

How Important Is the Adverse Feedback Loop for the Banking Sector?

Adam GERŠL* – Petr JAKUBÍK**

Abstract

Current regulatory framework for EU banks can have potential procyclical effects. 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. This effect was simulated on the example of the banking sector of a selected EU country, namely the Czech Republic. The simulation results point out that under certain assumptions the feedback loop may play an important role.

Keywords: *procyclicality; feedback loop; bank regulation; deleveraging*

JEL Classification: G21, E44, E47

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,

* Adam GERŠL, Czech National Bank, Na Příkopě 28, 115 03 Prague 1, Czech Republic, and Charles University in Prague, Faculty of Social Sciences, Institute of Economic Studies, Opletalova 26, 110 00 Prague 1, Czech Republic; e-mail: adam.gersl@gmail.com

** Petr JAKUBÍK, European Central Bank, Kaiserstrasse 29, 60311 Frankfurt am Main, Germany and Charles University in Prague, Faculty of Social Sciences, Institute of Economic Studies, Opletalova 26, 110 00 Prague 1, Czech Republic; e-mail: petr.jakubik@ecb.int

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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. This section also provides a brief overview of the tools that can be used to reduce procyclicality of the financial system. Section 3 describes the methodology of the simulation of the feedback effect that relies on the stress testing framework used by the central bank of the Czech Republic. Section 4 shows the results of an empirical simulation of the adverse feedback loop for the case of the Czech economy, using bank-by-bank data as well as projections of macroeconomic and financial variables. Section 5 compares the adverse scenario with real developments in 2010 and draws some policy implications. In the conclusion, the main findings from the synoptic and empirical sections are summarized.

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). 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. De Bondt et al. (2010) 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 et al., 1999; Maddaloni and Peydró, 2010).

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. This is indirectly supported by the current regulatory and accounting system. The prevailing system of provisioning for bad assets which is based on incurred (i.e. observed) losses leads to low provisions in good times and a rapid increase in provisions in bad times that can drag on capital and push banks to behave procyclically. Additional role is played by 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

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

are themselves procyclical because of over-optimism or imperfections in risk measurement and management (Novoa, Scarlata and Sole, 2009).

Finally, one source of procyclicality of the financial system is the current Basel II regulatory framework (BCBS, 2006; Gordy and Howells, 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, at least in the more advanced Internal Ratings Based approach on (IRB), 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.² An economic contraction will thus 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 (“deliberating”). 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 3.

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. First, as to the provisioning rules, 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 (EC, 2009; 2010). However, 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, 2000).³ 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,

² 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.

³ 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.

for example, Borio and Lowe (2001) and Frait and Komárková (2009). In January 2011, both relevant bodies in this area (i.e. International Accounting Standards Board – IASB, and US Financial Accounting Standards Board – FASB) issued a joint proposal on provisioning favouring better accounting for future credit losses. However, the proposal will have to go through a number of commenting rounds and discussions before it will be ready for implementation.

Second, as to the mark-to-market valuation, an IASB (2009) is proposing reduction of categories of financial assets from four to two – those measured at amortised cost and those measured at fair value. Third, the tools further include a BCBS proposal within its Basel III package to introduce leverage limits on banks. 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. The leverage ratio should be introduced fully only in 2018, but since 2013 it could be applied by supervisors for selected banks.

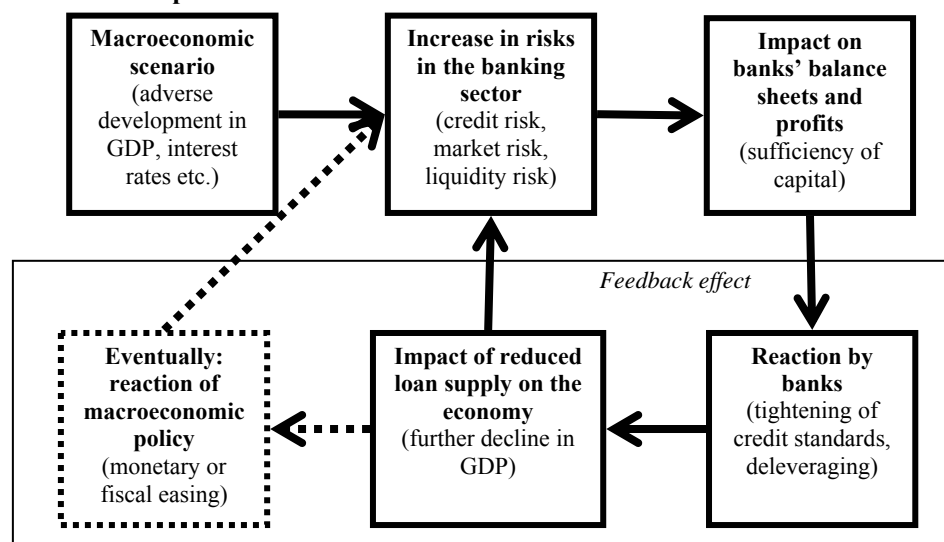
Finally, as to the procyclicality of capital requirements, options are discussed to smooth the capital requirements over time without losing the ability to differentiate between risks. This can be achieved by, for example, reducing the cyclicality of the parameters inputted into the capital adequacy calculation or by smoothing the already calculated capital requirements, i.e. to create countercyclical capital reserves on top of the minimum capital requirements. The Basel III package opted for the latter solution via introduction of the so-called countercyclical capital buffer which should be created in good times and released (i.e. serve to cover losses) in bad times (Geršl and Seidler, 2011). The size of the buffer should be based on the judgment of the national regulatory authority as to the accumulation of systemic risk and as a first guide, the departure of amount of credit in the economy from its long-term trend should be used.

