

## MODELLING BANK LOANS TO NON-FINANCIAL CORPORATIONS

Miroslav Plašil, Štěpán Radkovský, Pavel Řežábek

*This article aims to characterise the effect of demand and supply factors on bank loans to non-financial corporations and to obtain a forecasting model for the main variables linked with corporate loans. Our estimate of credit supply conditions in the Czech Republic echoes the results of the euro area bank lending survey. The results show that Czech banks significantly restricted credit when the financial crisis erupted, and this was partly reflected in the subsequent economic contraction. The article enhances our picture of the credit market, which, owing to the only recent launch of a bank lending survey in the Czech Republic, had not previously been mapped properly.*

### 1. INTRODUCTION

Bank loans are a key form of external financing of Czech non-financial corporations and a necessary precondition for the future growth of the sector. An analysis of total loans and their dynamics over time can thus yield valuable information on the real sector financing process and foster a better understanding of the relationship between real economic activity and the financial cycle. This knowledge can then be applied in the fields of financial stability (to assess the position in the financial cycle or estimate the path of credit risk) and monetary policy (e.g. to test the functioning of the credit channel of the transmission mechanism).

It is useful to analyse the credit market and the potential impacts of the credit conditions on economic growth separately from the perspective of the two main determinants of total loans, i.e. credit supply and credit demand. From the practical perspective, however, it is quite a challenge to disentangle these two determinants, because for every point in time only the combination of the price (the interest rate) and total quantity of loans is observable, not the demand and supply functions (see Busch et al., 2010). To get a more detailed idea of the effect of individual factors on credit growth, central banks generally conduct a regular bank lending survey (BLS),<sup>1</sup> in which commercial banks assess shifts in their credit standards and, on the other side, provide an indication of firms' and households' interest in borrowing. The Czech National Bank did not launch such a survey until mid-2012. This means it cannot yet use the available data for more extensive analyses.

This article therefore discusses the implementation of a simple empirical model to describe the credit dynamics

of non-financial corporations. The model can be used to determine in more detail how much the level of loans was influenced by the supply and demand sides over time. In this way we gain access to previously unavailable information. As even BLS results can be subject to distortions in some circumstances (see Del Giovane et al., 2011), the model outputs can also be used in the future to cross check whether the BLS results are informative and meaningful. The model can also be used to obtain forecasts for the variables analysed.

### 2. FINANCING OF NON-FINANCIAL CORPORATIONS AND ITS EVOLUTION OVER TIME

The banking sector is the primary financial intermediary in the Czech economy. The capital market – despite having grown over the last five years – still plays only a minor role in funding non-financial corporations (see, for example, Kubicová et al., 2012). Moreover, loans provided by non-bank financial institutions (such as leasing companies) still account for a relatively small proportion<sup>2</sup> of the financing of non-financial corporations. Bank loans and their dynamics are thus crucial to understanding the link between developments in the real economy and movements in the financial sector.

Total bank loans have been growing at quite a pace over the last 20 years. This growth has been driven by a whole range of factors, some of which are easy to capture in data and some are more difficult. These facts complicate the application of existing empirical techniques. The main problem is the question of the long-run stability of the relationships between the variables that characterise credit growth. This problem stems from relatively frequent transitions between fundamentally different time periods,

<sup>1</sup> Bank Lending Survey is the official name used by the CNB and other central banks.

<sup>2</sup> In the financial sector, loans provided by non-banks to non-financial corporations have a share of approximately 20%.

most of which have been of a unique or historically conditioned nature.

