

# ECONOMIC RESEARCH BULLETIN

Macroeconomic Forecasting: Methods, Accuracy and Coordination  
Volume 10, Number 1, April 2012

2012



# ECONOMIC RESEARCH BULLETIN

## Macroeconomic Forecasting: Methods, Accuracy and Coordination

Volume 10, Number 1, April 2012

### EDITORIAL

Macroeconomic forecasting has traditionally been at the centre of the national central bank's attention. Indeed, macroeconomic forecasts are essential in the implementation and communication of monetary policy. This edition of the Research Bulletin is devoted to selected recent CNB staff publications evaluating forecasting methods, forecast accuracy and forecast coordination.

The first article performs an empirical investigation of the accuracy of Czech quarterly GDP forecasts of various models which extract information from the available monthly indicators. The forecast performance of the eight models is compared mutually and with the historical near-term forecasts of the CNB's staff. The second article assesses the practical usability of Bayesian fan charts for the purposes of CNB forecast evaluation and financial stability stress testing. The third article evaluates the accuracy of Consensus Economics forecasts by comparison with the alternative forecasts including those of international organisations. Furthermore, the impact of the recent crisis on forecast performance is investigated. The last article analyses the extent to which private analysts coordinate their forecasts with those produced by the Czech National Bank, and whether such coordination changes over time.

**Jan Babecký**

### IN THIS ISSUE

#### **Short-Term Forecasting of Czech Quarterly GDP Using Monthly Indicators**

The accuracy of GDP forecasts is of key importance for the conduct of monetary policy. In the present study we evaluate the out-of-sample forecast accuracy of Czech quarterly GDP exploring early information available in monthly indicators. Employing eight different models, we find the one which is the most precise up to three quarters ahead. However, the CNB staff forecasts turn out to be the most accurate one quarter ahead.

**Kateřina Arnoštová, David Havrlant, Luboš Růžička and Peter Tóth (on page 2)**

#### **Are Bayesian Fan Charts Useful for Central Banks? Uncertainty, Forecasting and Financial Stability Stress Tests**

Fan charts have become an important tool to communicate uncertainty in inflation-targeting central banks. Our research shows how so-called Bayesian fan charts may be useful to complement the fan charts based on past forecasting errors and how we can use them to quantitatively evaluate to what extent the assumptions for macroeconomic scenarios in stress tests of the banking sector are sufficiently adverse.

**Michal Franta, Jozef Baruník, Roman Horváth and Kateřina Šmídková (on page 6)**

#### **Assessment of Consensus Forecasts Accuracy: The Czech National Bank Perspective**

Consensus Economics forecasts are used by the Czech National Bank to make assumptions about future external economic developments. We therefore compare the predictive accuracy of the Consensus forecasts with the available alternatives. The main conclusion is that Consensus forecasts beat the alternative forecasts by a difference which is typically statistically significant.

**Filip Novotný and Marie Duršpek Raková (on page 10)**

#### **Central Bank Forecasts as a Coordination Device**

Do private analysts coordinate their forecasts via central bank forecasts? We examine the coordination of private and central bank forecasts for the Czech Republic and find that private forecasters use the CNB forecast to coordinate the interest rate and inflation forecasts. The coordination tends to be stronger during times of high uncertainty. Improvements in CNB forecast communication, in particular the publishing of an interest rate forecast, have enhanced the coordination.

**Jan Filáček and Branislav Saxa (on page 14)**

Czech National Bank  
Economic Research Department  
Na Příkopě 28, 115 03 Prague 1  
Czech Republic  
tel.: + 420 2 2441 2321  
fax: +420 2 2441 4278  
Executive Director: Kateřina Šmídková (research@cnb.cz)  
Editor of the Bulletin: Jan Babecký

## Short-Term Forecasting of Czech Quarterly GDP Using Monthly Indicators<sup>1</sup>

Kateřina Arnořtová<sup>a</sup>, David Havrlant<sup>a</sup>, Luboř Růžička<sup>a</sup> and Peter Tóth<sup>b</sup>

<sup>a</sup>Czech National Bank <sup>b</sup>Ministry of Finance of the Slovak Republic



Short-term forecasting of quarterly GDP using monthly indicators is well motivated by the substantial delay in the publication of National Accounts statistics. This delay is ten weeks after the end of the quarter in the case of the Czech Republic. However,

weeks before the appearance of the latest GDP figure, several monthly indicators gradually become available for the full quarter. These indicators are usually closely related to real economic activity in the broad sense and include industrial production, construction output, domestic or foreign sales and labour market data. Other, alternative monthly indicators that provide timely information on recent developments on the aggregate level, such as price statistics, financial variables and survey data, can also be considered. The availability of early information in monthly series therefore offers potential for improving the accuracy of GDP forecasts. Accordingly, GDP forecast accuracy is of key importance for monetary policy in particular, as well as in the general context of macroeconomic forecasting.

Our research evaluates the out-of-sample forecast accuracies of eight competing models. The list can be divided into two groups, namely four non-factor models and four factor models. The first four include the naïve model of four-quarter moving averages of GDP, the core near-term forecasting (NTF) framework used at the bank, the averaged bivariate VAR models (VAR) and bridge equations (BEQ). The naïve model is univariate and the NTF approach does not explicitly rely on information from monthly indicators. The VAR and BEQ models directly link GDP to selected monthly series that are considered good predictors.

The second group is composed of four factor models which link GDP growth to a set of a few estimated factors that are common to a larger set of monthly indicators. Here we include two versions of standard principal components, where quarterly GDP is bridged with static factors. The first version of the principal components model (PC) follows the ECB's cross-country study by Barhoumi et al. (2008). We include a second, slightly different version (PC-Q) as a reference to an earlier work with leading indicators by Benda and Růžička (2007) at the Czech National Bank.