3. Description of the Methodology and Data for Simulation of the Feedback Loop

In our simulation, we were inspired by the developments at the outset of the 2007 – 2009 global financial crisis. In its initial phase, banks worldwide incurred substantial losses on assets linked to the sub-prime segment of the US mortgage market. When falling economic output in most economies started to lead to growth in credit risk in the traditional segments of households and corporations, concerns arose about the impact of the potential stronger procyclicality of the then newly implemented Basel II.⁴ This uncertainty was exacerbated by the fact that the new regulatory framework was untested by crisis and contained certain procyclical elements.

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. The figure also shows that eventually macroeconomic policy would react to such a feedback loop (for example monetary policy) so that the effect of deleveraging on the economy and further increase in risks in banks' balance sheets could be partially muted. However, to stay on the conservative side, in the simulations described in this article we did not take the countercyclical stance of policymakers into account.

Figure 1
Feedback Loop



Source: Authors.

⁴ Basel II was implemented in most European economies in 2007.

However, the high degree of procyclicality that would lead to such a feedback loop has numerous strong assumptions. We applied the following five assumptions for our empirical analysis.

1. 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 approach⁵ to the calculation of capital requirements for credit risk.

2. 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.

3. 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 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.

4. 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).

5. 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 Czech National Bank’s (CNB) existing macro-stress-testing system. This system offers a suitable framework thanks to

⁵ The Internal Rating Based Approach, a technique allowing banks to use internal rating models to manage credit risk.

its orientation towards adverse macroeconomic scenarios, its dynamic nature (capturing the situation in banks over the eight subsequent quarters), satellite models mapping macroeconomic developments into financial variables and the use of disaggregated data on the portfolios of individual banks in the Czech Republic. The stress testing framework is described in detail in Geršl and Seidler (2010). In this section, we focus on its most relevant features that enable us to simulate the feedback loop.

First, the stress testing framework has a horizon of 8 quarters and the prediction for macroeconomic and financial variables for individual quarters is reflected directly in the prediction for the main balance-sheet and profit and loss account items of banks.

Second, the predictions for macroeconomic variables enter the so-called satellite credit risk and credit growth models. The credit risk models are used to predict the probability of default (PD) for the four main credit segments (non-financial corporations, loans to households for house purchase, consumer credit and other loans). Credit growth models are used to estimate the growth in bank portfolios and are used (after certain adjustments) to estimate the evolution of risk-weighted assets (RWA).

Two econometric models based on one-factor model (Jakubík, 2007; Jakubík and Schmieder, 2009) are employed to calibrate PD for all considered segments. Both models were estimated using quarterly data obtaining from bank credit registries in the Czech Republic. This data covers newly past due loans which were used to calculate proxy for default rates.

Credit risk model for corporations suggests that lagged increases in short-term interest rates, lagged decreases in real investment growth, lagged decreases in real foreign demand growth, lagged decreases in real gross domestic product growth and lagged decreases in real consumption growth all positively affect the corporate default rate. The model captures domestic demand (real consumption) as well as foreign demand for firms' product (real foreign demand). The real investment can serve as an indicator for firms' financial health as corporates will probably reduce their investment during times of financial distress. Finally, the real GDP is used as a proxy for firms' revenues and the interest rate represents financial costs for corporate sector funding.