Given the data availability, we start our analysis of credit growth at the beginning of the last decade (see Chart 1). We can see that total bank loans were initially noticeably affected by banks' efforts to clear their balance sheets of bad loans provided in the 1990s (for more details, see Cimburek et al., 2009). This decline cannot be interpreted as a manifestation of cyclical behaviour caused by the situation in the real economy, as the economy was recording solid positive growth at the time. The decline linked with the clean-up of bank balance sheets gradually dissipated and was replaced approximately during 2004 by buoyant growth in loans in line with economic growth. Year-on-year loan growth peaked at around 20% in 2006 and 2007. Although the credit growth in this period was linked with the improving performance of the Czech economy, it also partly reflected the low initial indebtedness of Czech firms. Owing to the strong export orientation of the Czech economy, the financial crisis and its impacts on the country's main trading partners caused a large contraction in economic activity, reflected in a sharp downturn in credit growth.<sup>3</sup> The subsequent dynamics more or less mirrored the modest economic recovery in 2010 and 2011 and to a large extent also the later renewed recession. In addition to economic contraction, the recent period has been further characterised by an environment of unusually low interest rates.

### 3. EMPIRICAL MODEL AND DATA

The purpose of constructing the empirical model is to assess the effect of supply and demand factors on total loans. Likewise, it is also useful to assess how much the economic contraction was exacerbated by banks' credit supply restrictions at the time of the crisis.

There has recently been considerable progress in the analysis of the linkages between the real economy and the financial sector in both the theoretical area (focusing on DSGE models) and the area of developing empirical tools. The two<sup>4</sup> main empirical approaches currently used for

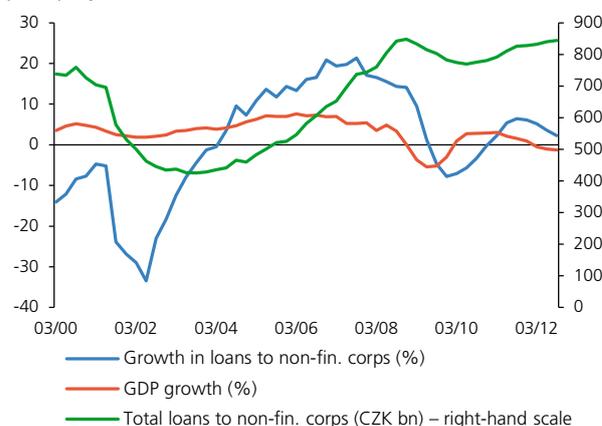
<sup>3</sup> We will try to answer the question of how much supply and demand factors contributed to this development in the next section.

<sup>4</sup> Apart from these two main techniques, it is also generally possible to use a panel regression approach combining BLS results with individual bank characteristics (Sóvágó, 2011; Del Giovane et al., 2011). However, this approach cannot be applied in the Czech case because the history of the BLS is too short.

CHART 1

#### BANK LOANS TO NON-FINANCIAL CORPORATIONS

(year-on-year growth rates in %; stocks in CZK billions)



Source: CNB, CZSO

these purposes are: (i) models based on cointegration analysis, which try to identify long-run relationships that can be interpreted as demand and supply functions (see, for example, Hülsewig et al., 2006; Kok Sørensen et al., 2012), and (ii) methods based on VAR models with sign restrictions on the impulse response functions. These restrictions stem from theoretical considerations and allow different types of shocks to be identified (see, for example, Busch et al., 2010; Tamási and Világi, 2011).

For the sake of simplicity, we focus in this article on the former approach, which is based on cointegration analysis and the construction of a vector error correction model (VECM).

#### 3.1 Error correction model

A VECM is a suitable representation of a multi-dimensional system of non-stationary time series which share common (stochastic) trends. Depending on the number of variables, one or more long-run relationships can be identified in the cointegrated system. Similarly to Kok Sørensen et al. (2012), we will focus on the magnitude and direction of the deviations from the long-run equilibrium (cointegration) relationships.

The VECM can be generally written in the form:

$$\Delta y_t = \mu + \Pi y_{t-1} + \sum_{h=1}^l \Gamma_h \Delta y_{t-h} + \varepsilon_t \quad (1)$$

where  $y_t$  is an  $n$  vector containing the variables under study, matrices  $\Pi$  and  $\Gamma$  contain information on, respectively, the long-run and short-run relationships between the variables,  $\varepsilon$  is a multi-dimensional white-noise process and  $\mu$  is

a deterministic term (for more details, see, for example, Lütkepohl, 2005).

