View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by Research Papers in Economics

Institute of Economic Studies, Faculty of Social Sciences
Charles University in Prague

Adverse Feedback Loop in the Bank-Based Financial Systems

Adam Geršl
Petr Jakubík

IES Working Paper: 14/2010

Institute of Economic Studies,
Faculty of Social Sciences,
Charles University in Prague

[UK FSV – IES]

Opletalova 26
CZ-110 00, Prague
E-mail : ies@fsv.cuni.cz
http://ies.fsv.cuni.cz

Institut ekonomických studií
Fakulta sociálních věd
Univerzita Karlova v Praze

Opletalova 26
110 00 Praha 1

E-mail : ies@fsv.cuni.cz
http://ies.fsv.cuni.cz

Disclaimer: The IES Working Papers is an online paper series for works by the faculty and students of the Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague, Czech Republic. The papers are peer reviewed, but they are *not* edited or formatted by the editors. The views expressed in documents served by this site do not reflect the views of the IES or any other Charles University Department. They are the sole property of the respective authors. Additional info at: ies@fsv.cuni.cz

Copyright Notice: Although all documents published by the IES are provided without charge, they are licensed for personal, academic or educational use. All rights are reserved by the authors.

Citations: All references to documents served by this site must be appropriately cited.

Bibliographic information:
Geršl, A., Jakubík, P. (2010). "Adverse Feedback Loop in the Bank-Based Financial Systems" IES Working Paper 14/2010. IES FSV. Charles University.

This paper can be downloaded at: http://ies.fsv.cuni.cz

Adverse Feedback Loop in the Bank-Based Financial Systems

Adam Geršl*
Petr Jakubík#

*Czech National Bank and
IES, Charles University Prague
E-mail: adam.gersl@cnb.cz

European Central Bank and
IES, Charles University Prague
E-mail: petr.jakubik@ecb.int

July 2010

Abstract:
This paper examines procyclicality of the financial system. The introduction describes the natural and regulatory sources of procyclicality, focusing on the potential procyclical effect of the current Basel II regulatory framework for banks. It also mentions the regulatory tools for mitigating procyclical behaviour by financial institutions currently being discussed in international forums. Under certain conditions, procyclical behaviour of the banking sector can lead to an adverse feedback loop whereby banks, in response to an economic downswing, engage in deleveraging and reduce their lending to the economy in order to maintain the required capital adequacy ratio. This then further negatively affects economic output and impacts back on banks in the form of, for example, increased loan losses. In the main empirical section of the paper, this effect was simulated on the example of the Czech banking sector. The simulation results suggest that under certain assumptions the feedback loop may play an important role.

Keywords: procyclicality; feedback loop; bank regulation; deleveraging

JEL: G21; E44; E47

Acknowledgements:
Authors thank Jan Frait, Michal Hlaváček, Tomáš Holub, Kateřina Šmídková, Karel Gabrhel and Petr Staněk for useful suggestions. Both authors acknowledge the support by the Czech Ministry of Education (Grant MSMT 0021620841) and the Grant Agency of the Czech Republic (GACR 403/10/1235), Petr Jakubík also acknowledges the support by the Grant Agency of the Charles University in Prague (GAUK 2009/47509). The findings, interpretations and conclusions expressed in this paper are entirely those of the authors and do not represent the views of any of the above-mentioned institutions.

1. Introduction

One of the issues that have taken centre stage in the international debate on the lessons of the global financial crisis is that of procyclicality of the financial system. Procyclical behaviour of the financial system, and especially of banks, means that financial intermediaries amplify swings in economic activity. This might be of higher relevance especially for the EU countries with traditionally bank-based financial system. Procyclical behaviour can have particularly serious implications in an economic downturn, as under certain assumptions it can considerably prolong and deepen the recession via a feedback effect on the economy.

This paper sets out to describe the main arguments of the current debate on financial system procyclicality and to give an overview of the current regulatory proposals for reducing procyclicality. To illustrate the seriousness of the effects of the potential strongly procyclical behaviour of the financial sector on a selected EU economy, the adverse feedback loop was simulated for the case of an adverse scenario for the Czech Republic. This is a useful case study as the banking system in this particular EU country is a typical example of an integrated financial system with the rest of the EU, as majority of banks in the Czech Republic are foreign-owned mostly by other EU institutions. Ideally, one would like to provide an empirical analysis of this phenomenon for the EU as a whole, but the data limitations are preventing us to do so.

The paper is structured as follows. Section 2 examines the sources of procyclicality of the financial system and summarises the debate on three related areas of regulation: provisioning, accounting rules for revaluation of financial assets and the procyclical effect of the current Basel II bank capital regulatory framework. Section 3 provides a brief overview of the tools that can be used to reduce procyclicality of the financial system. Section 4 describes an empirical simulation of the adverse feedback loop for the case of the Czech economy. Section 5 concludes by summarising the main findings from the synoptic and empirical sections.

2. Procyclicality of the financial system

Procyclicality is usually defined as the magnification of swings in the economic cycle by financial sector activities, most notably bank lending. It is caused by a whole range of interconnected factors, such as information asymmetry, fluctuations in balance-sheet quality, over-optimistic (or over-pessimistic) expectations, herd behaviour by market participants and financial innovation. Besides the natural sources of procyclicality, financial regulation and the accounting rules for revaluation of financial assets in financial institutions' balance sheets can play an important role.