The group of factor models under our evaluation further includes two models with an explicitly dynamic structure of factors. In the dynamic factor model of Doz et al. (2007), dynamic factors are estimated by Kalman filtering (DFM). The approach of Forni et al. (2000), referred to as the generalised dynamic factor model (GDFM), estimates dynamic factors in the frequency domain.

---

<sup>1</sup> This article is based on Arnořtová et al. (2010).

As an additional benchmark we test the out-of-sample forecasting performance of the average forecast coming from the five main models listed above (VAR, BEQ, PC, DFM and GDFM). This approach is motivated by evidence in the literature that pooling forecasts from individually well-performing but differently mis-specified models can improve forecast accuracy.

The full database of our monthly indicators consists of 98 time series describing the development of the main areas of Czech economy and the external environment. The supply side is represented by indicators depicting the development of industry, construction and the main branches of services. Several indicators represent the labour market. The list also contains foreign trade indicators, real and nominal exchange rates, monetary aggregates and interest rates. We also add surveyed confidence indicators and consumer and producer prices. The development of foreign demand is captured by leading indicators for Germany and Europe, such as the IFO business climate indicators, the composite leading indicators compiled by the OECD, and new car registrations in both Germany and the eurozone. The beginning of the time period examined was set at January 2001.

The indicators under consideration were pre-adjusted (seasonal adjustment, calculation of growth rates, testing for stationarity). To obtain the most relevant monthly indicators the list of 98 series was narrowed down by a simple rule of thumb. All variables with a correlation coefficient of less than 0.5 in absolute terms were excluded. In the next step we eliminated further series if the absolute value of their correlation with any other series was above 0.9. From such a pair, the one more correlated with GDP was kept in each case. The final set of indicators therefore consists of 27 series. We are aware that some properties of the estimators we consider in our factor models are based on the assumption of a “large” number of indicators. Motivated by the resulting improvement in the forecasting performance of the factor models, we still opted for reducing the initial set of monthly series for estimating those models.

Next, the forecast accuracies are evaluated. First, the out-of-sample root-mean-squared errors (RMSEs) of the forecasts for the set of methods are compared both in absolute terms (Table 1) and relative to the naïve model (Table 2). Next, an example of the forecast for Q4 2009 is presented based on all the examined methods. This is aimed at illustrating how forecasts are updated and accuracies improve as additional information becomes available. Finally, the outcomes are compared to an ECB study that covers other countries of the European Union.

As Tables 1 and 2 show, at all the horizons considered, the best performing model was standard principal components (PC), which conditions the forecast on a large number of monthly indicators. The next positions were taken by the following models: the Czech National Bank’s historical near-term forecasts (NTF), the dynamic factor model using the Kalman smoother (DFM), bridge equations (BEQ), the generalised dynamic factor model (GDFM), the alternative version of principal components (PC-Q) and averaged bivariate VARs. The top ranking of principal components was maintained for the horizons of two and three quarters ahead. At the shortest horizon, however, the CNB’s historical forecasts provided the best results. Quite surprisingly, the average forecast combining the forecasts from the five main models that we focus on was rather poor compared to the individual models. Finally, some of the large-scale factor models, such as DFM and GDFM, did worse than the naïve benchmark when estimated on the full set of 98 monthly indicators instead of a narrowed set of 27. This finding is in line with some other studies suggesting that smaller factor models tend to have better forecasting

performance. Our model rankings based on forecast precision were found to be statistically significant in most cases according to pairwise Diebold-Mariano tests of the equality of the squared forecast errors.

**Table 1.** Out-of-sample RMSEs (in terms of quarterly GDP growth)

RMSE	+1Q	+2Q	+3Q	Average
NTF	0.99	1.43	1.69	1.37
VAR	1.15	1.45	1.63	1.41
BEQ	0.82	1.20	1.46	1.16
<b>PC</b>	<b>0.82</b>	<b>0.89</b>	<b>1.24</b>	<b>0.98</b>
PC-Q	0.94	1.42	1.75	1.37
DFM	0.89	1.03	1.36	1.09
GDFM	1.23	1.21	1.35	1.26
Average forecast	0.97	1.12	1.30	1.13
PC - full panel	1.09	1.07	1.31	1.15
DFM - full panel	1.26	1.43	1.43	1.37
GDFM - full panel	1.29	1.28	1.39	1.32
AR(1)	1.31	1.49	1.50	1.43
Historical mean	1.33	1.33	1.33	1.33
4Q averages	1.19	1.31	1.38	1.29

Note: The forecast errors for NTF were computed on unrevised GDP data, so the RMSEs of NTF are not comparable with the rest.

**Table 2.** RMSEs relative to the naïve model of four-quarter averages

Relative RMSE	+1Q	+2Q	+3Q	Average
NTF	<b>0.67</b>	0.80	0.91	0.81
VAR	0.97	1.11	1.18	1.09
BEQ	0.69	0.92	1.06	0.90
<b>PC</b>	0.69	<b>0.68</b>	<b>0.90</b>	<b>0.76</b>
PC-Q	0.80	1.09	1.27	1.06
DFM	0.75	0.79	0.99	0.85
GDFM	1.04	0.93	0.98	0.98
Average forecast	0.81	0.86	0.95	0.88
PC – full panel	0.92	0.82	0.95	0.89
DFM – full panel	1.06	1.10	1.04	1.07
GDFM – full panel	1.09	0.98	1.01	1.02
AR(1)	1.10	1.14	1.09	1.11
Historical mean	1.13	1.02	0.97	1.03
4Q averages	1.00	1.00	1.00	1.00

Note: RMSEs are presented relative to the naïve model of 4Q averages. The RMSEs of NTF are expressed relative to the naïve model run on unrevised GDP data.