With respect to our objectives, we primarily focus on the matrix of long-run relationships  $\Pi$  and its estimate. In the case of  $r$  cointegrating relationships,  $\Pi$  can be written as the product of two matrices  $\Pi = \alpha\beta'$ , where  $\alpha$  and  $\beta$  are of dimension  $n \times r$ . The rows of parametric matrix  $\beta$  correspond to the long-run relationships between the variables, and the elements of matrix  $\alpha$  give the speed of adjustment to the long-run equilibria. However, the decomposition of  $\Pi$  is not unique and various (although not totally arbitrary) model specifications share identical VECM representation. To obtain unique values of  $\alpha$  and  $\beta$  therefore requires further identifying or overidentifying restrictions on the model. In practice, this involves setting certain parameters equal to 0 or 1.

As noted in section 2, the expected instability of the relationships between the variables, makes it quite difficult to estimate the parameters of model (1). One possibility is to shorten the length of the time series used and only estimate the model for a time period in which the role of structural changes can be expected to be negligible. In practice, however, there is no guarantee that this can be done by shortening the series. Moreover, given the number of parameters, one gets into a situation where the model cannot be estimated with sufficient accuracy.

For these reasons, we will additionally estimate an alternative model in which the matrix of long-run relationships  $\beta$  contains time-varying parameters. This modification is meant to capture changes in the cointegrating relationships. When constructing the model, we will now assume that the time-dependent matrix  $\Pi_t$  can be split into two matrices in the form:

$$\Pi_t = \alpha\beta_t \quad (2)$$

where the matrix of loading coefficients  $\alpha$  is defined as before, but matrix  $\beta_t$  can now vary over time (for more details, see Bierens and Martins, 2010). However, we still assume that the number of cointegrating relationships  $r$  remains constant over time.

One possible objection to this approach is that cointegration expresses a permanent property of the system, which is not easy to reconcile with the idea of changes in long-run relationships in every period. Instead of the long-run aspect, therefore, Koop et al. (2011) suggest thinking of cointegrating vectors in terms of equilibria towards which

the system is attracted at any particular point in time. The key feature is that these relations are slowly changing over time.

### 3.2 Data

For the purpose of our analysis, the data set of quarterly time series for 2002 Q1–2012 Q3 comprises six variables: total bank loans to non-financial corporations (L), gross domestic product (Y), the interest rate on new loans ( $r$ ), the CZEONIA interest rate as a proxy for the monetary policy rate ( $i$ ),<sup>5</sup> the non-performing loan ratio (NPL) and the default rate (DF). The first four variables are the standard indicators used in similar studies (see, for example, Hülsewig et al., 2006).<sup>6</sup> We expanded this set to include risk rates, which models of this type usually abstract from, but which do have (as we show below) a substantial effect on credit demand and supply. Likewise, their presence in the model is useful for analysing the impacts of credit growth on financial stability.

The time series of total loans and GDP are expressed in natural logarithms. Where the standard time series tests detected the presence of seasonal effects, seasonal adjustment was performed prior to the analysis itself. All the series were tested for the presence of a unit root using the augmented Dickey-Fuller test. The results indicate that all the series can be considered  $I(1)$  in the given time period, which naturally gives rise to the error correction model representation.

We estimate model (1) over the period 2005 Q1–2012 Q3 and the time-varying parameter model based on relationship (2) over the period 2002 Q1–2012 Q3. The estimation period for model (1) was shortened because of the above-mentioned problem of bank balance sheet clean-ups, which cannot be adequately captured using a model with fixed parameters. Other argument for shortening the period is a methodological change to statistical reporting of loans and interest rates of non-financial corporations in 2004. Note that the results should be interpreted with caution because of the high number of parameters estimated (due to the number of variables and their lags).

<sup>5</sup> The CZEONIA rate was chosen ahead of the probably more commonly used PRIBOR because it more faithfully copied the two-week repo rate during the crisis. However, the PRIBOR gives comparable results.

<sup>6</sup> Variables describing firms' investment activity and financing needs (e.g. gross operating surplus) are also often included in such models. We exclude them from our analysis because the data are less reliable in the Czech case. However, omitting these factors may have adverse implications for the correct specification of the model.