The main determinants of the credit cycle are discussed in the literature connected with the cyclical nature of bank lending. Numerous studies have shown a positive correlation between GDP and the credit cycle (e.g. Calza, Gartner and Sousa, 2001). The profitability of corporate projects and credit demand rise in line with economic activity and productivity. Conversely, banks react to rising macroeconomic uncertainty by reducing the supply of credit (Quagliariello, 2007). Growth in interest rates has a negative effect on real sector demand

owing to increased financing costs and can also adversely affect supply via banks' reaction to the increased credit risk of firms and households or the lower profitability of investment projects (Calza, Gartner and Sousa, 2001). However, if growth in interest rates leads to a fall in profit margins, banks may increase the supply of loans in an attempt to maintain their profitability thanks to larger loan portfolios. The impact of interest rate changes is therefore not entirely clear-cut. Koopman, Kraussl, Lucas and Monteiro (2009) demonstrate empirically that GDP is the most significant indicator affecting bank lending.[1] Macroeconomic fluctuations affect not only the volume of loans in the economy, but also credit standards. Maddaloni (2009) demonstrated on data for the euro area countries that credit standards are tightened at times of economic contraction and softened at times of economic growth. Moreover, low interest rates cause credit standards to be softened (Bernanke and Gertler, 1995). Another natural source of procyclicality is the way in which risks are measured and managed. Problems distinguishing between short-term swings and longer-term trends and estimating robust correlations between market and economic variables, together with the use of risk management techniques that take into account relatively short periods of past observations, can cause risks to build up in an expansion phase (Borio, Furfine and Lowe, 2001). This phase usually results in growth in optimistic expectations, leading to rising leverage of financial and non-financial institutions at times of growth. Simultaneously, the need to create a buffer of reserves for the adverse phase of the cycle is underestimated during the growth phase. During the subsequent economic slowdown, measured risk rises sharply and leverage falls, with mutually reinforcing effects on the financial and non-financial sectors in a situation where financial institutions have inadequate capital and other buffers.

In the field of financial regulation, discussions are going on in three areas. The first is the system of provisioning for bad assets, in particular non-performing loans. Efforts are being made to find a provisioning mechanism that will ensure timely recognition of loan losses and reduce the sensitivity of financial institutions to cyclical fluctuations in the economy. This is generating a conflict between macro-prudential regulation and current accounting principles. Advocates of the macro-prudential concept are pushing for the introduction of a provisioning system that would ideally cover expected losses over the entire economic cycle. This concept, implemented, for example, under the name "dynamic provisioning" in Spain in 2000, is aimed at enabling banks to build up a capital buffer in good times that can be used in bad times (De Lis, Pages and Saurina, 2001).[2] A countercyclical capital framework should foster a more stable banking system and dampen the impacts of cyclical fluctuations. By contrast, the accounting authorities prefer information provided to investors to be verifiable and object that dynamic provisioning allows profit to be manipulated and artificially smoothed on the basis of "excessive" provisioning in times of boom. The conflict between the regulatory and accounting views of loan loss provisioning is examined in, for example, Borio and Lowe (2001) and Frait and Komárková (2009).

The second area is the debate regarding the accounting rules for revaluing financial assets using market prices. The application of "mark-to-market" techniques for valuing financial assets (fair value accounting) can foster procyclicality of the financial system, particularly given the assumption that market prices are themselves procyclical because of over-optimism or imperfections in risk measurement and management (Novoa, Scarlata and Sole, 2009). Asset valuation based on current market prices involves assessing risks which arise from the current situation and which therefore do not reflect the entire business cycle. During a growth

[1] Eickmeier, Hofmann and Worms (2006) show that the fall in lending in Germany in 2000–2005 was driven by an adverse supply shock.

[2] Saurina (2009) suggests that the dynamic provisioning system played a positive role in maintaining the stability of the Spanish banking sector during the global financial crisis.

phase, financial risk indicators (such as default rate and asset price volatility) thus tend to decrease. This encourages growth in market liquidity at times of economic growth and the acceptance of a higher level of risk and subsequently growth in the leverage of financial institutions (including off-balance-sheet exposures).

The final area being discussed in relation to procyclicality of the financial system is Basel II itself (Basel Committee on Banking Supervision, 2006). Basel II requires banks to hold higher capital if the risks associated with holding financial assets (loans and securities) rise. This is because the capital requirement for credit risk is a function of the probability of default (PD), the loss given default (LGD) and the exposure at default (EAD), whose values and correlations can change according to the phase of the economic cycle.[3]

The procyclicality of Basel II – or the sensitivity of risk parameters to the current cyclical position of the economy – may be the main source of the feedback effect, as an economic contraction will generate, via growth in PD and LGD, a need for higher capital requirements, which, given certain assumptions, can lead to a decrease in lending to the real economy ("deleveraging"). Such a decrease, however, can produce a further negative effect on the real economy and a further increase in PD and LGD with a subsequent further increase in the capital requirements (Benford and Nier, 2007). The assumptions for strongly procyclical bank behaviour are discussed in detail in section 4, which subsequently contains an empirical illustration of the feedback effect on data for the Czech Republic.

3. Proposals for mitigating procyclicality

At least since the global financial crisis erupted, numerous international initiatives have been examining how regulatory, macro-prudential and accounting principles can mitigate procyclicality of the financial system. The main platforms for the debate of these principles are the Financial Stability Forum (since 2009 called the Financial Stability Board, FSB), the Basel Committee on Banking Supervision (BCBS) and the Committee on the Global Financial System (CGFS). These forums make use of technical and professional assistance from the Bank for International Settlements (BIS) in Basel. Given the significant role of accounting principles, discussions are also going on within the International Accounting Standards Board (IASB). At European level, these efforts are being coordinated by the European Commission (EC), the European Central Bank (ECB), certain committees under the European Council (the Economic and Financial Committee, EFC) and the Lamfalussy committees, in particular the Committee of European Banking Supervisors (CEBS). The European initiatives were launched back in October 2007 under the ECOFIN Roadmap.

