented maneuvers, since the current orthodoxy is rather to cut rates to ludicrously low levels, whenever the economy goes into trouble. In Poland, judging by interest rate policy, the central bank did what it took to avoid reduced money supply and credit availability. Repo rate was regularly lowered until March 2006, when it reached 4 percent and remained at this level until April 2007, when no signs of the crisis were visible yet. Repo rate anchored at 6 percent in July 2008. If we assume that banks 'should' react, they did so in April 2009, when during just one month, amount of outstanding loans decreased by nearly 5 billion PLN. After rebounding, reference rate dived to 3.5 percent just in July 2009 and demonstrate stability for over one year. Confronted with the facts, it seemingly did not contribute to the rebuilt of corporate credit. This is why the interdependence between outstanding corporate loans and NBP reference rate remains ambiguous. In 2008, lending rose amid spiking reference rate, while in 2009 and 2010 it stagnated in spite of the declining rate.

Figure 2: Various interest rates, prevalent in the Polish financial sector from January 2005 to January 2011.
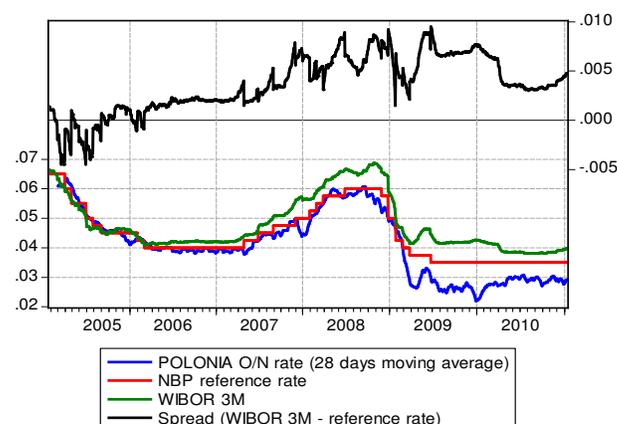
Source: National Bank of Poland, money.pl.

The above graph shows that yet in the end of 2007 spreads became unusually high, which means that the cost of credits had to go up too. It has to be underlined that POLONIA is purely factual (ex post) interest rate under which real transactions have been concluded, while WIBOR is just theoretical price (ex ante), not entailing the fact that any trade has been made under this quotation. This additionally authenticates the inference about the enormity of spread, which leads to the conclusion that credits were sold at a very expensive price.

Portfolio Adjustments
Switching to more secure types of credit and reinforcing one's market position in the safer segments clearly seemed to be the mainstream survival strategies of Polish banks. A shift to retail credits is confirmed e.g. by Jakub Borowski from Invest Bank and Maja Goettig from Bank BPH (Kuk, 2009). In both static and dynamic analyses, however, mortgage and housing loans are completely irrelevant descriptor of corporate lending instabilities. This is because both types of loans are inseparably connected with economic growth, thus they both have been growing almost monotonically throughout the recent decade. The shift that took place in 2009, a slight in numbers, although psychologically and graphically compelling, is "lost" in time series' breadth, even in the short term model.

It is undoubtedly self-explanatory that certain types of corporate loans were among the riskiest ones. As it has already been indicated, elevated profitability of consumer loans pays off the increased risk, while SME loans are both risky and only moderately profitable.

Deterioration of Assets
During the crunch, the share of non-performing loans heaved by 79.2 percent (from 13,5 billion PLN to a shocking 24,3 billion PLN) and their share in banks' portfolio boosted from 6.1 to 11.4 percent.

Figure 3:   Non-performing loans have been on the rise since 2009, but they did not reach the peak of 2001-2004.
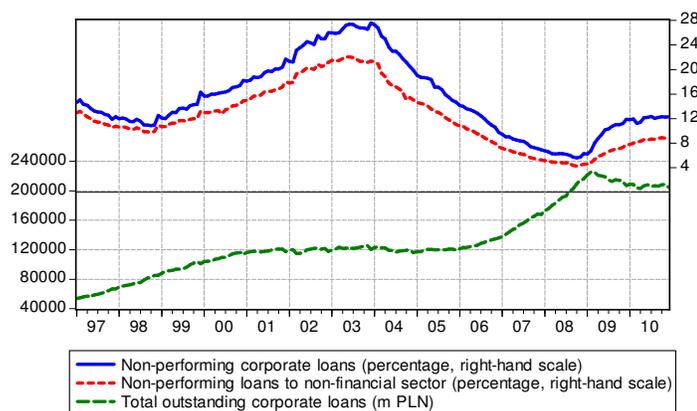
Source: National Bank of Poland.

Skyrocketing impaired loans ratio caused much distress among banking sector. It was probably a red flag for banks to pull the emergency brake. On the one hand, NPLs doubled between October 2008 and May 2010. On the other hand, the ratio used to be even more alarming in the earlier years. However, if we assume the existence of adaptive expectations, imposing a pressure on low NPL levels, this variable may still be significant at least in the short term.

Andrzej Bratkowski claims that there must be a differentiation between a surge in risk and a surge in risk aversion. As the economic conditions worsen, the financial standings of virtually all actors in the economy automatically worsen accordingly. It means that all firms rise up to higher risk categories. Therefore, even if banks' criteria are unchanged, we will encounter a decline in lending, ceteris paribus. Bratkowski theorizes that the deteriorating NPL ratio indicates that banks are still not

risk averse enough (sic!). Otherwise, with constant risk aversion, they would have avoided the losses, provided that it is possible for banks to obtain perfect insight into enterprises' financial standings. (Bratkowski and Myjak, 2009: 12)

2.2. High-Level Inferences

We operate in a communicating vessels framework. The intuitive orthogonalization of dynamic correlations between variables is relatively easy to perform, unlike the assessment of the strength of these interactions, which directly transforms to their significance or non-significance. With regard to the theory-supported data provided in this chapter, the following is implicit:

- A flight to quality occurred: banks have been striving to diminish the share of the most risky assets in their portfolio, giving underperforming enterprises short shrift
- Customers' deposits that stopped growing, were a cause of concern for banks struggling to meet their capital adequacy ratio, unofficially raised from required 8 percent to 10 percent recommended by the KNF (Samcik, 2009) – this implied relatively conservative measures in the area of prospective loans assessment
- Uncertainty among market players led to the demise of the interbank market, where banks used to reinforce their short-term liquidity – nevertheless, excess liquidity was still ubiquitous.