### 3.3 Model construction and estimation

Before estimating the parameters, we need to determine the number of cointegrating relationships. The relevant tests do not give an entirely clear answer in this regard. The most commonly used Johansen trace test indicates the existence of three or four cointegrating vectors depending on the pre-selected significance level (and on the choice of time period). The alternative tests are not entirely unanimous either.<sup>7</sup> For this reason, we need to consider the objectives of the analysis in addition to statistical criteria when determining the number of relationships. Taking into account the test results and the nature of the problem, we set the number of cointegrating relationships at three.

The equation of three cointegrating relationships, together with the estimated parameters and their statistical significance, can be written as follows:<sup>8</sup>

$$L = \beta_{1,1}Y + \beta_{1,2}r + \beta_{1,3}DF + \beta_{1,0}$$

6,15\*
-0,06\*
-0,13\*
(3a)

$$r = \beta_{2,1}i + \beta_{2,2}NPL + \beta_{2,0}$$

1,09\*
0,47\*
(3b)

$$NPL = \beta_{3,1}(L - Y) + \beta_{3,2}DF + \beta_{3,0}$$

-4,09\*
1,48\*
(3c)

Model (3a)–(3c) was identified using overidentifying restrictions on the parameters of matrix  $\beta$ ; these restrictions are accepted by the model using the likelihood-ratio test.

Relation (3a) can be interpreted as long-run demand for credit, with the level of loans depending on the size of GDP, the interest rate on corporate loans (the cost of external financing) and the default rate. The first two variables (see Calza et al., 2001) are considered to be standard factors influencing credit demand, while a rising default rate can to some extent be thought of as a proxy for the profitability or overall soundness of non-financial corporations' balance sheets. The presence of this variable in relation (3a) can be justified with reference to theoretical models which postulate that adverse changes in corporate balance sheets have a negative effect on total credit demand (see, for example, the discussion of this literature in Balke and Zeng,

2011). This implies that  $\beta_{1,1}$  should take positive values, while  $\beta_{1,2}$  and  $\beta_{1,3}$  should, according to the theory, be negative. The signs of the estimated parameters are in line with the theory, although the GDP parameter seems unusually high. The estimates of this parameter in empirical studies in other countries are generally slightly greater than one, with some studies even working with a homogeneity assumption where  $\beta_{1,1}$  is exactly equal to one (loan growth equals GDP growth). The very high parameter value for the Czech Republic can be partially explained by the time period chosen for the estimation. It covers the pre-crisis phase of strong credit expansion, during which credit growth significantly outpaced economic growth (see Chart 1). The low initial debt level may also have affected the parameter value.

Equation (3b) describes the formation of corporate sector funding costs. Economic theory holds that, in the long run, banks generally set their interest rates with reference to the monetary policy rate, from which their financing costs are derived. Omitting the credit risk rate (NPL), relation (3b) shows that each bank sets its interest rate as a constant mark-up on the policy rate, so it can be interpreted as a long-run credit supply equation (see Kok Sørensen et al., 2012). The presence of the  $\beta_{2,2}NPL$  term in this equation complicates this simple interpretation, but there is some justification for including the NPL ratio in the credit supply equation. Growth in NPLs is closely related<sup>9</sup> to loan loss provisioning, which, in turn, leads to growth in banks' costs and (*ceteris paribus*) deterioration in their capital positions. This puts downward pressure on the total supply of loans. Armed with this reasoning, we will continue to interpret relation (3b) as a long-run credit supply equation. At the same time, it is reasonable to assume that  $\beta_{2,1}$  and  $\beta_{2,2}$  will be positive, i.e. that interest rates for non-financial corporations will rise in line with banks' funding costs and the credit risk rate. These assumptions are consistent with the estimated parameter values.