The first set of proposals to mitigate procyclicality contains measures relating to the provisioning system. In this context, the European Commission has published a consultation paper that should result in an amendment of the capital directive. This document proposes to mitigate the procyclicality arising from regulation by means of provisioning and by introducing additional measures on top of the asset risk-based regulatory requirements, by ensuring responsible borrowing and lending, and by removing national discretions (e.g. in respect to capital requirements and capital) (EU Commission, 2009, 2010). Since 2009, the

[3] The risk of procyclicality was taken into account when Basel II was being prepared and some countercyclical elements, such as a requirement for conservative PD and LGD estimates (ideally covering the entire business cycle and containing a conservative buffer) were incorporated into the overall framework. In addition, under Basel II the time series used to estimate the models should cover essentially the entire economic cycle, bank portfolios should be tested for resilience to extreme shocks, and the models used should be validated and backtested.

IASB has also been engaged in revising the provisioning system so that provisions cover expected losses through the cycle.[4]

In connection with changes in asset accounting, an IASB Exposure Draft (2009) on new accounting standards has been approved. Under these rules there are to be only two categories of financial instruments – those measured at amortised cost and those measured at fair value. A financial asset or financial liability should be measured at amortised cost if the instrument has basic loan features and it is managed on a contractual yield basis. In other cases, the instrument should be measured at fair value. This would substantially reduce the complexity of measurement of financial instruments, as under currently valid IAS 39 there are four categories of financial assets and two categories of financial liabilities. The tools under discussion also include a BCBS proposal to introduce leverage limits. This leverage ratio would be used as a safeguard against excessive growth in banking transactions and underestimation of risks undertaken at times of economic growth. This issue is also covered by a consultation paper of the European Commission (EU Commission, 2010), which is coordinating its work with the BCBS. According to this proposal, the leverage ratio should be introduced at the end of 2012.

Probably most attention is being devoted to possible revisions of Basel II itself. A fundamental problem with this regulatory framework is that while one of its main objectives is to increase the risk-sensitivity of regulatory capital, this simultaneously means that the minimum capital requirements of banks are procyclical. Certain measures to mitigate this property were implemented into Basel II before it was introduced. Others were added later on, during the global financial crisis. Examples include efforts to capture the risk associated with off-balance-sheet structures, the risk of a sudden fall in the value of market portfolios and the risk of insufficient balance-sheet liquidity. However, available evidence points out that these mechanisms are unable to mitigate the cyclicality of Basel II to a sufficient extent. Proposals intended to further reduce the procyclicality of the framework are therefore under discussion. These suggestions can be divided into three main categories. The first comprises measures intended to mitigate the cyclicality of Basel II itself in an attempt to smooth the capital requirements over time without losing the ability to differentiate between risks. This can be achieved by, for example, reducing the cyclicality of the parameters inputted into the capital adequacy calculation. Another option is to smooth the already calculated capital requirements, i.e. to create countercyclical capital reserves on top of the minimum capital requirements. The third and final set of measures is linked with the relationship between capital requirements and provisioning.[5]

The proposal to seek potential measures to reduce the procyclicality of bank lending first of all within the existing Basel II framework seems very sensible. For example, the second pillar of Basel II allows supervisory authorities to stipulate higher capital requirements if the regulator decides that risks are not sufficiently covered. Mandatory stress testing of bank portfolios using extremely negative scenarios also plays a supporting role, as does backtesting of PD and LGD models using crisis-period data.

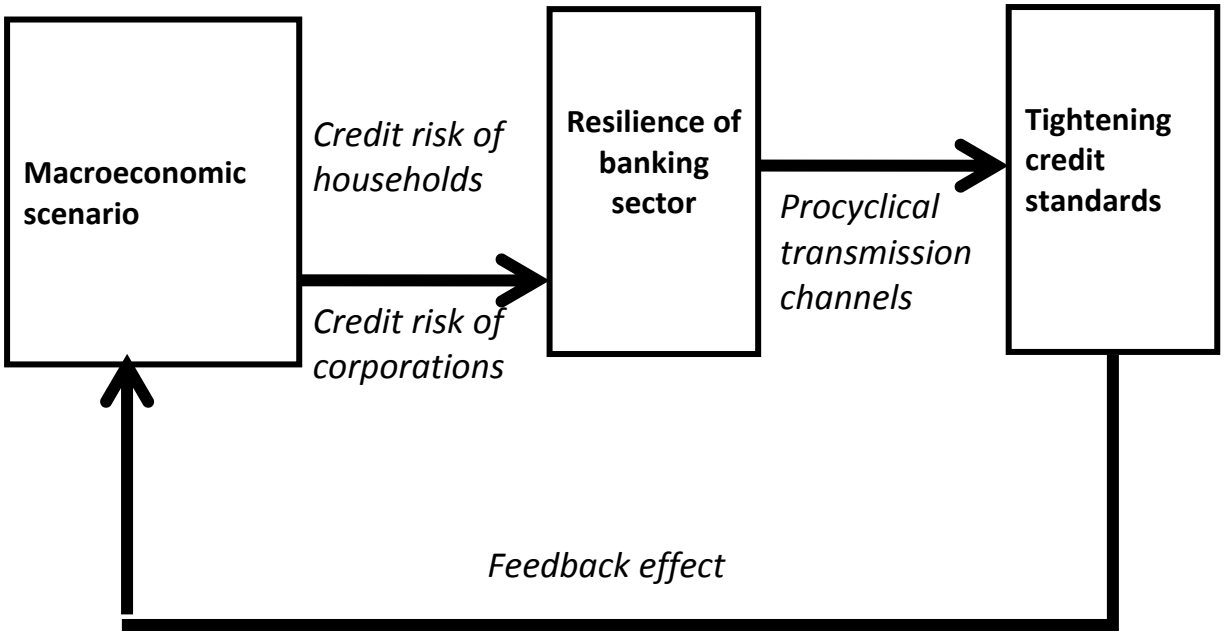
4. The feedback loop and its empirical simulation for the Czech Republic

In its initial phase the 2007–2009 global financial crisis caused substantial losses on assets linked to the sub-prime segment of the US mortgage market in many internationally active banks. When falling economic output in most economies started to lead to growth in credit

[4] See http://www.iasplus.com/agenda/ias39impairment.htm.
[5] The BCBS opened a public debate on this issue by publishing its Basel II reform proposals in December 2009.

risk in the traditional segments of households and corporations, concerns arose about the impact of the potential stronger procyclicality of the newly implemented Basel II.[6] This uncertainty was exacerbated by the fact that the new regulatory framework was untested by crisis and contained certain procyclical elements.