Credit risk model for households suggests that the lagged real GDP growth negatively affects default rates. However, a decrease in lagged nominal wage growth, an increase in the unemployment rate and an increase in lagged interest rates has a positive effect on the household credit default rate. The model captures both the asset and liabilities side of households' balance sheets. While unemployment and nominal wages have an impact on household income, interest

rates have an influence on household financial costs. Real GDP is used as a proxy for the factors affecting disposable income not covered by the previously mentioned indicators. Household financial distress or default can be defined as a situation when a debtor is not able to service its outstanding debt. Under these circumstances, the disposable income of such a household is negative. The predicted household default rates are used to calculate PDs for both mortgage and consumer lending portfolios.⁶

Third, assuming certain levels of loss given default (LGD) determined by expert judgement for different credit segments in line with the projected economic development, especially the house prices, the loan losses are computed as a product of PD and LGD. However, the equally important impact of increased PDs comes as the increased capital requirements for credit risk. For banks applying the advanced approach to the calculation of capital requirements for credit risk under Basel II, the capital requirements for credit risk are a function of PD and LGD. Given that the largest banks in the Czech Republic apply the advanced approach, this relation is applied to all banks for the sake of simplicity. An increase in PD and LGD results in an increase in RWA providing a constant portfolio volume.

Fourth, next to credit losses, the framework also contains modules for calculating the impact other risks, namely market risk and interbank contagion. The prediction for long-term interest rates is used to estimate profits/losses from the revaluation of bond holdings (except for bonds held to maturity and bonds with a variable coupon linked to certain reference interest rate). The quarter-on-quarter change in the CZK/EUR exchange rate is applied to the net open foreign currency position, generating either a loss (in the case of a positive open position and appreciation of the koruna) or a profit due to the change in the exchange rate (in the opposite case). Interbank contagion risk is modelled on the basis of data on interbank exposures and uses iterations for modelling a possible domino effect of a fall of one banks on the system as whole.

Fifth, the framework assumes a decline in operating profit in adverse macroeconomic scenario. This, together with the incurred credit and market losses, may lead to accounting loss which is directly subtracted from the regulatory capital.⁷

Finally, the stress testing framework was adjusted to allow reaction of banks in the supply of credit (the feedback effect). The above mentioned credit growth models are interpreted as models of credit demand and the banks have a possibility

⁶ For evidence on drivers of default in retail segment in the Czech Republic see Kočenda and Vojtek (2011).

⁷ If a bank generates profit (i.e. its operating profit is higher than its credit and market losses), its regulatory capital remains at the same level and once per year there is decision modelled about distribution and/or (partial) retention of the profit.

to cut lending in order to reach such a level of risk-weighted assets for which the regulatory capital at disposal is sufficient to achieve a pre-determined targeted capital adequacy ratio.

As to the data, the bank-level data used in the simulation come from the internal databases of the Czech National Bank. Default rates are based on data from the CNB Credit Register (corporations) and the private Banking Register run by Czech Credit Bureau (households). Macroeconomic and financial market variables are taken from publicly available sources such as Czech Statistical Office, Datastream and Bloomberg. Projections of macroeconomic variables for the adverse economic scenarios are produced by the official CNB forecasting model g3.

4. Empirical Simulation for the Czech Economy

The simulation was conducted on the data for the Czech banking sector as of end-September 2009 using a highly adverse macroeconomic scenario describing a typical crisis in developing markets (e.g. the 1997 crisis in the Asian economies) for the next eight quarters, i.e. for 2010 and three quarters of 2011. 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 strong depreciation of the exchange rate and an immense rise in short-term interest rates (see Chart 1). A variation of this scenario can be found in the CNB Financial Stability Reports (CNB, 2010; 2011).

Chart 1
Evolution of Key Macro-indicators
in Adverse Scenario
(in %; in CZK/EUR)

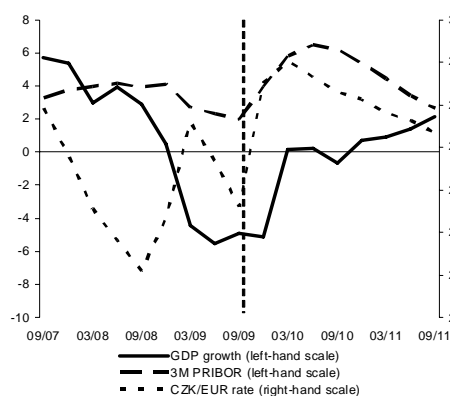
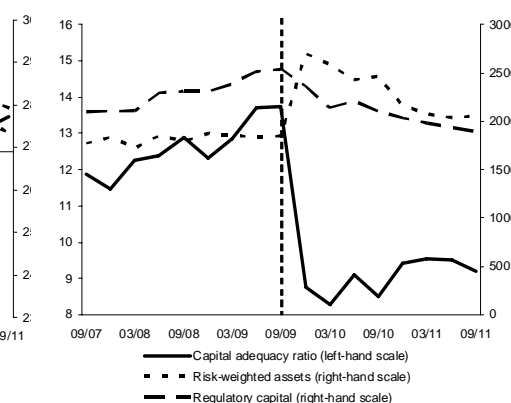


Chart 2
Evolution of Capital Adequacy Ratio
in Adverse Scenario
(in %; RWA in CZK billions, regulatory capital in CZK hundreds of millions)



Source: CNB; authors' calculations.