Crunching the available data was even more fruitful in identifying the inferences that are seemingly incorrect, although they used to be more or less frequently put forward by experts. The robustness of these conclusions has been seriously shaken. The reasons are:

- Foreign-based parent banks, in aggregate, did not make an effort to transfer their affiliates' profits abroad, thus the financial standing of domestic institutions, as a whole, has been neither deliberately nor heavily weakened; however, individual exceptions may apply
- Banks have not faced direct liquidity problems, since NBP's open market transactions volume suggests that banks were vested with ample resources and, instead, it is a shift in policy or market conditions that diverted their attention from lending activities
- Central bank's policy was highly unlikely to have any negative effect on lending volumes; although the NBP significantly reduced its reference rate, it did not preclude the decreased corporate lending from arising – it may possibly be another evidence of impaired monetary transmission, not being the strong suit of Poland's financial sector.

3. Behavioral Dimension

The goal of this paper is to detect whether and to what extent the behavioral factors contribute to the determination of lending amounts. Before moving forward with the model, the crucial "animal spirits", as Keynes would have said, have to be investigated. Most of them are to some extent unobservables, but the profound impact of animal instincts with regard to the Polish crunch incident is explicitly corroborated e.g. by Brzoza-Brzezina and Makarski (2010: 8). The atmosphere of a crisis increases the probability that the decision making process is performed under extraordinary pressure, which makes economic agents more than usual risk averse. The key stressors are:

- Frantic pace of events and the chaotic flow of information, resulting in the data smog
- Uncertainty with regard to the depth, breadth and durability of the crisis, as well as the parties hit; all forecasts are potentially biased
- Uncertainty with regard to the magnitude of austerity measures that actually need to be taken within an organization to secure its financial standing and reputation – as no guarantee exists that a lifeline will be thrown by a third party in case of emergency.

Jocelyn Pixley (2004: 146) utters that 'banks allocate credit according to trust or distrust', thus inevitably administrative discretion applies. She also rightly says that trust is an emotion best acknowledged when it turns into the opposite, and in moments of crisis little suffices for trust

unexpectedly transmuting into blame or rage. This opinion is echoed by Milne (2009), who claims that 'financial markets are inherently unstable, veering from excessive optimism to excessive pessimism' and that banks have always leaned towards increasing their lending too much in booms and to reducing it too heavily in recessions. Indeed, corporate lending seems to be relatively more sluggish in prosperity and more volatile in downturn, which is sub-optimal from the macroeconomic point of view.

In the area of more fundamentally financial papers, in their aged, but not an outdated article, Stiglitz and Weiss (1981) show that even in a competitive equilibrium a loan market may be characterized by credit rationing. It may be stirred by the existence of several types of informational asymmetries: adverse selection, moral hazard, monitoring.

When it comes to Poland-specific research, Wilkowicz (2009) quotes Bratkowski who confirms that risk aversion is to blame for corporate credit contraction in the first half of 2009. Banks' deteriorating liquidity and capital constraints were allegedly of only minor sway. The economist has also remarked that senior loan officers highlighted in quarterly SLOS questionnaires that poor macroeconomic situation is the key inhibitor to credit expansion. However, a possible bias is associated with this statement. For marketing purposes, banks are uneasy to communicate capital or liquidity problems. Instead, they explain to the public that it is the crisis, whatever it means, that restrains credit supply. Moreover, it is also a shrewd justification for increases in margins or required collaterals.

Some scholars also infer that reduced crediting in the banking sector might result from low competition, determining weak motivation to fight for clientele. On the one hand, this appears to be a compelling explanation, on the other hand the method of validating this hypothesis would have to be too discretional. The level of competition in the banking sector is not merely the derivative of the level of concentration, as the banking industry is "suspected" to be a contestable market, in Baumol's sense (see Baumol, W. J., Panzar, J. C. and Willig, R. D., 1982), as found out by Pawłowska (2010).

Macroeconomic Climate
Most of the scholars and bankers accentuate the importance of mutual trust between the market players. Although the financial world is more often than not considered to be a ruthless kingdom of rationality, this pop-culture-rooted image emerges as ultimately invalid in the light of latest developments. Murphy (2009, 284-285), for instance, offers a spiral theory of how the crunch has actually been built up, in which the issue of confidence is of prominent importance. Not surprisingly, the first step is a lack of confidence between financial institutions themselves, which reduces their "largesse" and willingness to lend to each other. This, subsequently, disseminates to other investors, too. Furthermore, the demand for good quality collateral significantly skyrockets. However, a hiking cost of funding decreases banks' profitability and constitutes another premise for reduced ability to lend. However, the widespread demise of securitization facilitates the return of assets back on the firms' balance sheets, which reinforces their appetite for additional liquidity. Nevertheless, here is where confidence comes into play again. As the stress in the funding market persists, banks strive to communicate decent results to the market, proving sound financial status. In order to do that, they reduce their funding liquidity risks, i.e. protect themselves from the customers' panic. At the top of everything, central bank's intervention may turn out to be inadequate to reliquify the financial system if the confidence loss is too severe.

Intensifiers of the global crisis were complexity and leverage, as noted by Gorton (2008) and Murphy (2009). None of these is particularly helpful when researching the Polish case. But qualitative evidence illustrates that sometimes only little suffices. Investors in Poland are notoriously over-sensitive to external information. A good example is the Warsaw Stock Exchange, where investors are frequently reported to overreact in response to the news releases concerning the U.S. unemployment-related figures or those on Chinese export.