In comparison to the ECB study, we got similar results to the euro area countries. Principal components and the dynamic factor model based on the Kalman smoother did well on data from both the Czech Republic and the euro area countries. However, we obtained quite different results in terms of model rankings compared to the new EU member states (Hungary, Poland and Lithuania). At this stage, therefore, it is difficult to draw general conclusions from our results. Nevertheless, we need to interpret such comparisons with substantial care, as the forecast errors are relatively sensitive to the selection of the evaluation interval and the set of monthly indicators. Both these parameters of our evaluation design are difficult to relax. This is first because the

sample size of the Czech data is relatively small and therefore we used the longest possible time interval for the evaluation, and second because the set of available indicators differs substantially across countries too.

Concerning the implications for GDP forecasting practices at the Czech National Bank, we recommend using all the models evaluated in the present study. The average forecast of the above models could serve as a good benchmark for the bank's core near-term forecasting framework, at least at the one-quarter horizon. For further quarters ahead, greater weight could be given to the principal components model, which ranked as clearly the best in our evaluation.

## References

- Arnoštová, K., Havrlant, D., Růžička, L. and Tóth, P. (2010): Short-Term Forecasting of Czech Quarterly GDP Using Monthly Indicators. CNB Working Paper No. 12/2010.
- Bai, J. and Ng, S. (2007): Determining the Number of Primitive Shocks in Factor Models. *Journal of Business and Economic Statistics*, 21(1), 52–60.
- Barhoumi, K., Benk, S., Cristadoro, R., Den Reijer, A., Jakaitiene, A., Jelonek, P., Rua, A., Rünstler, G., Ruth, K. and Van Nieuwenhuyze, C. (2008): Short-Term Forecasting of GDP Using Large Monthly Datasets. A Pseudo Real-Time Forecast Evaluation Exercise. ECB Occasional Paper Series No. 84.
- Benda, V. and Růžička, L. (2007): Short-term Forecasting Methods Based on the LEI Approach: The Case of the Czech Republic. CNB Research and Policy Notes No. 1/2007.
- Doz, C., Giannone, D. and Reichlin, L. (2007): A Two-Step Estimator for Large Approximate Dynamic Factor Models Based on Kalman Filtering. CEPR Discussion Paper No. 6043.
- Forni, M., Hallin, M., Lippi, M. and Reichlin, L. (2000): The Generalized Dynamic Factor Model: Identification and Estimation. *The Review of Economics and Statistics*, 82(4), 540–554.

## **Are Bayesian Fan Charts Useful for Central Banks? Uncertainty, Forecasting and Financial Stability Stress Tests<sup>2</sup>**

**Michal Franta<sup>a</sup>, Jozef Baruník<sup>b,c</sup>, Roman Horváth<sup>b</sup> and Kateřina Šmídková<sup>a,b</sup>**

<sup>a</sup>Czech National Bank <sup>b</sup>Charles University <sup>c</sup>UTIA, Czech Academy of Science



Fan charts have become an important communication tool for inflation-targeting central banks. They are used mainly to communicate the uncertainty relating to macroeconomic forecasts and monetary policy decisions. In some cases, fan

charts are also employed to facilitate internal discussions about forecast risks. Most inflation targeters publish fan charts for inflation and some also for GDP growth, the interest rate and the exchange rate.

Currently, inflation targeters produce fan charts typically mixing two pieces of information: (i) the macroeconomic forecast, which represents the most likely future development, and (ii) past forecast errors. In cases where fan charts facilitate internal discussion, a subjective assessment of the forecast risks is incorporated into the fan charts after the forecast is created.

As an alternative, Cogley et al. (2005) suggest fan charts based on vector autoregressions with time-varying parameters estimated using Bayesian techniques. This approach accounts for the uncertainty related to the model parameters, future changes in the parameters, and future shocks to the economy. Fan charts based on past forecast errors implicitly assume that the future uncertainty is the same as the uncertainty reflected by the past forecast errors.

Following the strand of literature that draws on the Bayesian estimation of vector autoregressions to generate fan charts, we employ a simple Bayesian VAR model with constant parameters and assess the potential that the resulting Bayesian fan charts may have for the Czech National Bank (Franta et al., 2011). More specifically, we focus on four potential applications: (1) an alternative to the fan charts currently used by the CNB, (2) an additional source of information about the forecast uncertainty which can complement the CNB's fan charts, (3) a tool for the probabilistic assessment of macroeconomic scenarios used in stress tests of the banking sector, and (4) fan charts that can be easily enriched by outside information.

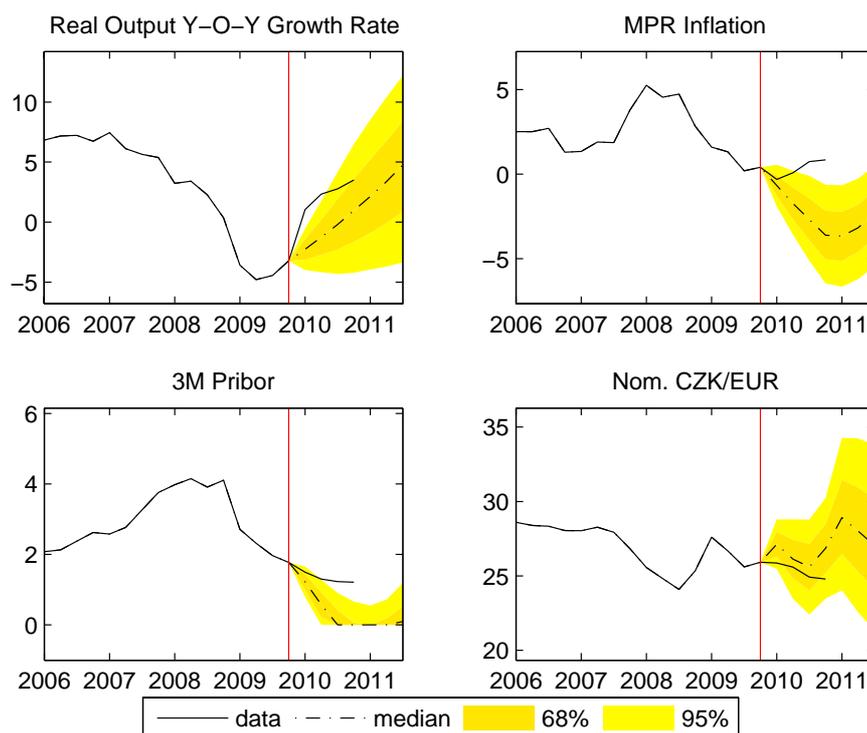
In this short note, we discuss two applications – Bayesian fan charts as an alternative to the current CNB fan charts and the use of Bayesian fan charts as a way of verifying that macroeconomic scenarios used in banking stress tests are sufficiently adverse.