Figure 1: Feedback loop



The main source of concern was the fact that rising credit risk was leading, via growth in PD (and possibly also LGD), to growth in risk-weighted assets (or capital requirements) in a situation where bank capitalisation had already been significantly weakened by losses from toxic assets. Growth in risk aversion and the globally synchronised recession, moreover, effectively eliminated any privately funded capital increases. To stop their capital adequacy ratios falling below a certain threshold, banks had to radically reduce their exposures to the real sector (and tighten their credit standards) and thus reduce their risk-weighted assets. This deleveraging process, however, could have adverse consequences for the economy and feed back to the banking sector, as a fall in lending to the real sector would inevitably lead to a further decline in economic output and thus to further growth in credit risk (the feedback effect). This growth could lead to a further decrease in exposure to the real sector, which, in turn, would cause a deeper decline in economic output, and so on. Figure 1 illustrates this mutually reinforcing feedback loop.

However, the high degree of procyclicality that would lead to such a feedback loop has numerous strong assumptions. First, the volume of risk-weighted assets of most banks would have to be a direct function of PD and LGD, i.e. the majority of banks would have to apply the IRB approach[7] to the calculation of capital requirements for credit risk. Second, when calculating capital requirements most banks would have to use PD and LGD estimates responding directly to the phase of the economic cycle ("point-in-time" estimates). Only in this case would an economic downturn be reflected immediately in changes in PD and LGD. Third, higher capital requirements would have to force the bank to change its behaviour, in the sense of reducing the supply of loans. This is possible if the bank is operating at the

[6] Basel II was implemented in most European economies in 2007.
[7] The Internal Rating Based Approach, a technique allowing banks to use internal rating models to manage credit risk.

threshold of its targeted capital adequacy ratio, for example because of a fall in regulatory capital due to accumulated accounting losses. However, we would have to assume simultaneously that the bank does not have the option of strengthening its regulatory capital from external sources or accumulated retained earnings. The capital adequacy ratio targeted by banks would moreover have to be higher than the regulatory minimum of 8%. Many banks maintain a capital buffer above the regulatory minimum (for example to maintain their ratings) which they do not want to fall to zero. Fourth, the reduction in the supply of loans would have to exceed the decline in demand for loans due to the contraction in economic activity. Otherwise, banks would not have to actively reduce their risk-weighted assets by reducing their exposures, but would merely wait for demand for loans to fall spontaneously. This simultaneously implies that banks are able in reality to reduce the supply of loans (or reduce their portfolios). Fifth and finally, the reduced supply of loans would have to have a strong effect on economic output. This implies, for example, that private entities would have no other ways of raising funding (for example by issuing securities in the financial markets, retaining profits or obtaining funding from non-banking institutions). The propagation mechanism and transmission channels of this impact are discussed in more detail in, for example, Aikman et al. (2009).

Using data on the Czech banking sector we tried to simulate the feedback loop for a selected adverse macroeconomic scenario. To get as close as possible to a potential real situation, the simulation was conducted using disaggregated data on individual banks within the CNB's existing macro-stress-testing system. This system offers a suitable framework thanks to its orientation towards adverse macroeconomic scenarios, its dynamic nature (capturing the situation in banks over the eight subsequent quarters), the dependence of PD values on macroeconomic developments by means of credit models (see Jakubík and Schmieder, 2009) and the use of disaggregated data on the portfolios of individual banks in the Czech Republic.

Although the simulation was conducted under the aforementioned five assumptions, it can give us an idea of the magnitude of this effect. In the empirical analysis it is assumed that negative macroeconomic developments will foster higher capital requirements for all banks owing to higher PD and LGD values in their credit portfolios. These risk parameters are inputted into the capital requirement calculation under the Basel II IRB approach. Although this advanced method for calculating risk-weighted assets is applied by only a few banks in the Czech Republic, the institutions that do apply it are large banks accounting for almost three-quarters of total loans to the real sector.

The simulation was conducted on the data for the Czech banking sector as of 30 September 2009 using a highly adverse macroeconomic scenario describing a typical crisis in developing markets (e.g. the 1997 crisis in the Asian economies). This unlikely yet plausible scenario assumes very low Czech economic output in 2010 and a significant rise in risk aversion towards the Czech economy, manifesting itself in depreciation of the exchange rate and a rise in interest rates (see Chart 1).[8]

[8] The scenario was created in November 2009. In order to simulate the feedback effect, however, it is an independent macroeconomic scenario.