Another intensifier had to do with fundamentals, though not being fundamental itself. It is uncertainty of banks with regard to how balance sheets perform in peer banks. Not being sure about the

scrutiny with which one's business partner runs his firm, one may have reasonable worries surrounding the decision whether to trade with him or not.

On the demand side, what about the colossal portion of enterprises that have no linkages to abroad and operate on a "safe and sound" market located in the "green island" surrounded by the ocean of crisis? According to the conventional risk aversion concept, a potential loss looms larger, i.e. it is perceived more harmful, than an equally likely gain of the same magnitude is perceived to give pleasure (Brooks and Zank, 2004: 2-3). All in all, it is seemingly better, or at least more compliant with textbook economics, to overestimate the risk than to underestimate it. However, it seems that the fall of demand was only secondary to the less favorable lending conditions.

Banks always take a look on macroeconomic data, being an indicator of macroeconomic environment condition. The most important ones are data on unemployment, salary and year-on-year retail sales. The variable representing salary concerns the average wage in enterprises employing more than 9 people (micro firms are excluded).

Sentiment Indices
Sentiment indices are imperfect reflection of reality. They are based on surveys to a limited, though considered representative portion of the population. They seem to be fairly well intertwined with the output value of corporate credit. It may be seen clearly on the figure 4 that sentiment indices have given an advance indication of decreased prosperity by falling sharply at the end of 2008.

Figure 4: Various sentiment indices calculated for the Polish economy.
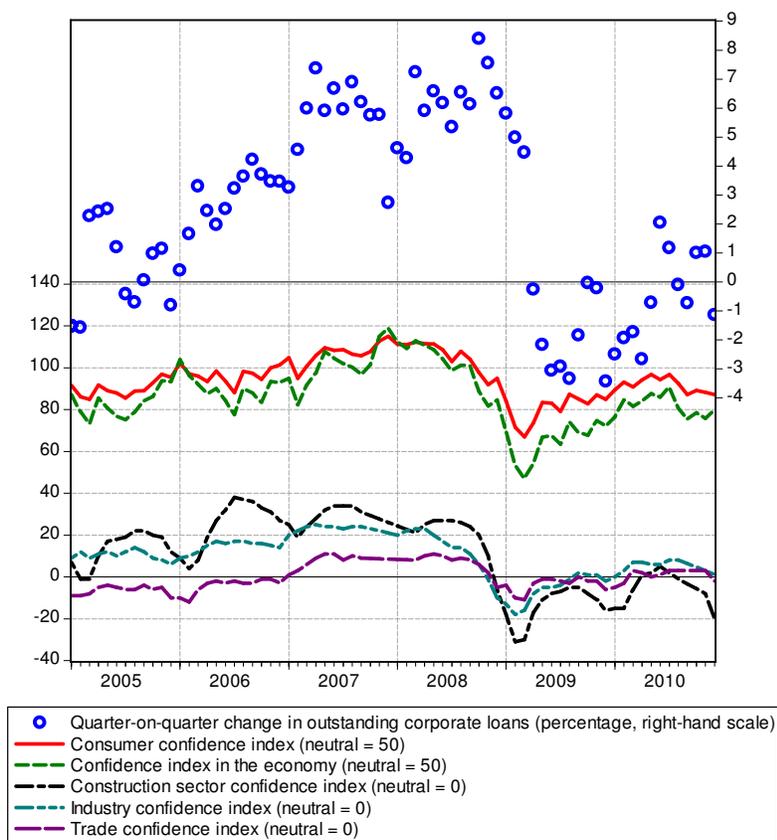
*Source:* GUS, Ipsos Demoskop, National Bank of Poland.

SLOS Questionnaires
Polish methodology of Senior Loan Officer Survey (SLOS) interprets each positive number, defined as the net percentage, as a favorable change from customer's perspective. A net percentage is thus a

difference between optimists and pessimists numbers related to the total number of respondents answering particular question in the survey.

The recent paper of Grodzkicki, Hałaj and Żochowski (2010) adopts a panel model to test if Polish individual banks' lending policies have an impact on banks' loan supply. Instinctively, a positive relationship is evident here, since by declaring stricter policy a bank signals its greater than before reluctance to lend. Employing data from the Polish bank lending survey (SLOS), the authors controlled also for demand-side factors. Predictably, they concluded that individual bank lending strategies are an important driver of credit growth.

Figure 5: Corporate loans criteria broken down by type of credit.
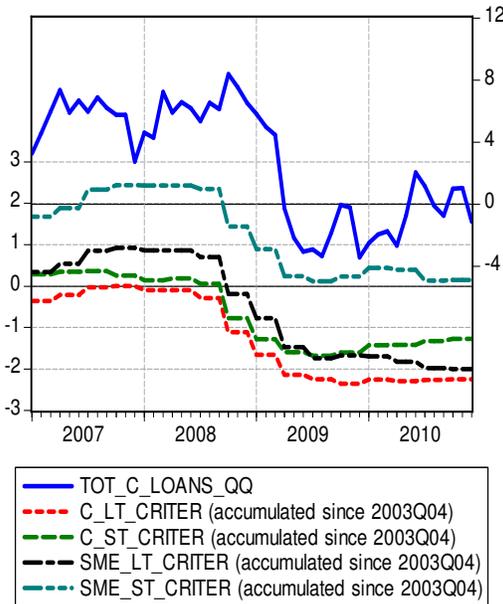
Figure 6: Terms and conditions of corporate credit, applied by banks.