---

<sup>2</sup> This article is based on Franta, Baruník, Horváth and Šmídková (2011).

As an illustration of the first application, Figure 1 shows BVAR fan charts for real GDP growth, monetary-policy relevant inflation (MPR inflation), the short-term interest rate (3M PRIBOR) and the exchange rate (CZK/EUR) based on the model estimated for 1998Q1–2009Q4. The realised values of the respective time series are reported, too. The fan chart is represented by the median and centred 68%/95% of the predictive distributions. We believe that one of the preconditions for building large structural macroeconomic models with a financial sector that will be of some guidance for monetary policy decision-making is first to verify empirically whether financial variables convey any useful additional information. To shed light on this issue, we compare the forecasting performance of two empirical models. The first forecasting model consists of macroeconomic variables only (hereinafter referred to for convenience as the macroeconomic model), while the second model in addition includes financial variables (hereinafter referred to for convenience as the macro-finance model). The empirical framework we apply is a two-country vector autoregression model consisting of two economies – the Czech Republic and the euro area. We impose the realistic assumption that the euro area variables can influence the Czech variables, but not vice versa. In addition to examining whether the financial sector helps to predict the macroeconomic environment, our framework allows us to assess the transmission and relative importance of euro area developments for the Czech economy.

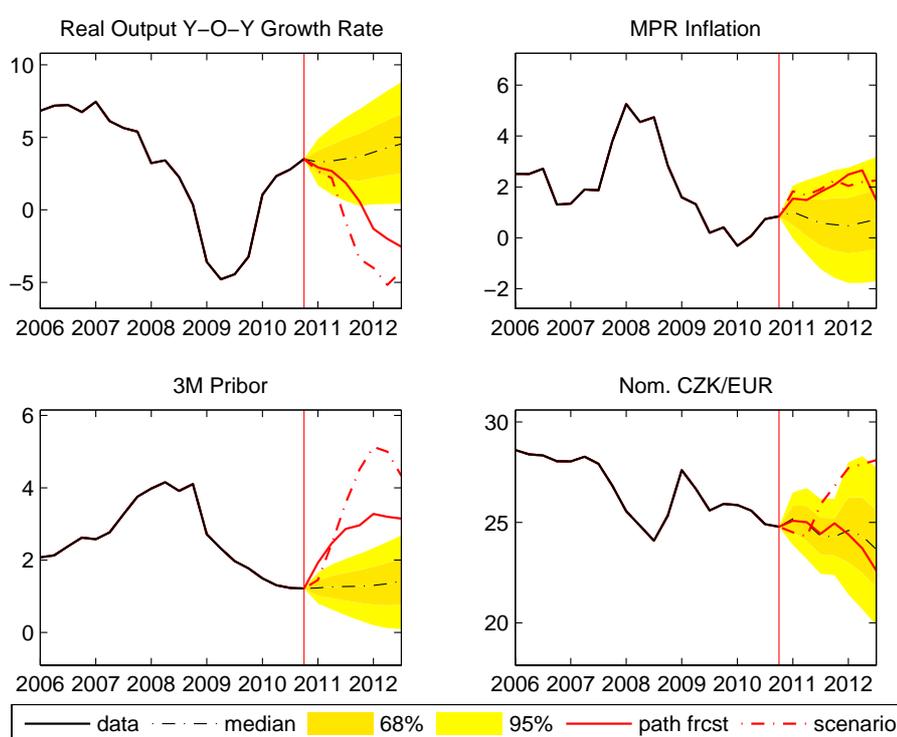
**Figure 1.** BVAR fan charts starting in 2010Q1



In contrast to the values observed after 2009 Q4, the fan charts suggest a lower interest rate and lower MPR inflation. Realised real GDP growth has been close to the 68% band and the exchange rate mostly fits in the 98% band. Note that the BVAR fan charts explicitly account for the zero lower bound on the nominal interest rate (the nominal interest rate is treated as a censored variable).

Focusing on a systematic comparison of CNB and BVAR fan charts, Franta et al. (2011) show that the CNB fan charts come out well by comparison with the BVAR methodology. For shorter horizons up to a year ahead, the CNB fan charts perform better than the BVAR benchmark. In our opinion, this result highlights the importance of expert judgment of CNB staff. Small-scale BVAR cannot compete unless expert judgment is incorporated on a much larger scale compared to our current expert input limited to the zero bound restriction only. For longer horizons, the BVAR fan charts sometimes outperform the CNB fan charts. This result probably reflects the fact that the BVAR fan charts benefit from high quality data while the CNB fan charts were constructed in real time without knowledge of subsequent data revisions. Given the comparison, it may be reasonable to use the BVAR fan charts as a benchmark to assess the CNB fan charts or as a complementary input to create combined fan charts.