Chart 1: Evolution of key macro-indicators in adverse scenario
(in %; in CZK/EUR)

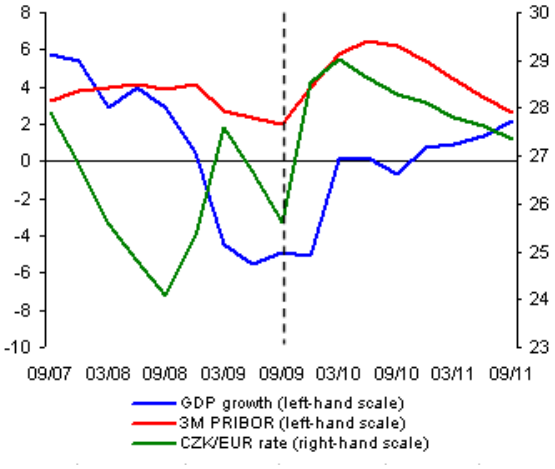
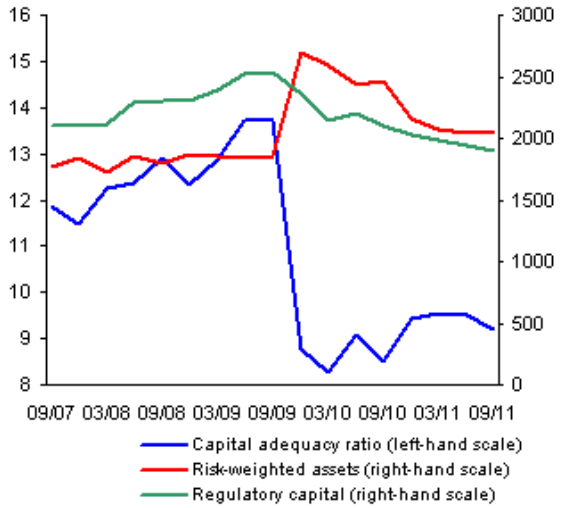


Chart 2: Evolution of capital adequacy ratio in adverse scenario
(in %; RWA in CZK billions, regulatory capital in CZK hundreds of millions)



We also assumed that banks will generate very low income (especially net interest income and net fee and commission income) over the entire simulation period to serve as a first line of defence against loan losses and losses due to market risks.[9] This leads immediately to absolute losses in many banks due to a fall in the value of bond holdings, exchange rate changes and loan loss provisioning, which together exceed the assumed income. The resultant losses are reflected immediately in a fall in regulatory capital.

The downturn in economic output, however, is reflected simultaneously in growth in risk weights via growth in PD and LGD and leads to higher risk-weighted assets. In some banks, this can give rise to pressure to maintain sufficient capital adequacy.[10] Compared to the initial position as of 30 September 2009, the aggregate capital adequacy ratio is lower owing to a fall in capital (due to realisation of accounting losses) and to the rise in risk-weighted assets (see Chart 2), and is bordering on the regulatory minimum of 8%.

Assuming that all banks want to maintain a capital adequacy ratio of, say, 10% and there is no way of raising capital externally,[11] the logical response of banks is to lower their risk-weighted assets by reducing their credit exposures. The aforementioned results of the adverse scenario already contain a decrease in the credit portfolio reflecting reduced demand in an environment of weak economic output. To maintain a sufficient capital buffer, banks would therefore have to resort to a further decrease in loans in excess of the decline in credit demand.

In the following analysis of the feedback effect we proceed in a sequential manner. This approach is permitted by the dynamic nature of the banking sector stress-testing system. In the first quarter of the simulation (in this case 2009 Q4) banks are exposed to the effect of the worse economic situation and observe growth in PD and estimated LGD, a fall in the value of

[9] The scenario assumes that banks' net income (i.e. income gross of the effect of macroeconomic shocks) in the period 2009 Q4–2011 Q3 will reach just 50% of the average for the previous two years. This is an extreme assumption used to create a truly bad but still possible alternative scenario that is consistent with the aforementioned assumptions for realisation of the feedback effect.

[10] PD is estimated using credit risk models, while growth in LGD is simulated by expert estimation; in the corporate exposure segment, for example, a rise in LGD from the regulatory 45% to 70% is assumed.

[11] The option of increasing capital internally from retained earnings is kept, but this is more of a theoretical option given the assumed accumulated losses.

bonds, very low yields and also a decline in demand for loans. On the basis of these observed developments, banks for the first time calculate for themselves what their capital adequacy ratio would be at the end of the quarter if they failed to react in a significant way. If this calculated capital adequacy ratio is lower than required (the 10% assumed above), they will reduce their exposures during this quarter such that the resulting capital adequacy ratio is at least 10%. This is, of course, a very simplifying assumption, as the reduction in exposures would in reality probably last more than one quarter.

In the adverse scenario given here, 15 of the 21 banks tested are forced to react in the first quarter of the simulation.[12] The reduction in the supply of loans (for example through the sale of claims out of the banking sector or through the non-renewal of short-term revolving and overdraft financing, or even – which is more costly for banks, although not an entirely impossible strategy – through the cancellation of standby credit or the reduction of credit limits) in excess of the decline in credit demand will have a major impact on the economy, especially if economic agents have significantly limited access to funding from alternative sources. The existing evidence on bank financing in the Czech Republic suggests that the overwhelming majority of non-financial corporations have just one financing bank. This effectively prevents firms from switching to other banks with which they have no credit history (Geršl and Jakubík, 2009). Market financing is also not very widespread. On the other hand, we should add that large firms (which very often have foreign owners) can theoretically have other sources of funding either directly from their parent companies or from foreign banks in the form of cross-border loans. For the sake of simplicity, the simulation assumes very strong financial constraints on firms, which are forced to cut output if they lose bank financing, which in turn leads to a further decline in economic output.

We assume that the reduced bank financing has a slightly lagged effect on the economy such that the decline in the loan supply in the first quarter of the simulation is reflected in real GDP in the following quarter, i.e. in 2010 Q1. The key issue is the estimation of the feedback effect itself. In this paper we use a simple approach based on an estimate of the elasticity of GDP to changes in lending. Most of the studies applying this idea are based on the methodology presented in Driscoll (2004). This technique was also used by Čihák and Brooks (2009), who in cooperation with the European Central Bank for a panel of European countries estimated the elasticity between a decline in the year-on-year growth rate of loans (in excess of the decline caused by reduced loan demand) and year-on-year real GDP growth at around 0.1. This means that, for instance, a decline in the year-on-year growth rate of loans of 10 percentage points in excess of the decline due to lower demand is reflected in a decline in year-on-year GDP growth in the following quarter of 1 percentage point. This elasticity estimate was used to simulate the feedback effect for the Czech economy.