Source: National Bank of Poland (2011b).
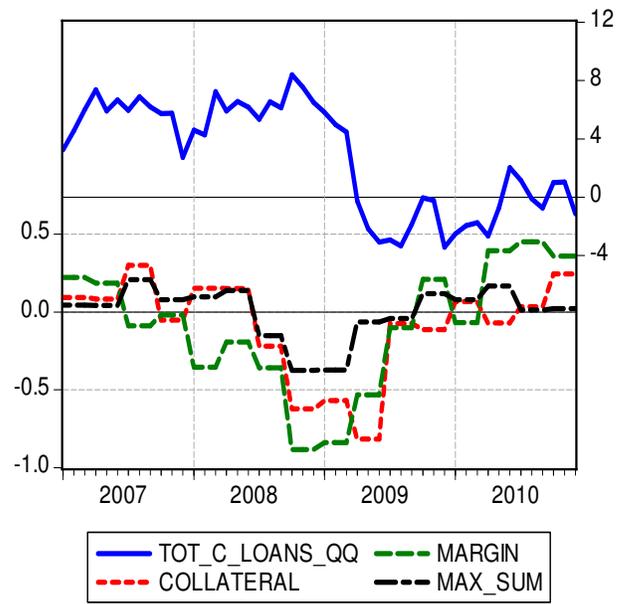
Source: National Bank of Poland (2011b).

It stems from the theory that the stricter rules in terms of required collateral were particularly calamitous to the lending levels. The thing is, as the value of firms' assets has supposedly been shrinking, lenders should adjust the requirements by setting them at the lower level. In fact, banks' measures were opposite and might have magnified the crunch. Obviously, it was banks' response to the information asymmetry, an imbalance that marks its presence particularly during the periods of distress. The problem of informational opacity between firms and banks is often raised in literature (e.g. Berger, Molyneux and Wilson, 2010; Steijvers and Voordeckers, 2009; Stiglitz and Weiss, 1981), since it typically gives rise to above-average credit rationing. However, the enforcement of higher collateralization may not necessarily combat the adverse selection problem. Stiglitz and Weiss (1981: 402-405) indicate, under reasonable assumptions, that the higher collateral requirements imply that firms can only finance smaller projects with higher risk. Therefore higher collateral fuels adverse selection. The presumption of adverse selection in Poland is expressed by Bratkowski in Bratkowski and Myjak (2009: 12): while well-performing companies tend to wait until they apply for a new credit, the weaker ones struggle to gain liquidity, since it may be the only tactics aimed at avoiding bankruptcy.

Overall, manipulating credit terms and conditions and excessive flight to liquidity, amplified by sometimes maniacal fixation on what global players do, are altogether the best description of the Polish economic landscape during the turbulence.

Unfortunately, there are shortcomings and controversies that seriously undermine leveraging the behavioral data in the model. First, the quantity of those time series is limited. Second, vast

majority of them is characterized by collinearity problem. Third, the strict non-fundamentality of some variables remains debatable. Fourth, the fact that the crucial source of information concerning enterprises' demand for credit comes from within the banking industry, is a source of a potential bias.

4. Econometric Evaluation
4.1. Choice of Estimation Method

Capturing the evolution and the interdependencies between multiple macroeconomic time series entails vector autoregression models to be employed. Since nearly all variables from the ultimate data set, except for the trade confidence index, exhibit unit root, vector error correction model (VECM) seemed the best option. After defining appropriate lag length, Johansen cointegration test has been carried out and revealed that no cointegrating equations may be defined.

Although trace statistic yields equivocal results, maximal eigenvalue method is commonly referred to as more reliable and it should be taken into consideration as primary indicator for the number of cointegrating relations. Such an approach is recommended e.g. by Kennedy (2003), and Johansen and Juselius (1990). The specification "intercept, no trend" is the most relevant in this case. Max-eigenvalue test indicates no cointegration at the 0.05 level.

Given no cointegration, the return to VAR-based modeling on non-stationary levels is justified according to e.g. Canova (2007), as long as the residuals remain stationary. As a matter of fact, there are also some researchers who prefer the differenced time series to be estimated instead (see Kakes, 2000; Wang, Kutan and Yang, 2005), but this approach will not be followed now. The stationarity of residuals was formally verified with the help of ADF test, but already the visual inspection indicated that error terms are rather not spoilt by any serial correlation and can be assumed to be white noise.

In order to diagnose the credit crunch, a structural vector autoregression (SVAR) model, based on monthly data, was selected. It allows for appropriate orthogonalization of external shocks and deriving correct inferences concerning causal relationships in the system. Not only the joint dynamics of a set of variables is represented, but also the economic relationships are reflected more accurately than by the reduced form of VAR. In this chapter, a model building process will be briefly replicated, so that to ensure it possesses an appropriate theoretical structure and yields relatively reliable estimates of potential output.

Since the impulse responses may substantially differ in various identification schemes, a theoretical justification is provided to derive arguments in support of the robustness of results.

4.2. Credit Crunch Model

Numerous experiments with different data sets, lag lengths, orderings of variables, as well as with different forms of VAR have been carried out. The available time series were very short in some areas, e.g. variables capturing the interbank market are quoted only since January 2005, while the Senior Loan Officer Survey was first released in the last quarter of 2003. This is a serious malady when forming a long-term model. Therefore, the effort in this paper is directed toward the short-term, crunch-dedicated measurement. The quasi-dependent variable, from point of view of this paper's main goal, is the quarter-on-quarter percent change in outstanding amount of corporate lending. Both large firms, and small and medium-sized enterprises are included, as contrary to self-employed sole traders and individual farmers that are not treated as firms in this framework. The set of variables, which remained robust after numerous iterations is presented in the table below. Available time intervals for selected variables were displayed for information purposes only. In the model, 2005M01-2010M12 time span is employed, as the joint time interval of VAR is always as long as the overlap between the time series of all variables in the system.