The final equation describes the relationship between the two credit risk rates. The (partially) forward-looking default rate explains the movements in the ratio of NPLs to total loans. This relationship is more of a definition and is needed in the model in order to capture the existing long-run relationship. The NPL ratio is also dependent on the difference between the actual level of loans and GDP. Owing to their logarithmic transformation, the difference

7 The Saikkonen-Lütkepohl test also indicates the existence of three or four cointegrating relationships depending on the period length (starting either in 2002 Q1 or in 2005 Q1), whereas the Bierens non-parametric test suggests that there are only two cointegrating relationships.

8 The estimated values of the relevant parameters are given below the equations. Asterisks indicate statistical significance at the 5% level. The validity of the chosen model was tested using standard tests of normality and (non-)autocorrelation of residuals. These identified no serious violations of the standard assumptions.

9 A simple comparison of the NPL ratio with the ratio of provisions to gross loans reveals a very close correlation between the two series.

between the two variables in (3c) is identical to the loan-to-GDP ratio, which is regarded as an important credit cycle indicator. This form of the equation is achieved by means of suitable restrictions on the original parameters of the model. At a time of credit expansion (contraction), when loans are rising significantly faster (slower) than GDP and market expectations are optimistic (pessimistic), the NPL ratio will tend to fall (rise). Here again, the estimated parameters are consistent with the assumed values.

Finally, we need to investigate the stability of the cointegrating relationships. Using the test proposed by Bierens and Martins (2010) we can test the stability of the parameters of matrix  $\beta$  against the alternative of smooth change over time. The test clearly rejects the hypothesis of stable long-run relationships in favour of time-varying cointegrating vectors. This suggests that model (2) leads to more realistic estimates and provides more refined outputs. For this reason, the results obtained using this model are also partially<sup>10</sup> presented in the following text.

#### 4. IDENTIFICATION OF DEMAND AND SUPPLY PRESSURES

With regard to the aims of our analysis, we are interested primarily in the deviations from equilibrium for the first two cointegrating relationships, which, according to the reasoning above, can be thought of as credit demand and credit supply.

In the case of the credit demand equation (3a), negative deviations indicate that the actual amount of loans is lower than the equilibrium level as determined by structural factors. In such circumstances, the corporate sector exerts upward pressure on loans towards the equilibrium level. Conversely, if the actual amount of loans is higher than the level consistent with economic fundamentals (a positive deviation), there is no fundamental reason for demand pressures to exist. However, positive deviations from equilibrium can also arise if the amount of loans gradually falls in response to a rapid economic downturn. The slower decline in loans than in GDP is due to the greater persistence of this series. To assess the presence of demand pressures, one therefore needs to consider not only the

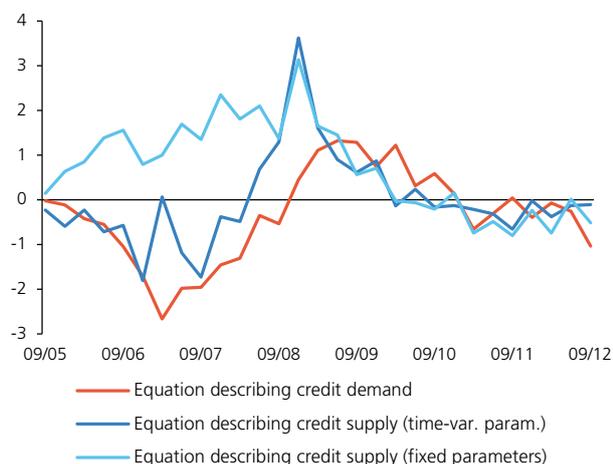
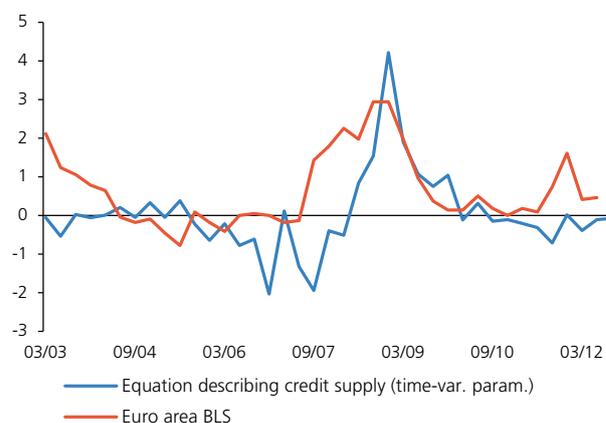
direction of the deviation, but also the current position in the credit cycle and simultaneously the situation on the supply side, as the demand and supply sides interact with each other.