Additionally to adverse macroeconomic developments, we also assumed that banks will generate very low operating profit over the entire simulation period to serve as a first line of defence against loan losses and losses due to market risks.⁸ This leads immediately to accounting 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 operating income. The final 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 (via credit risk models) and LGD (ex-*post*ly set)⁹ and leads to higher risk-weighted assets. In some banks, this can give rise to pressure to maintain sufficient capital adequacy. Compared to the initial position as of September 30, 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%.

For the analysis, we assume that all banks want to maintain a capital adequacy ratio above regulatory minimum and set the targeted ratio to 10%. Moreover, we assume that there is no way of raising capital externally,¹⁰ thus 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 projected by the credit growth model 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 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

⁸ The scenario assumes that banks' operating profit adjusted for market gains/losses (i.e. net interest and fees income minus administrative costs) 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.

⁹ In the corporate exposure segment, for example, a rise in LGD from the regulatory 45% to 70% is assumed. In other loan segments, the increase amounts to some 20 – 30 percentage points.

¹⁰ The option of increasing capital internally from retained earnings is kept, but this is more of a theoretical option given the assumed accumulated losses.

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.¹¹ 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, 2011). 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

¹¹ 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.

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.¹² 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 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.¹³ 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 policymakers would in all probability react to the sharper decline in GDP by easing the interest-rate conditions.

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

¹² Another highly likely impact would be a decline in operating profit; this is fixed in the simulation for the time being and does not change as GDP declines further.

¹³ Only in the third quarter of the simulation, i.e. in 2010 Q2, does the number of reacting banks start to fall slightly.

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).

Chart 3
Evolution of Total Loans in Adverse Scenario
(year-on-year growth in %)

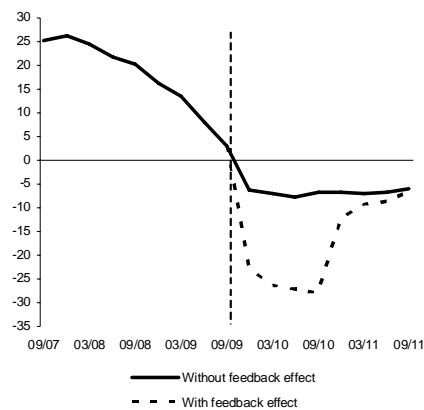
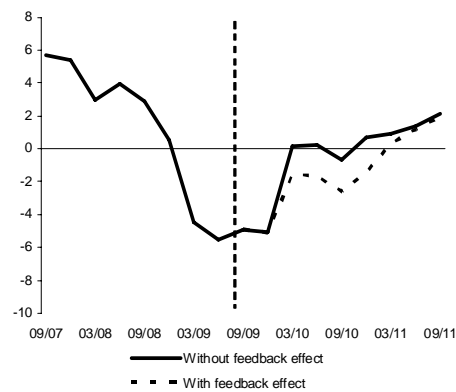


Chart 4
Evolution of Real GDP in Adverse Scenario
(year-on-year growth in %)



Source: CNB; authors' calculations.

Chart 5
Evolution of Capital Adequacy Ratio (CAR) and RWA in Adverse Scenario
(in %; in CZK billions)

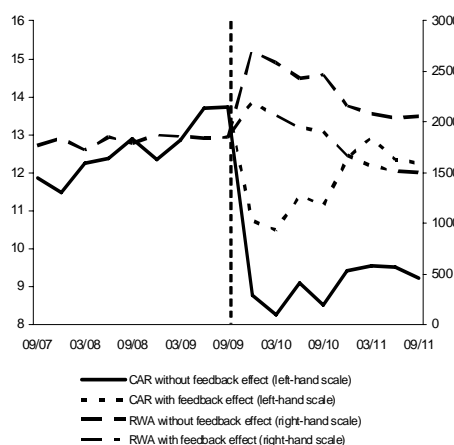
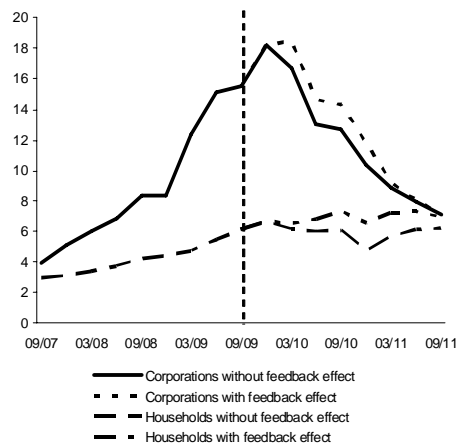


Chart 6
Evolution of PD Predictions for Corporations and Households in Adverse Scenario (in %)



Source: CNB; authors' calculations.