Unfortunately, not only the time series are short, but also the frequency of reporting and range of subjects covered by reporting leave a lot to be desired. The situation is changing for better, e.g. from

the beginning of 2011 the KNF switched to monthly reporting scheme, which would allow for the extended review of this analysis within several years. However, probably the main flaw that calls for change, apart from the time span of time series (self-solvable as time goes on), is the way in which lending volumes in the economy are reported by the central bank. The analysis would be much more fruitful if it might explain the variability of newly issued loans, rather than just the fluctuations of the outstanding amounts. This would directly capture the behavior of lenders, whereas now it is possible just to approximate it, since the outstanding amounts are sensitive to the possibly unbalanced maturity of loans in the sample. Haplessly, no reporting is made on that with required data granulation and frequency.

Table 1:   The data set of regressors

|	Variable	Unit	Source
1.	Quarter-on-quarter change in outstanding amount of corporate loans (TOT_C_LOANS_QQ)	Percentage	NBP
2.	Year-on-year growth in retail sales (RETAIL_SALES_YY)	Percentage	GUS
3.	Trade confidence index (SI_TRADE)	Pure number	GUS
4.	Quarter-on-quarter change in non-performing corporate loans' share in total outstanding corporate loans (NPL_CORPO_QQ_PP)	Percentage points	NBP
5.	Demand of small and medium sized enterprises for long-term credit (SME_LT_DEMAND)	(Net) percentage	NBP: SLOS
6.	Average monthly unweighted POLONIA reference rate (POLONIA_RATE_M)	Pure number (representing a percentage)	NBP
7.	Average monthly turnover of interbank POLONIA O/N transactions (POLONIA_TURNOVER)	Million PLN	NBP

Source: NBP, GUS.

Most of the variables in this framework are self-explanatory. Quarter-on-quarter changes in the "dependent" variable were chosen as they match the characteristics of a short term approach better than the absolute values of outstanding credit. Year-on-year growth in retail sales and trade sentiment indicator are standardized, unmodified economic indices published by GUS. The demand of SMEs for credit is a SLOS-originated variable, with its measurement based on the net percentage method, explained earlier in this paper. The variable was directly extracted from the data. Quarterly changes in NPLs' share in total corporate loans were found to yield more convincing results than NPLs' absolute levels, therefore they were retained in the model in this form. POLONIA reference rate is calculated as an average weighted of the rates and amounts of transactions provided by the market players. At the moment, POLONIA rate describes, on average, 57 percent of the concluded interbank O/N transactions (see ACI Polska – The Polish Financial Markets Association, n.d.).

SVARs coefficients are not economically interpretable. Therefore, providing the model's exact and very extensive specification is not much of a help. Nevertheless, what matters here is the structural factorization formula, which reflects an intuitive comprehension of the economic interrelations and which allows for producing instructive impulse response functions. The variables are incorporated in the model in an identical order as presented in the table above, which means that this more or less mirrors the intuitive causality. The "dependent" variable is left in the first place. Later on, it was assumed that data on retail sales is the major stimulus, pretty much independent of the other ones. A shift in retail sales is thought to directly cause the relevant sentiment index to either boost or decline. If it declines, NPLs grow automatically. In response to this change, firms' demand for credit may either soar, if they e.g. desperately need extra liquidity, or decrease, if they e.g. want to wait till the hardships are over. Judging from SMEs' demand and weighing non-performing loans ratio, banks manage their liquidity to ensure sufficient money supply. For this purpose they trade with each other in the interbank

market. There the interest rate is formed and, accordingly, the turnover is determined. This completes the reasoning behind the structural factorization procedure.
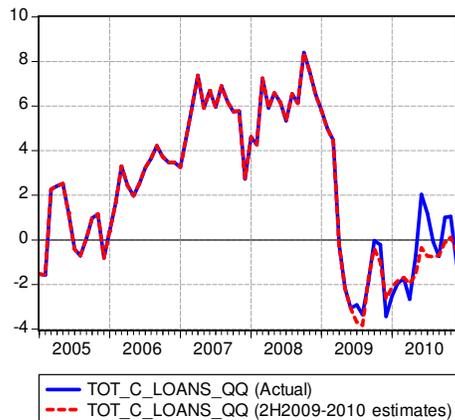
**Figure 7:** The sequence of crucial interplays in the model.
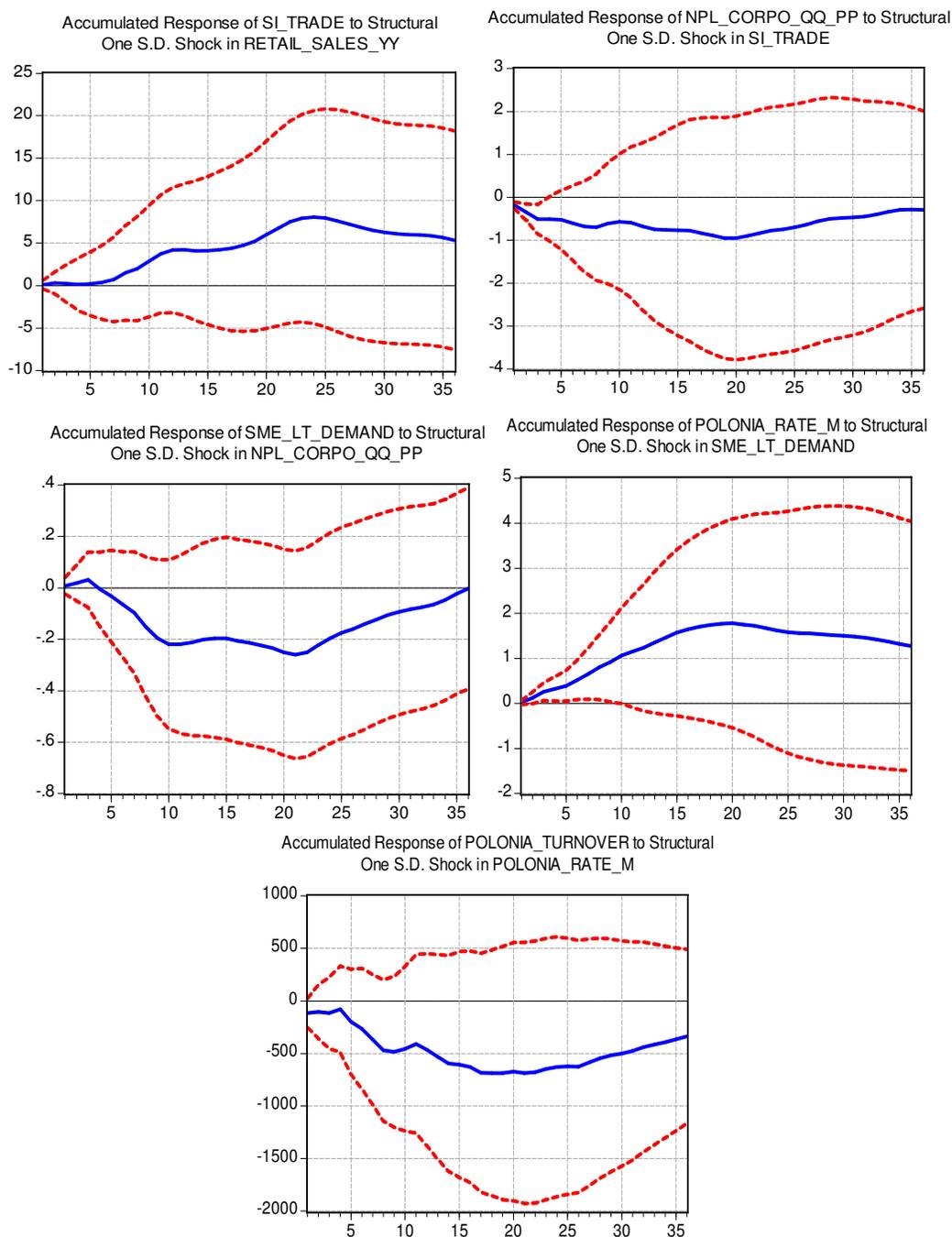
The deterministic model below indicates, how successfully 2005-1H2009 variables were in yielding 2H2009-2010 dependent variable's estimations, as compared with actual, already known, values. The model is helpless in defining more exact marginal changes, but again fares well in the long run and yields plausible end-of-sample result.