**Figure 2.** The “Unexpected Recession” scenario and the minimum-distance path forecast



Next, Figure 2 illustrates how the BVAR fan charts can be used as a tool to assess the probability of macroeconomic scenarios underlying stress testing of the banking sector. One of the important issues for credible stress testing is that the assumptions about whether the banking sector can withstand negative shocks must be sufficiently adverse. In our research, we assess the macroeconomic scenario from the CNB’s stress test of February 2011. The “Unexpected Recession” scenario (solid red line) is characterised by a significant drop in economic activity in 2011 H2 caused by an external shock, exchange rate depreciation and, in reaction to inflation pressures, a marked increase in the monetary policy rate, reflected in a rise of short-term interest rates. The scenario is based on the data set up to 2010 Q4 and thus we use the BVAR model with the first forecasting period 2011 Q1. The red dotted line represents the particular forecast that is the closest to the scenario and that is consistent with the data correlations estimated within the BVAR model. All in all, the scenario and its closest forecast are well out of the yellow fan chart.

Thus, we conclude that the CNB stress test based on the “Unexpected Recession” scenario was sufficiently severe.

## References

Cogley, T., Morozov, S. and Sargent, T. (2005): Bayesian Fan Charts for U.K. Inflation: Forecasting and Sources of Uncertainty in an Evolving Monetary System. *Journal of Economic Dynamics and Control*, 29(11), 1893–1925.

Franta, M., Baruník, J., Horváth, R. and Šmídková, K. (2011): Are Bayesian Fan Charts Useful for Central Banks? Uncertainty, Forecasting, and Financial Stability Stress Tests. CNB Working Paper No. 10/2011.

## Assessment of Consensus Forecasts Accuracy: The Czech National Bank Perspective<sup>3</sup>

Filip Novotný<sup>a</sup>, Marie Duršpek Raková<sup>a,b</sup>

<sup>a</sup>Czech National Bank, <sup>b</sup>Charles University



Under inflation targeting, the forecast for consumer price inflation (CPI) at the monetary policy horizon is of great relevance to the decision-making on the current interest rates. An important assumption of the Czech National Bank's macroeconomic forecast is the external economic outlook, which is partly derived from the Consensus Forecasts (hereinafter "Consensus"). Consensus is a regular monthly

survey publication issued by a London-based private organisation which pools economic analysts, mostly from private investment banks. It provides forecasts and views on the principal macroeconomic indicators, including GDP growth, price inflation, interest rates and exchange rates, in over 85 countries.

As Consensus serves as a background for the decision-making process at the Czech National Bank, we found it relevant to research the ex-post accuracy of Consensus. The forecasting accuracy of Consensus is compared with the corresponding forecasts of the International Monetary Fund (IMF), Organization for Economic Co-operation and Development (OECD) and European Commission (EC) and also with the naïve forecast and forecasts implied by the forward exchange rate. The forecasts of real GDP growth, CPI inflation and PPI inflation for Austria, France, Germany and Italy are assessed along with the nominal USD/EUR exchange rate forecasts. Contrary to the available literature, we assessed the forecasts for each macroeconomic variable in terms of the effective indicator, where each country forecast is weighted by the respective country share in Czech exports. The same effective indicators are applied in the Czech National Bank's prediction process.

Our main focus is on the Consensus performance in the period from 1994 to 2009, but we also separately assess the pre-crisis period from 1994 to 2007 to reveal any potential impacts which the financial crisis might have imposed on the overall forecasting accuracy. In addition, we assess the accuracy of the forecasts for a shorter period starting in 2002, when the Czech National Bank began to use Consensus.

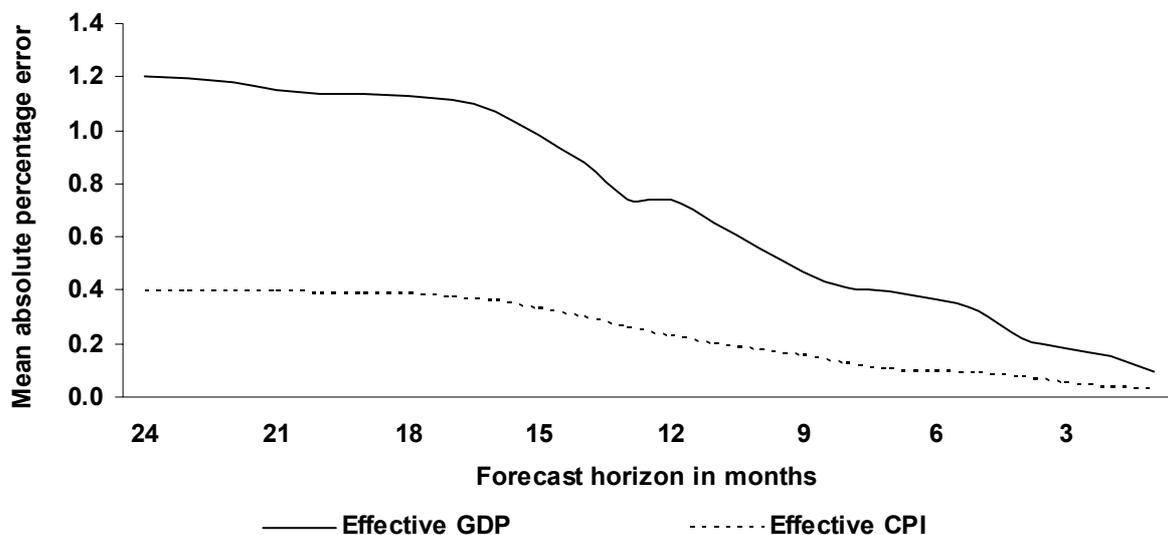
From the methodological point of view, we use standard measures for the descriptive analysis of forecasting accuracy, including the mean forecast error, the mean absolute forecast error, the mean absolute percentage error and the root mean squared error. Moreover, we perform a forecast comparison regression, following Ang et al. (2007) and Stock and Watson (1999), and the Diebold-Mariano (D-M) test of statistical significance in the forecasting errors of competing forecasts (Diebold and Mariano, 1995).

---

<sup>3</sup> This article is based on Novotný and Raková (2010).