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 %)

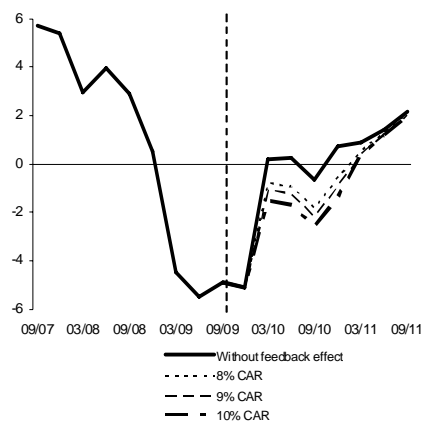
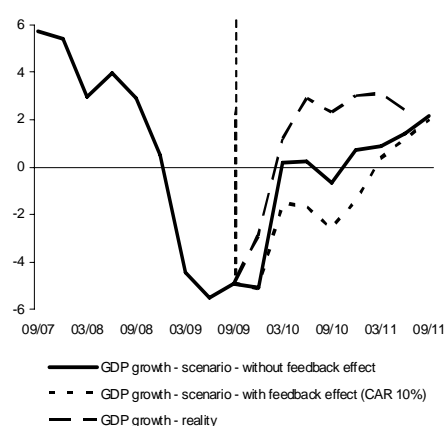


Chart 8
Comparison of GDP Growth in Adverse Scenario and Reality (in %)



Source: CNB; authors' calculations.

5. Economic Developments in 2009 – 2011 and Policy Implications

Due to the fact that data for end-2009, 2010 and partially also for 2011 are already available, one can ex-post discuss to what extent the macroeconomic scenario employed in the simulation exercise was materialized. Comparing macroeconomic data for the simulated horizon with the employed adverse scenario, we can find out that actually the assumed adverse scenario was relatively close to the real developments in terms of GDP growth path (see Chart 8). However, even a relatively bad situation in the real economy in 2009 – 2010 did not lead to the materialization of the feedback effect in the Czech Republic, as simulated in our analysis.

There are several reasons why the feedback effect did not materialize. First, the real GDP path was slightly more favourable than the one in our adverse scenario, mainly due to a revival in external demand. Second, the risk aversion to the Czech Republic did not increase and the banks did not suffer market losses from revaluating bond portfolios. On the contrary – the Czech koruna appreciated and interest rates stayed at very low levels, as the central bank responded to the economic recession and low inflation pressures by accommodative monetary policy. This was probably the crucial factor which mitigates negative impact of the crisis on economic growth and also prevented the feedback effect to be fully materialized. Stronger external demand also helped to mitigate the effect of appreciation of the Czech koruna on the Czech corporate sector. Third, the banks did not experience declines in operating profits – on the contrary, some part of banks' income even increased (such as net interest income). The banking sector increased its overall profits (net, i.e. after tax) from some 45 CZK billion to levels close to 60 CZK billion both in 2009 and 2010, a good base from which the regulatory capital was strengthened. The capital adequacy increased from levels around 14% in 2009 to close to 16% in mid-2011. Overall, despite similar GDP growth path, the situation was more favourable compared to the simulation exercise.

Despite the feedback effect was not fully materialized during 2010, our analysis suggests that it could be an important factor which needs to be taken into account by policymakers, especially if some of the conditions listed in section 3 should become binding. Our experience suggests an important role for monetary policy which could ease the pressures on real economy via accommodative stance. Moreover, over time, macroprudential tools such as countercyclical capital buffers and regular stress testing should be utilized to encourage banks to create capital buffers in good times to be drawn down in bad times. Finally, the negative impact of de-leveraging on the corporate sector could be minimized through supporting the financial developments in funding markets, such as the domestic corporate bond market.

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 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 – relatively restrictive – 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.

Ex-post comparison of the conducted simulation exercise with the real developments suggest that adequate monetary and ex-ante macroprudential policy can help to mitigate the feedback effect on the economy. All in all, the empirical analyses point out that procyclicality of the financial system should thus be taken into account in economic and macro-prudential policy-making.

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