In the case of the credit supply equation (3b), deviations from equilibrium can, with some caution, be interpreted analogously. The case where the actual interest rate is higher than the model-implied rate (a positive deviation) reflects efforts by banks to curb the loan supply by tightening their credit conditions and raising corporate financing costs. On the other hand, a negative deviation, indicating a lower interest rate than that implied by the model, signals that the credit conditions are favourable and banks are more interested in lending. Note that equation (3b) only captures change in the interest rate component of the credit standards and is not able to capture any other forms of tightening or loosening of the credit conditions, which also affect the total supply. However, in crisis periods, which this analysis is primarily concerned with, all available instruments are usually set in the same direction, so the main tendencies should be captured by the model.

Our analysis of the deviations from long-term credit demand and supply (see Chart 2a) indicates that the period from the end of 2005 to mid-2008 can be characterised as a time when growth in loans was driven mainly by demand pressures amid positive economic growth, although the credit conditions also remained relatively relaxed.<sup>11</sup> The onset of the financial crisis and its real impacts on the Czech economy led to sizeable credit restrictions by banks and subsequently also to a fall in demand in line with the fall in GDP during the crisis. Although the credit conditions were eased again relatively quickly, demand for credit did not change significantly. In 2011 we can see a pick-up in bank lending due to roughly neutral credit conditions and temporarily renewed economic growth. By comparison with the previous period, the last two years are characterised by relatively small deviations from equilibrium for both cointegrating relationships and by relatively low credit activity. Given the favourable financing conditions, the modest growth in loans in the most recent quarter is due more to demand pressures, which, however, are very limited.

<sup>10</sup> We cannot rely entirely on this model, because it does not allow us to impose the (over-)identifying restrictions that lead to the system of equations (3a)–(3c). Strictly speaking, then, model (2) is not entirely analogous to the system we are investigating. Nonetheless, we were able, by mutually evaluating the coefficients, to choose a time-varying cointegrating vector that strongly resembles a credit supply equation.

<sup>11</sup> We base our evaluation of the credit conditions on the time-varying parameter model, the choice of which is motivated by the test results and by economically more intuitive findings. We will return to the differences between the static and time-varying parameter models later.

**CHART 2**
**RESULTS OF THE MODEL AND COMPARISON WITH AVAILABLE DATA FOR THE EURO AREA**
**a) Deviations from long-run relationships**

**b) Comparison of euro area BLS results with model results**


Source: CNB, ECB, authors' calculations

Note: For the purposes of comparison, the series were normalised by the standard deviation.

Looking at the effects of supply and demand factors over time with regard to the magnitude and length of the deviations, we see larger deviations from equilibrium on the demand side. This is in line with the opinion of some earlier studies on the role of demand in credit growth (see Kok Sørensen et al., 2012, p. 6). However, supply shocks and their effect on total loans cannot be ignored, especially in a crisis period. In the initial phase of the crisis (which peaked in the final quarter of 2008) we can see a sizeable deviation from the equilibrium supply relationship, implying significant credit restrictions. The question of how much the excessive supply restrictions throttled subsequent GDP growth is not an easy one to answer, although given their timing one cannot rule out that they played a part in the subsequent contraction. Such a finding would be in line with Woodford (2010), who sees the initial cause of the economic crisis more in obstacles on the supply side than in a change in the behaviour of firms or in the problems of firms.<sup>12</sup>

The description of the evolution of credit demand using the fixed parameter model (1) seems consistent with economic intuition. In the case of supply, by contrast, the tightening of the credit conditions in the pre-crisis period seems too strong. For this reason, when interpreting the supply pressures we concentrated on the output of the model with time-varying cointegrating relationships. The two

relationships describing credit supply have been almost identical since 2008, but in the pre-crisis period the static model is unable to fully capture the path of adjustment to equilibrium because of changes in the parameters.