The contraction of the economy in the second quarter of the simulation (2010 Q1) caused by the feedback effect is reflected in bank portfolios in further growth of PD in the following quarters (LGD is assumed to be at a higher, but constant level). This leads to increased growth in loan losses, a decrease in regulatory capital and a rise in risk-weighted assets. At the same time, however, the feedback effect also generates a further decline in demand for credit in the given quarter.[13] The overall effects on profit/loss, regulatory capital and risk-weighted assets in 2010 Q1 and hence the resultant capital adequacy ratio depends on the calibration of the scenario and the size of the portfolios relative to banks' income. In 2010 Q1, banks will evaluate the expected impact of the economic environment on the resultant capital adequacy

[12] As capital regulation is responsible for the procyclical behaviour of banks in this simulation, the simulation is performed only for capitalised banks, i.e. branches of foreign banks are excluded.

[13] Another highly likely impact would be a decline in net income; this is fixed in the simulation for the time being and does not change as GDP declines further.

ratio and, if necessary, will further decrease the credit supply during the quarter. This will negatively affect GDP in the next quarter. The simulation performed here reveals, for example, that the same number of banks as in 2009 Q4 must further reduce their loan portfolios.[14] The same logic is then applied to all eight quarters for which the simulation is performed. Hence, if the feedback effect materialises, the original scenario (see Chart 1) and the original path of the effect on the banking sector (see Chart 2) do not apply and the economy and the key banking sector variables develop differently (see Chart 3 and Chart 4).

For the sake of simplicity, the simulation of the effect of procyclical bank behaviour on the economy is performed only for GDP; the other macroeconomic variables maintain their original paths. This is, of course, a very significant simplification. It can be expected, for example, that monetary policy-makers would in all probability react to the sharper decline in GDP by easing the interest-rate conditions.

Chart 3: Evolution of total loans in adverse scenario
(year-on-year growth in %)

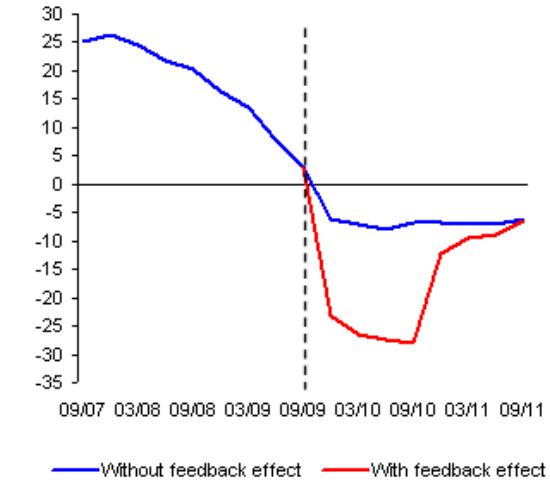


Chart 4: Evolution of real GDP in adverse scenario
(year-on-year growth in %)

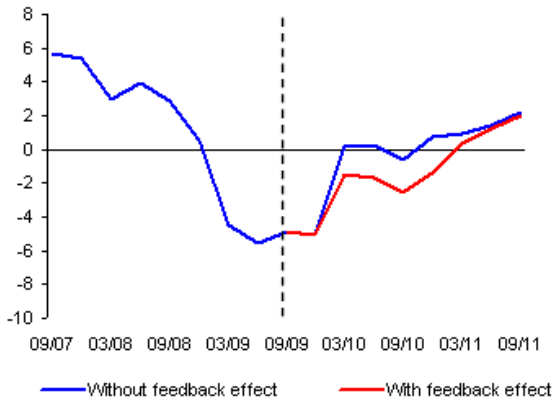


Chart 3 shows the evolution of year-on-year loan portfolio growth for the scenario without the feedback effect (i.e. with a demand-driven decline in loans only) and for the scenario with the feedback effect. The difference in the paths is directly correlated with the impact on GDP growth, as illustrated in Chart 4.

The decline in credit exposure reduces risk-weighted assets such that all the banks maintain the targeted capital adequacy ratio of 10% (see Chart 5). The path of the capital adequacy ratio in the presence of the feedback effect is thus better, since RWA declines. However, the worse evolution of the economy is reflected, with a lag, in growth of the risk parameter PD for the principal sectors of the economy (see Chart 6).

[14] Only in the third quarter of the simulation, i.e. in 2010 Q2, does the number of reacting banks start to fall slightly.

Chart 5: Evolution of capital adequacy ratio (CAR) and RWA in adverse scenario
(in %; in CZK billions)