Generally, we observe a gradual improvement in the Consensus accuracy along the forecast horizon (Figure 1). Intuitively, the forecasting errors decrease as we move towards the end of the predicted year because forecasters have more information to make more accurate assumptions about the future and the forecasting process thus becomes easier. Similarly, Osterloh (2008) shows that the average RMSE of the Consensus forecasts for German GDP growth (across all forecasters and target years) diminishes strongly as we get closer to the end of the predicted year. It is also apparent from Figure 1 that Consensus is characterised by higher forecasting errors in the case of GDP growth than in the case of CPI inflation. This reflects the higher historical variability of GDP growth compared to consumer price growth.

**Figure 1.** Average gradual improvement in Consensus forecasts in the period 1994–2009



Furthermore, the forecasts for GDP growth are biased upwards (overestimated). This bias is statistically significant for the next-year forecasts. This is in accordance with the results found in the literature (Ager et al., 2009, Batchelor, 2001, Osterloh, 2008) and reflects the systematically positive expectations of forecasters about the future. We infer that most Consensus forecasters are affiliated with investment banks and may intend to promote positive expectations among their clients (self-fulfilling expectations). On the contrary, the CPI inflation forecasts are mostly underestimated by all institutions, including Consensus, but not at statistically significant levels, i.e. they are not biased. This holds especially for the shorter period from 2002 to 2009 and may possibly reflect a positive role of independent central banks and the resulting anchoring of inflation at low levels (Dovern et al., 2009).

The Consensus forecasts beat the international institutions' forecasts mainly in the current year forecasts and, additionally, Consensus is superior to the naïve forecasts in all cases. If we focus solely on the pre-crisis period from 1994 to 2007, the results are more diverse.

Another important characteristic of a multiple-economic-variable forecast is the expected consistency among single economic variables given by their long-term relationship. We measure

the mutual consistency between the CPI inflation forecast and the GDP growth forecast by their mutual correlation. The correlation coefficient between actual values of CPI inflation and GDP growth in the period from 1994 to 2009 was positive (correlation coefficient equal to 0.51). Nevertheless, the correlation coefficient was strongly affected by the last observation. If we exclude 2009, no correlation between these two variables is apparent. Accordingly, the Consensus and international institutions' forecasts for the current year are correlated at similar or higher levels to the historical values. They are therefore strongly affected by the actual values. Conversely, the forecasts for the next year are less correlated. Thus, we do not detect strong consistency in the longer-term forecasts.

Furthermore, if we look at the direction of the forecast re-estimations we cannot find strong synchronisation between the forecast updates of CPI inflation and GDP growth. The forecasts for these two variables are very often re-estimated in different directions. Only about 54% of all the Consensus re-estimations are synchronised, i.e. the forecasts for CPI inflation and GDP growth are re-estimated in the same direction. The degree of synchronisation in the case of the EC, IMF and OECD forecasts varied between 39% and 56%, depending on the number of observations.

Because the international institutions (EC, IMF and OECD) do not provide forecasts for PPI inflation, this is assessed only against the naïve forecast. The Consensus forecasts for the current year are characterised by lower forecasting errors in comparison with the naïve forecasts. The Consensus effective euro-area PPI inflation forecast for the current year is superior to the naïve forecast at the 10% significance level (measured by the D-M test statistic). The forecasting errors of the next-year forecasts match the naïve forecast.

In the case of the USD/EUR exchange rate, the forecasts are biased mostly downwards, i.e. a stronger dollar is systematically predicted. The Consensus forecasting accuracy was compared with the naïve forecast and the forecast derived from the forward exchange rate. Both forecasts were even more biased. The Consensus forecast for USD/EUR improved dramatically after 2002, when it significantly outperformed the naïve forecast at all forecasting horizons and the forward implied forecast at the one-year horizon.

The practical advantage of the Consensus Economics forecasts lies in a broader range of predicted economic variables and in the high frequency of forecast releases (every month). Based on the relatively high forecasting accuracy and the additional practical characteristics of Consensus, the Czech National Bank will continue to use it in its prediction process. However, the Consensus Forecasts will also be regularly confronted with alternative assumptions.

## References

- Ager, P., Kappler, M. and Osterloh, S. (2009): The Accuracy and Efficiency of the Consensus Forecasts: A Further Application and Extension of the Pooled Approach. *International Journal of Forecasting*, 25(1), 167–181.
- Ang, A., Bekaert, G. and Wei, M. (2007): Do Macro Variables, Asset Markets, or Surveys Forecast Inflation Better? *Journal of Monetary Economics*, 54(4), 1163–1212.
- Batchelor, R. (2001): How Useful are the Forecasts of Intergovernmental Agencies? The IMF and OECD Versus the Consensus. *Applied Economics*, 33(2), 225–235.
- Diebold, F. X. and Mariano, R. S. (1995): Comparing Predictive Accuracy. *Journal of Business & Economic Statistics*, 13(3), 253–263.
- Dovern, J., Fritsche, U. and Slacalek, J. (2009): Disagreement among Forecasters in G7 Countries. ECB Working Paper No. 1082.
- Novotny, F. and Rakova, M. (2010): Assessment of Consensus Forecasts Accuracy: The Czech National Bank Perspective. CNB Working Paper No. 14/2010.
- Stock, J. and Watson, M. W. (1999): Forecasting Inflation. *Journal of Monetary Economics*, 44(2), 293–335.
- Osterloh, S. (2008): Accuracy and Properties of German Business Cycle Forecasts. *Applied Economics Quarterly*, 54(1), 27–57.

## Central Bank Forecasts as a Coordination Device<sup>4</sup>

Jan Filáček<sup>a</sup> and Branislav Saxa<sup>a</sup>

<sup>a</sup>Czech National Bank



An extensive literature covers the field of information asymmetry between a central bank and the public. A central bank forecast, if it includes central bank rules, contains useful information on both central bank objectives and economic shocks. Therefore, many papers use the disclosure of central bank forecasts as an illustrative example of how information asymmetry between a central

bank and the public might be removed and what the economic effects of such a step would be. Unfortunately, the conclusions of these papers (e.g. Jensen, 2000, Morris and Shin, 2002, Fukač, 2006, Eijffinger and Tesfaselassie, 2007) are rather ambiguous, and depend on the frameworks and assumptions used.