Figure 8: Deterministic model of 2H2009-2010 **Figure 9:** Deterministic model of 2H2009-2010 corporate quarter-on-quarter lending (percents), using 2005-1H2009 data as input, compared with actual values. outstanding corporate loans (m PLN), using 2005-1H2009 data as input, compared with actual values.
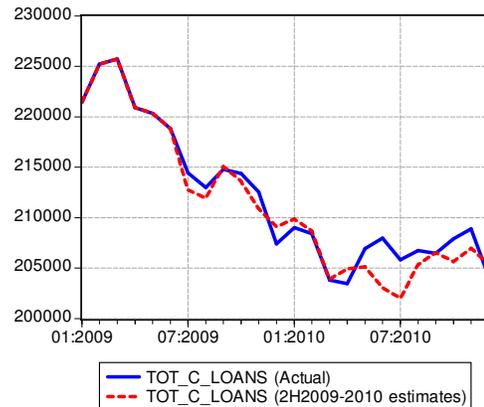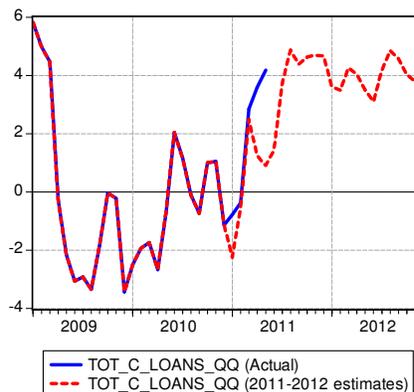

Source*: EViews 5 output.   Source*: EViews 5 output.

However, the nearest future will show how usable the model really is. Particularly, how resistant it is to shrinkage, i.e. an effect in which fitted relationship performs inferior on a new data set than on the data set used for fitting. As for now, the credit crunch model successfully forecasted a rebound at the beginning of 2011. At the moment of submission of this paper, the data for five months of 2011 were available. According to the two-year forecast, the upturn is going to be fair, with a quarter-on-quarter dynamics oscillating around 4 percent.

Figure 10: Deterministic model of 2011-2012 corporate quarter-on-quarter lending fluctuations (percents), using 2005-2010 data as input, compared with actual values for the first five months of 2011.

Source*: EViews 5 output.

However, it has to be made clear at this juncture that the credit crunch model is not claimed to be plausible in the long run, as it was not meant to be its task. The long term corporate lending model is subject to further exertion.

4.3. Structural Analysis

As it has already been said, VAR models, whichever the variation, are difficult to interpret due to many parameters and complex interactions and feedbacks between the variables. Due to the bulk of interactions, stirring reversal causality dilemmas, the dynamic properties of a VAR are typically summarized using various types of structural analysis. Impulse response function and variance

decomposition are presented below. Granger causality tests are displayed, too. However, the latter are only useful a priori, i.e. when constructing the model, rather than a posteriori, i.e. when diagnosing its performance.

Impulse response functions are keys to understand the outcome of every VAR-type model. They indicate how a given variable reacts to external shocks in the dynamic system. Figures below plot the impulse responses to various shocks together with two standard error intervals. The impact of some shocks takes time to feed through to the economy to reach the peak value. The relatively fastest reaction of corporate lending levels is in response to the trade confidence index. As it may be seen, a boost in retail sales is the biggest contributor to the increased lending. Taking decent consumer demand for granted, both banks are more tuned to lend, and enterprises are eager to borrow. It is quite analogical with an indicator of sentiment in trade. However, the magnitude of this shock is slighter.