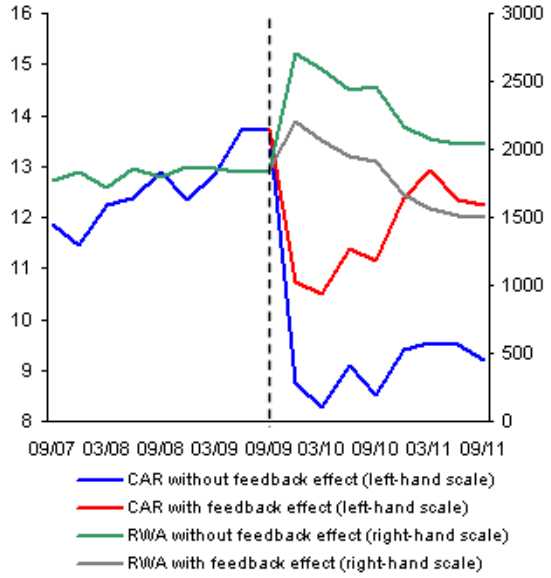
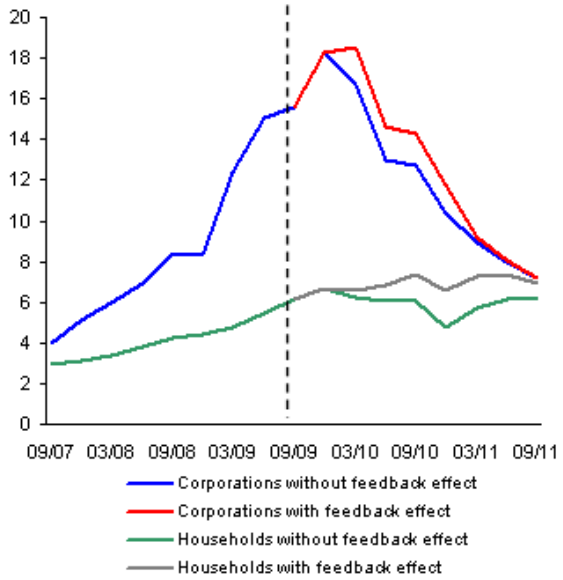
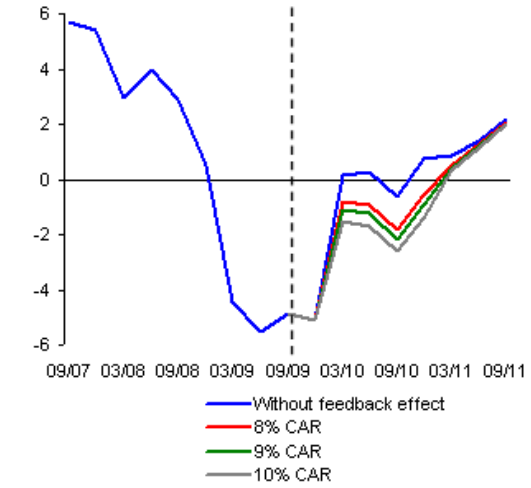


Chart 6: Evolution of PD predictions for corporations and households in adverse scenario
(in %)



The simulation results depend on many of the parameters discussed above. Besides the elasticity between the supply of loans and GDP growth, the key parameters include above all the capital adequacy ratio targeted by banks. For this reason, we conducted several alternative simulations with different targeted capital adequacy ratios of 8% and 9% and the original 10%. As the simulation results show (see Chart 7), the impact on the GDP growth path ranges from one percentage point (for a targeted capital adequacy ratio of 8%) to two percentage points (for a targeted capital adequacy ratio of 10%) of year-on-year GDP growth over a period of at least one year.

Chart 7: Evolution of real GDP in adverse scenario given alternative assumptions about targeted capital adequacy ratio
(year-on-year growth in %)



5. Conclusion

This paper set out to present an overview of the debate on the sources and effects of procyclical behaviour of the bank-based financial system that prevails in most EU countries. The main natural and regulatory sources of procyclicality were discussed, as were the current regulatory proposals for mitigating procyclicality.

In the event of a very strong decline in economic activity, and given some assumptions, procyclical behaviour by financial intermediaries can lead to a feedback loop, i.e. a mutually reinforcing effect between growing risks in the financial/banking sector and in the real economy. The main objective of the paper was to try to simulate the potential magnitude of this feedback loop on the example of a selected EU country, namely the Czech Republic. A single highly adverse scenario was chosen for the simulation and the entire simulation was performed on disaggregated data for the Czech banking sector using the CNB's stress-testing system.

The results of the simulation showed that under certain assumptions the feedback effect on the real economy can be 1–2 percentage points of year-on-year GDP growth over a period of at least one year. Procyclicality of the financial system should thus be taken into account in economic and macro-prudential policy-making.

References

AIKMAN, D., ALESSANDRI, P., EKLUND, B., GAI, P., KAPADIA, S., MARTIN, E., MORA, N., STERNE, G., WILLISON, M. (2009): *Funding Liquidity Risk in a Quantitative Model of Systemic Stability*, Bank of England Working Paper No. 372.

ALTMAN, E. I., BRADY, B., RESTI, A., SIRONI, A. (2005): *The Link between Default and Recovery Rates: Implications for Credit Risk Models and Procyclicality*, Journal of Business, Vol. 78, No. 6, pp. 2203–2228.

ALTUNBAS, Y., GAMBACORTA, L., MARQUÉS, D. (2007): *Securitisation and the Bank Lending Channel*, ECB Working Paper No. 838.

BASEL COMMITTEE ON BANKING SUPERVISION (2006): *Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework – Comprehensive Version*, BIS, June.

BCBS (2005): *International Convergence of Capital Measurement and Capital Standards: A Revised Framework*, Basel: Basel Committee on Banking Supervision – Bank for International Settlements, November 2005, ISBN 92 9197 669 5.

BENFORD, J., NIER, E. (2007): *Monitoring Cyclicality of Basel II Capital Requirements*, Financial Stability Paper No. 3, Bank of England.

BERNANKE, B. S., GERTLER, M., GILCHRIST, S. (1999). The Financial Accelerator in a Quantitative Business Cycle Framework, in handbook of Macroeconomics, Volume 1C, Handbooks in Economics, Volume 15, Amerstdam: Elsevier, pp. 1341–93

BORIO, C., FURFINE, C., LOWE, P. (2001): *Procyclicality of the Financial System and Financial Stability Issues and Policy Options. In: Marrying the Macro- and Micro-prudential Dimensions of Financial Stability*, BIS Paper No. 1, pp. 1–57.