To check the relevance of the results obtained, we can compare our estimated “credit supply” with the results of the euro area BLS. Although the situation is not necessarily uniform across countries, it is reasonable to assume that the main features will be similar given the interconnectedness of markets (including ownership links) and the global nature of the crisis. We can see (in Chart 2b) that the time-varying parameter model reconstructs the survey results surprisingly well. Thus, it can be used in the future to cross check the results of the recently introduced BLS in the Czech Republic.

A more detailed comparison of the two indicators (see Chart 2b) reveals that developments in the Czech Republic lagged behind those in the euro area in the pre-crisis period, since the significant easing of credit conditions between 2005 and 2006 took a while to show up in the Czech environment.<sup>13</sup> A time shift can also be observed in the onset of the subsequent tightening, although its peak and the ensuing process of easing were more or less synchronised. This mirrors the economic cycles of the two economies, which were also not fully synchronised in the

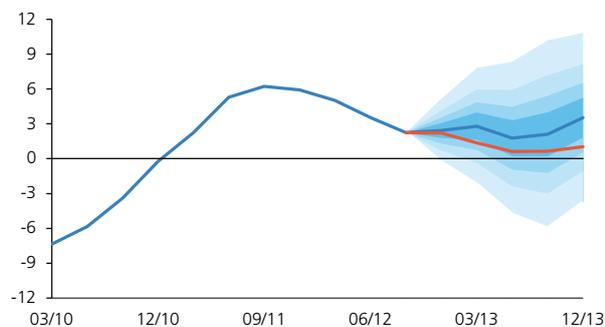
<sup>12</sup> Concerns about developments in Europe had a strong effect despite the Czech banking sector's different situation (systemic liquidity surplus, high capital adequacy). Links to European parent banks played a role here.

<sup>13</sup> The easing seems to have been stronger in the Czech economy, but this may be due solely to the noise present in the data.

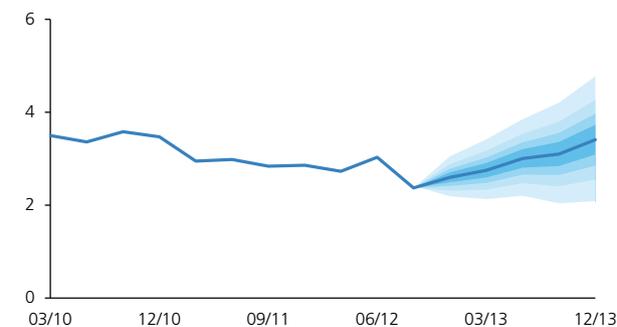
## CHART 3

## FORECASTS OF SELECTED VARIABLES AND COMPARISON WITH THE BASELINE SCENARIO OF THE BANK STRESS TEST

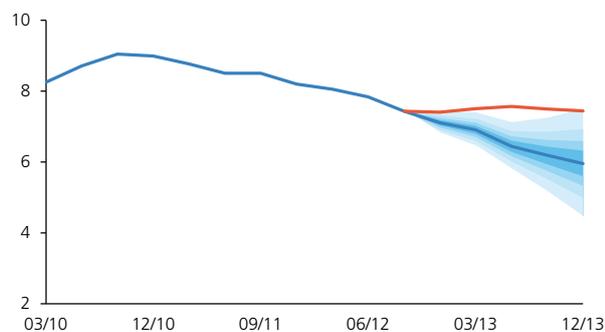
a) Growth in total bank loans to non-financial corporations  
(year-on-year change in %)