It should be emphasized that the analyzed short-term model is quite robustly based on indirect variables, like retail sales or trade sentiment indicator. Due to multiple links between various variables, even these cannot be considered purely non-fundamental, though.

Figure 11: Accumulated impulse response functions. Abscissas indicate time (in months).
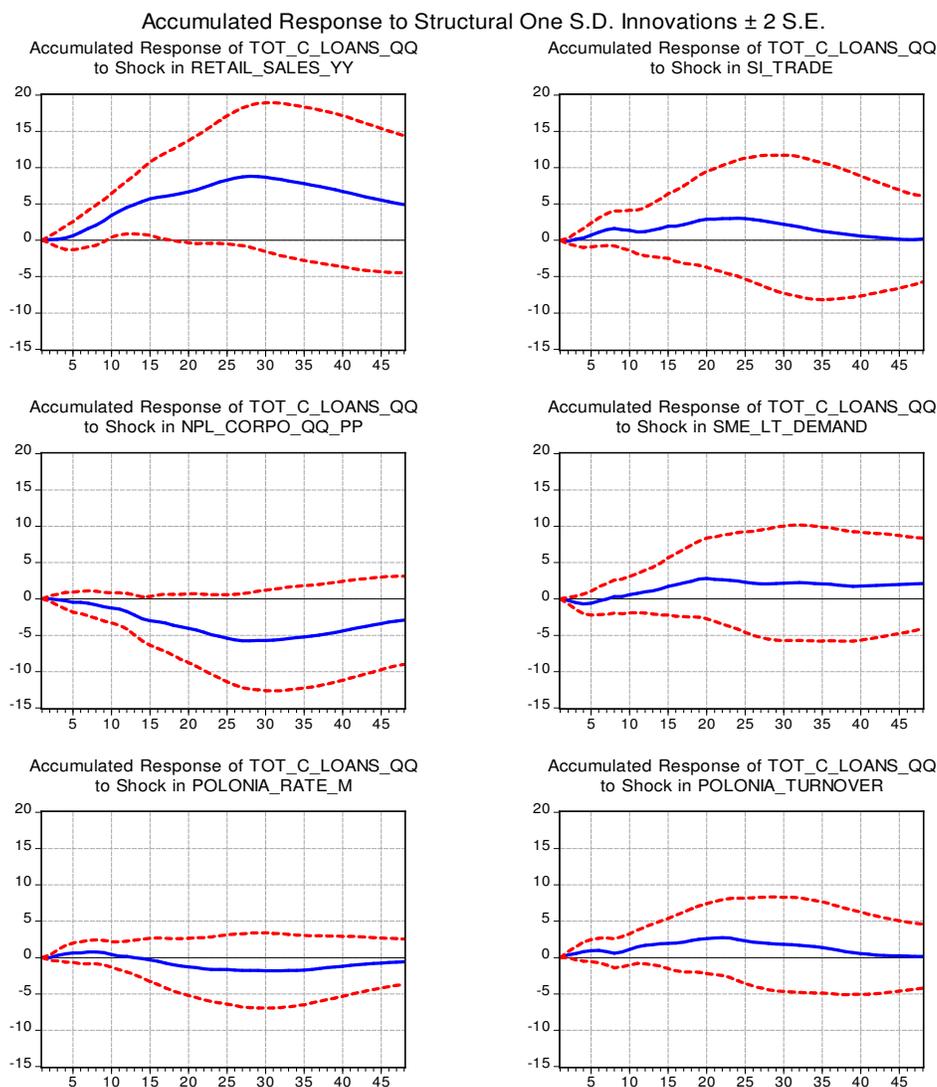
Source: EViews 5 output.

Figure 12: Variance decomposition charts. Abscissas indicate time (in months).
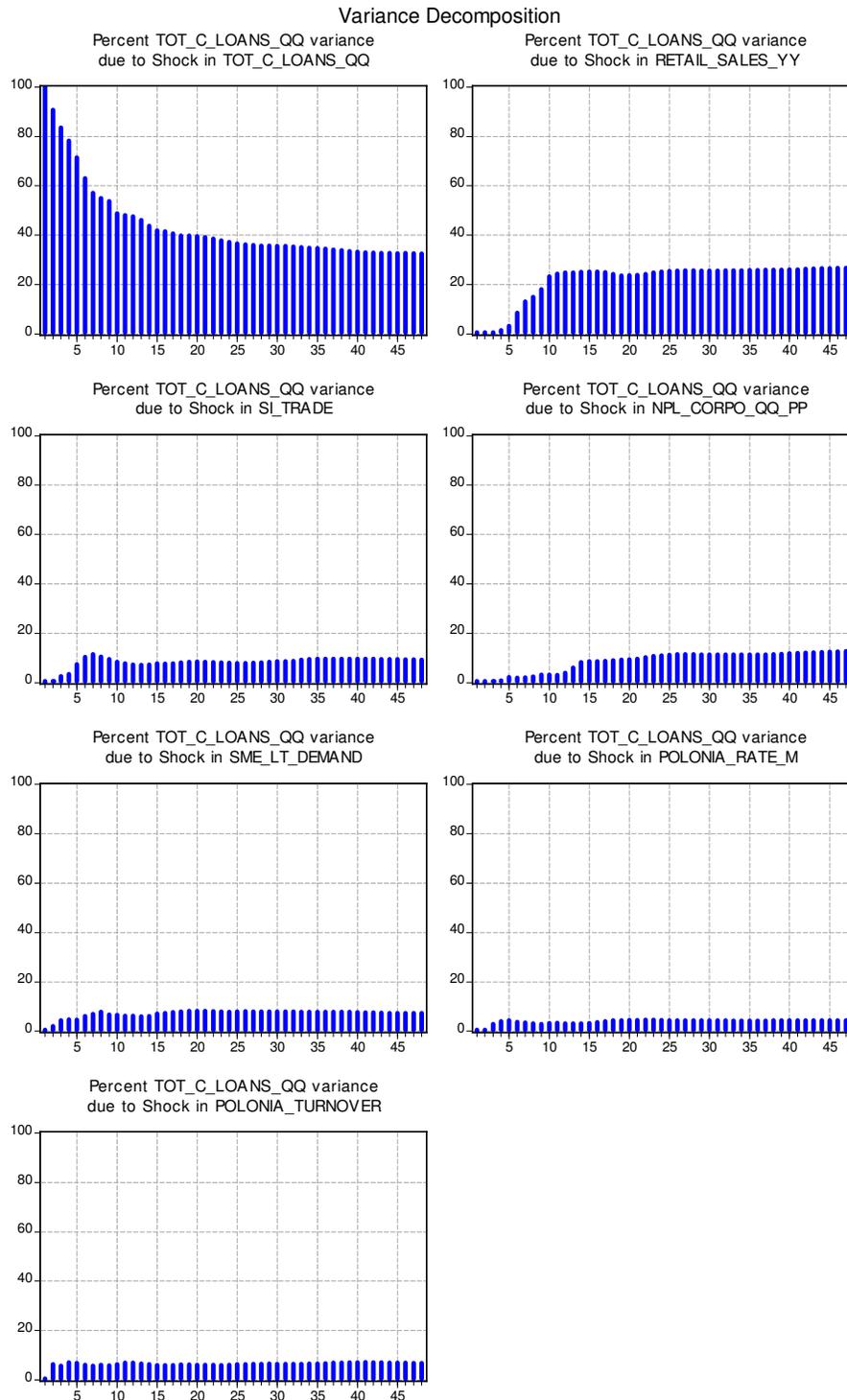
Variance decomposition analysis provides additional source of insight. It may be seen that particular shocks are not very dramatic, each of them accounting for no more than 20 percent of the "explained" variable's variance. The response of the "explained" variable that is due to itself is somewhat elevated, which signals autoregression. However, it does not appear to ruin the interpretation in the underlying framework.