BORIO, C., LOWE, P. (2001): *To Provision or Not To Provision*, BIS Quarterly Review, September 2001.

CALZA, A., GARTNER, C., SOUSA, J. M. (2001), *Modelling the Demand for Loans to the Private Sector in the Euro Area*, ECB Working Paper No. 55.

CHRISTODOULAKIS, G., BATIZ-ZUK, E., POON, S. (2009): *Systemic Basel II Credit Loss Distributions Under Non-normality*, DG ECFIN 6th Annual Research Conference, Brussels.

ČIHÁK, M., BROOKS, P. K. (2009): *From Subprime Loans to Subprime Growth? Evidence for the Euro Area*, IMF Working Paper No. 09/69.

DE LIS, F. S., PAGES, J. M., SAURINA, J. (2001): *Credit Growth, Problem Loans and Credit Risk Provisioning in Spain*, BIS Papers No. 1, pp. 331–353.

DRISCOLL, J. C. (2004): *Does Bank Lending Affect Output? Evidence from the U.S. States*, Journal of Monetary Economics, Vol. 51(3), pp. 451–471.

EICKMEIER, S., HOFMANN, B., WORMS, A. (2006): *Macroeconomic Fluctuations and Bank Lending: Evidence for Germany and the Euro Area*, Discussion Paper Series 1: Economic Studies 2006, 34, Deutsche Bundesbank, Research Centre.

EU COMMISSION (2009): *Capital Requirements Directive on Trading Book, Securitization Issues and Remuneration Policies*, Proposal for a Directive of the European Parliament and of the Council, Brussels, 13.7.2009.

EU COMMISSION (2010): *Possible Further Changes to the Capital Requirements Directive*, http://ec.europa.eu/internal_market/consultations/docs/2010/crd4/consultation_paper_en.pdf.

FRAIT, J., KOMÁRKOVÁ, Z. (2009): *Instruments for Curbing Fluctuations in Lending Over the Business Cycle*, Financial Stability Report 2008/2009, Czech National Bank, pp. 72–81.

GERŠL, A., JAKUBÍK, P. (2009): *Models of Bank Financing of Czech Corporations and Credit Risk*, Financial Stability Report 2008/2009, Czech National Bank, pp. 92–101.

GORDY, M., HOWELLS, B. (2006): *Procyclicality in Basel II: Can We Treat the Disease Without Killing the Patient?* Journal of Financial Intermediation, Vol. 15, pp. 395–417.

IASB (2009): Financial Instruments: Classification and Measurement, International Accounting Standards Board.

JAKUBÍK, P., SCHMIEDER, C. (2009): *Stress Testing Credit Risk: Is the Czech Republic Different from Germany?* CNB Working Paper 9/2008.

KOOPMAN, S. J., KRAUSSL, R., LUCAS A., MONTEIRO, A. (2009): *Credit Cycles and Macro Fundamentals*, Journal of Empirical Finance, Vol. 16, Iss. 1, pp. 42–54.

MADDALONI, A., J.-L.PEYDRÓ and S. SCOPEL (2010), *Does monetary policy affect bank credit standards? Evidence from the euro area Bank Lending Survey*, ECB working paper, forthcoming.

NOVOA, A., SCARLATA, J., SOLE, A. (2009): *Procyclicality and Fair Value Accounting*, IMF Working Paper No. 9/39.

QUAGLIARIELLO, M. (2007): *Banks' Riskiness over the Business Cycle: A Panel Analysis on Italian Intermediaries*, Bank of Italy Economic Research Paper No. 599.

SAURINA, J. (2009): *Dynamic Provisioning. The Experience of Spain*, Crisis Response, Public Policy for the Private Sector, Note Number 7, July, The World Bank.

IES Working Paper Series

2010

1. Petra Benešová, Petr Teplý : *Main Flaws of The Collateralized Debt Obligation's Valuation Before And During The 2008/2009 Global Turmoil*
2. Jiří Witzany, Michal Rychnovský, Pavel Charamza : *Survival Analysis in LGD Modeling*
3. Ladislav Kristoufek : *Long-range dependence in returns and volatility of Central European Stock Indices*
4. Jozef Barunik, Lukas Vacha, Miloslav Vosvrda : *Tail Behavior of the Central European Stock Markets during the Financial Crisis*
5. Onřej Lopušník : *Různá pojetí endogenity peněz v postkeynesovské ekonomii: Reinterpretace do obecnější teorie*
6. Jozef Barunik, Lukas Vacha : *Monte Carlo-Based Tail Exponent Estimator*
7. Karel Báťa : *Equity Home Bias in the Czech Republic*
8. Petra Kolouchová : *Cost of Equity Estimation Techniques Used by Valuation Experts*
9. Michael Princ : *Relationship between Czech and European developed stock markets: DCC MVGARCH analysis*
10. Juraj Kopecsni : *Improving Service Performance in Banking using Quality Adjusted Data Envelopment Analysis*
11. Jana Chvalkovská, Jiří Skuhrovec : *Measuring transparency in public spending: Case of Czech Public e-Procurement Information System*
12. Adam Geršl, Jakub Seidler : *Conservative Stress Testing: The Role of Regular Verification*
13. Zuzana Iršová : *Bank Efficiency in Transitional Countries: Sensitivity to Stochastic Frontier Design*
14. Adam Geršl, Petr Jakubík : *Adverse Feedback Loop in the Bank-Based Financial Systems*

All papers can be downloaded at: http://ies.fsv.cuni.cz

Univerzita Karlova v Praze, Fakulta sociálních věd
Institut ekonomických studií [UK FSV – IES] Praha 1, Opletalova 26
E-mail : ies@fsv.cuni.cz http://ies.fsv.cuni.cz