Given these opposing views on the welfare effects of publishing central bank forecasts, the results of empirical studies on coordination are highly beneficial in deciding whether central banks should release more signals. Our paper goes in this direction and expands on the existing literature (most recently Ehrmann, Eijffinger and Fratzscher, 2010) in at least three respects. First, we look at the coordination problem from a closer perspective, analysing the responses of individual private forecasters to released central bank forecasts. Second, we not only look at the dispersion of private forecasts, but also examine how distant private forecasts are from the central bank forecast. Third, we focus on the details of central bank forecast communication by taking into account the risk assessment as viewed by the board members and by inspecting the effects of communication improvements.

The main hypotheses under our review are: (1) financial market analysts tend to coordinate their forecasts for the Czech economy via the CNB forecast, (2) this coordination also depends on macroeconomic uncertainty, and (3) improvements in CNB communication have deepened the coordination effect.

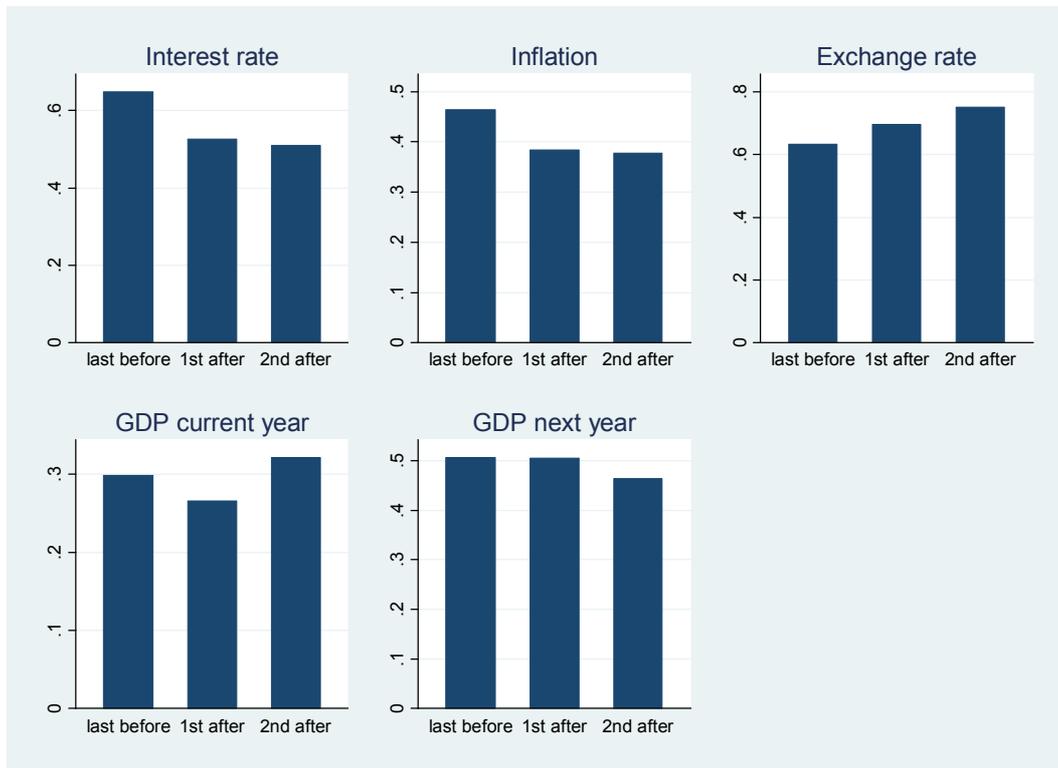
To test our first hypothesis we analyse three sets of monthly private forecasts for each release of the quarterly CNB forecast. The first set of private forecasts comprises the last available forecasts before each release of the quarterly CNB forecast. The second set are those private forecasts which are surveyed immediately after the release of the CNB forecast. The third set of private forecasts are the forecasts surveyed approximately one month after the release of the CNB forecast.

Figure 1 shows that the distance between the private forecasts and the CNB forecast decreases after the release of the CNB forecast in the case of interest rates, inflation and GDP growth in the current year. On the contrary, the distance increases in the case of exchange rates. The distance for GDP growth in the next year remains broadly stable.

---

<sup>4</sup> This article is based on Filáček and Saxa (2010).