5. Conclusions

The key findings of the underlying credit crunch econometric model and the accompanying qualitative analysis are only partly intuitive, with some rather unexpected outcomes. Those who have been voicing prophecies that foreign-based parent banks will drain the domestic banking industry from capital, were wrong. Instead, the theory that foreign ownership alleviates shocks proved to be right. Those who believed that the contraction of credit is caused in equal extent by supply-side and demand-side factors, also did not capture the reality accurately. Weakened demand had its impact, mainly in 2010 when some banks started to lend more courageously again, but it was not a decisive determinant. Despite premature calls audible in the early stages of the crisis that liquidity in the sector has to be reinforced, the liquidity standing of most banks remained very good. Apparently, the underlying problem was psychological, as banks were hoarding the cash instead of distributing it in form of credits, and were also unwilling to lend to each other in the interbank market, which hampered short-term liquidity position of some banks. Monetary policy was balanced and regulatory measures practically did not exert any influence on corporate lending. The central bank failed to animate the interbank market and reduce interest rate spreads that became highly distorted. Those banks that did not have either reliable foreign funding or strong deposit base, were the major victims of the interbank market imperfections. Overall, the research has shown that behavioral determinants, at first sight remote from the issue of corporate credit, wield profound explanatory power. Retail sales and trade sentiment index, being the "litmus paper" of the general economic climate, both account for approximately 35 percent of corporate credit fluctuations. Boosted non-performing loans, indicating that something ill takes place in the economy, explain approximately 15 percent of the variance in the long run. However, quite interestingly, relative measures of NPLs have been found to be a much more accurate regressor than their absolute measures. which signals adaptive expectations. It seems that the economy that once got rid of unsustainably high NPLs, is more sensitive to their even minor increase later on. Last but not least, quarter-on-quarter corporate lending exhibits quite intense autocorrelation, explaining roughly more than 40 percent of its own variance up to 18 months, and less than 40 percent of its own variance afterwards. This effect may occur due to several reasons, which are subject to further analysis, e.g.: rolling over debt into subsequent periods, staged financing or the stylized fact of volatility clustering.

As regards the subject matter elaborated here, this study is undoubtedly a preliminary one, particularly in terms of econometric modeling. There are numerous directions to which the further analysis may fruitfully take off from here. First, boom and bust cycles, identified throughout the sample period, may be put under more precise investigation to determine the changeable influence of given variables, conditional to the contemporary macroeconomic environment. Second, a greater effort may be applied to granulate the data, e.g. to split the affected indebtedness volume into short-term and long-term, or to control for industries, which have suffered most, which would signpost their disadvantaged strategic positioning. Individual bank characteristics have also been underrepresented here, due to limited data. Third, a similar attempt may be made to capture the household credit supply and demand determinants. However, this case would probably require refining the here presented approach quite substantially.

Naturally, the enriched econometric analysis, putting alternative specifications and methods in place, would furthermore contribute to the greater understanding of how influences were distributed. Unfortunately, satisfactorily long time series are not currently available for Poland, since it embarked on its transition only in the early 1990s and it took time to achieve decent stock of statistical data.

This analysis is ex-post and it would not be impossible if the interrelations presented here were one-off. However, the forecasting potential of the presented model is subject to prompt verification. Naturally, other specifications capturing the pertinent issue are feasible, provided that alternative, compelling theoretical framework is developed. Meanwhile, the first quarter of 2011 was already a fourth in a row, in which banks reduced margins for corporate loans. This bodes well for future. Demand rebuilds accordingly and the outstanding corporate credit arose month-on-month by 0.9 percent and exceeded 209 billion PLN in March 2011, that is the highest level since November 2009.

Year-on-year growth rates in March, April and May were all within the range between 4 and 6.4 percent, and with deposits rising even faster – but slower than in 2010 – robust fundamentals underlying the forthcoming revival are placed, which is mirrored by elevated Moody's rating for the Polish banking sector, from negative to stable, dated mid-June.

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