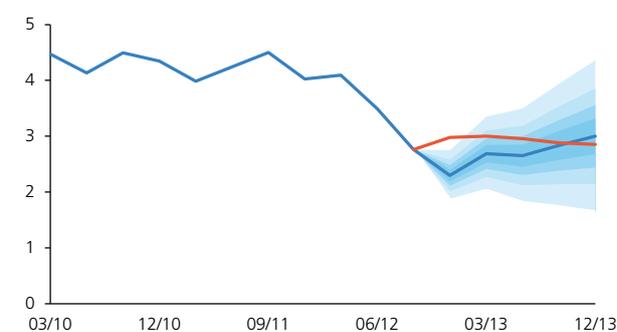
b) Interest rate on new loans  
(%)



c) NPL ratio  
(%)



d) Default rate  
(%)



Source: CNB, authors' calculations

Note: The confidence intervals of the forecasts are 30%, 50%, 70% and 90%; the red line represents the outputs of the bank stress test (*Baseline Scenario, December 2012*)

pre-crisis period but became much more correlated after the crisis began.<sup>14</sup>

A significant difference between conditions in the euro area and those in the Czech economy arose again in the first half of 2012, when market tensions increased and credit standards were tightened in the euro area as a result of the problems faced by the southern member states. This blip is also visible in the supply time series for the Czech Republic, although it is far less intense. This can be ascribed to the fact that the temporary tensions were not reflected very strongly in credit conditions in the Czech Republic owing to the low exposure of domestic banks to the problem countries. This conclusion is supported by data from a survey of non-financial corporations indicating no deterioration in access to credit financing in this period.

<sup>14</sup> See, for example, the Analyses of the Czech Republic's Economic Alignment with the Euro Area published annually by the CNB.

## 5. FORECASTS OF SELECTED VARIABLES

VAR and VECM models are widely regarded as suitable tools for constructing forecasts. This means that, in addition to the analyses conducted above, the estimated model can be used for forecasting purposes. Although predictions can be obtained for any of the six variables included in the model, we only focus on those which relate to the corporate sector and which also (with the exception of the interest rate) feature among the outputs of bank stress tests (see Chart 3).

According to the forecasts, credit growth should remain moderate and both credit risk indicators will stay relatively favourable until the end of 2013. The interest rate should remain favourable for firms, although the predictions indicate that interest rates will gradually go up. However, the uncertainty associated with the forecasts is relatively high.

The results can again be compared with other published outputs, in this case the corporate indicators emanating

from the *Baseline Scenario* of the December 2012 banking sector stress test (see Chart 3).<sup>15</sup> Although the two models produce slightly different forecasts of the analysed indicators (note, in particular, the faster decline in the NPL ratio than in the *Baseline Scenario*<sup>16</sup>), the basic tendencies are broadly similar (see Chart 3). This confirms that the tested scenario is plausible and that the calibration of the satellite models (with use of which the corporate indicators in the stress test are estimated employing the CNB's main "g3" macroeconomic model) is realistic.

## 6. CONCLUSION

In this article we discussed the construction of a simple model to describe the evolution of the determinants of credit growth. The estimated model was used to disentangle demand and supply effects on the amount of loans and to obtain forecasts for the credit characteristics of the corporate sector.

The main contribution is to obtain credit supply side information that was not previously available owing to the short history of the bank lending survey in the Czech Republic. This output finds wide application in a whole range of analyses, including in the area of financial stability. The plausibility of the results is supported by the fact that the estimated deviations from the equilibrium level of the supply relationship correlate very well with the credit conditions obtained on the basis of existing surveys for the euro area.

The results also suggest that in normal circumstances, supply and demand show a high degree of interaction and correlation. Given the general consensus that credit growth is predominantly driven by demand, this can be interpreted as meaning that in normal conditions the credit supply adjusted to demand pressures. By contrast, when the financial crisis erupted the situation was briefly influenced by significant credit restrictions by banks, which to some extent may also have affected the magnitude of the subsequent contraction in GDP. There are currently no major pressures on either the demand side or the supply side and both factors are close to their equilibrium levels.

<sup>15</sup> The results of the December 2012 stress test are also based on the data available up to 2012 Q3.

<sup>16</sup> In the following year, the NPL ratio in the *Baseline Scenario* falls to similar levels as the model (1) forecast, although this is not shown in the chart. The difference may also be due to the fact that the credit risk indicators are conservatively calibrated in the stress tests.

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