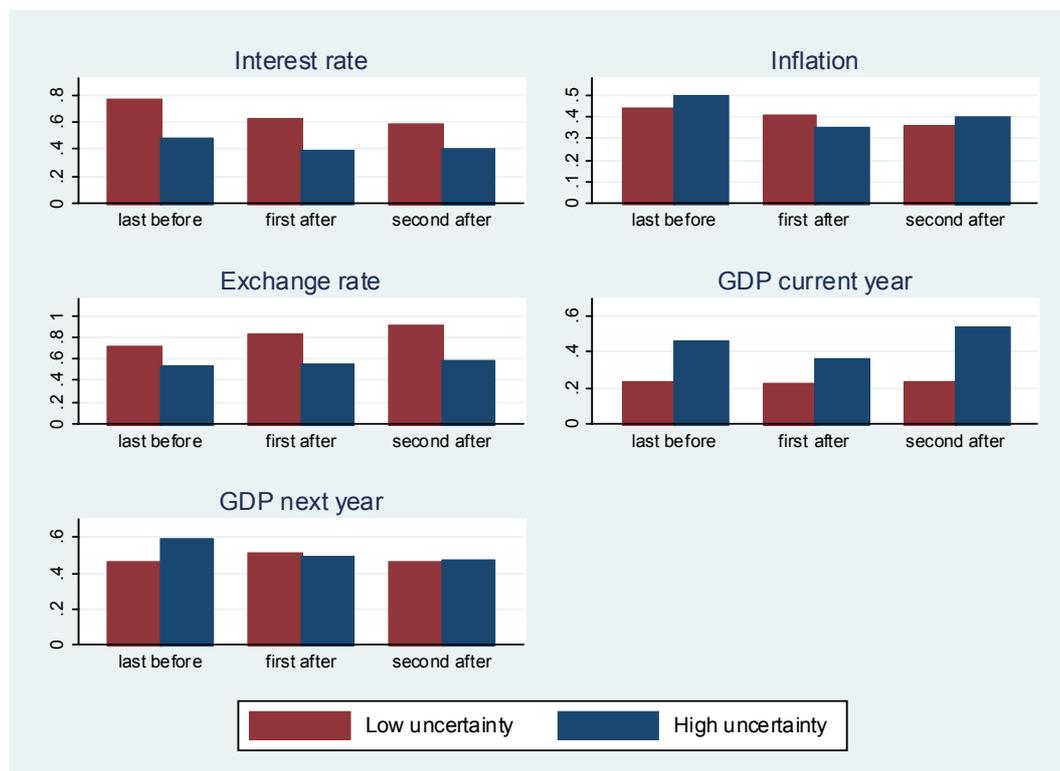
**Figure 1.** The sensitivity of the median absolute distance of private forecasts from the CNB forecast on the release of the latter



These results comply with intuition. The CNB has the power to steer the interest rate as its main instrument. Hence, the interest rate forecast is mostly credible and its publication reduces the uncertainty of private forecasts. As an inflation-targeting central bank, the CNB inflation forecast is also considered credible. However, the CNB forecasts for the remaining indicators – the exchange rate and GDP – are perceived as being less credible and their publication does not significantly reduce the uncertainty among private forecasters. The highest exchange rate uncertainty at the time of publishing the CNB forecast might be explained by higher exchange rate volatility surrounding the CNB decision-taking, which coincides with the publication of the forecast. The uncertainty around the current and next year GDP forecasts is likely to be heavily influenced by statistical releases.

We continued our analysis by scrutinising if and how our results change during times of higher uncertainty. Quarters were divided into low and high uncertainty quarters depending on the average standard deviation of the private forecasts. Figure 2 provides a view of the relationship between uncertainty and the distance of the CNB forecast from the median of the private forecasts. The distance of the CNB forecasts from the private forecast median is substantially smaller during high uncertainty periods than at times of low uncertainty in the cases of interest rates and exchange rates. On the contrary, in the case of GDP forecasts for the current year, the distance is greater in uncertain times. In addition, Figure 2 shows that under high uncertainty, the distance decreases after the release of the CNB forecast in the cases of all forecasted variables except for the exchange rate.

**Figure 2.** The sensitivity of the median absolute distance of private forecasts from the CNB forecast on the release of the latter, depending on the degree of uncertainty



In the final step, we examined whether the sensitivity of private forecasts to the CNB forecast varies with the way the CNB forecast has been communicated. Changes in communication should deepen the coordination effect. Indeed, a positive effect was found for the publication of the interest rate forecast (increasing coordination of inflation, exchange rate and current year GDP forecasts) and for the publication of detailed forecast information (since April 2007 spreadsheets with underlying datasets have been published for all figures and tables in the Inflation Report, increasing the coordination of exchange rate forecasts).

In addition to changes in communication, we analysed the effects of actual economic developments, the risk assessments made by the CNB board members and the influence of other influential forecasters in the Czech Republic (the Ministry of Finance forecast). The actual developments are influential and come with the correct sign for the interest rate and current year GDP – the bigger the surprise, the bigger the distance of private forecasts from the CNB forecast. The risk assessment is significant only for inflation. This seems intuitive because the risks of the forecast are assessed mainly for inflation and verbally described as inflationary or disinflationary. The higher accuracy of the CNB forecast implies that inflation and GDP private forecasts coordinate more intensively. As regards the Ministry of Finance forecast, when it differs from the CNB forecast by more than one percentage point, this tends to increase the difference between private forecasts and the CNB forecast in the case of current year GDP.

## References

Ehrmann, M., Eijffinger, S. and Fratzscher, M. (2010): The Role of Central Bank Transparency for Guiding Private Sector Forecasts. ECB Working Paper No. 1146.

Eijffinger, S. and Tesfaselassie, M. F. (2007): Central Bank Forecasts and Disclosure Policy: Why It Pays to be Optimistic. *European Journal of Political Economy*, 23(1), 30–50.

Filáček, J. and Saxa, B. (2010): Central Bank Forecasts as a Coordination Device. CNB Working Paper No. 13/2010.

Fukač, M. (2006): New Keynesian Model Dynamics under Heterogeneous Expectations and Adaptive Learning. CNB Working Paper No. 5/2006.

Jensen, H. (2000): The Optimal Degree of Transparency in Monetary Policy-making: The Case of Imperfect Information about the Cost-push Shock. University of Copenhagen, mimeo.

Morris, S. and Shin, H. S. (2002): Social Value of Public Information. *American Economic Review*, 92(5), 1521–1534.

<b>CNB Working Paper Series 2009–2012</b>		
2/2012	Adam Geršl Petr Jakubík Dorota Kowalczyk Steven Ongena José-Luis Peydró Alcalde	Monetary Conditions and Banks' Behaviour in the Czech Republic
1/2012	Jan Babecký Kamil Dybczak	Real Wage Flexibility in the European Union: New Evidence from the Labour Cost Data
15/2011	Jan Babecký Kamil Galuščák Lubomír Lízal	Firm-Level Labour Demand: Adjustment in Good Times and During the Crisis
14/2011	Vlastimil Čadek Helena Rottová Branislav Saxa	Hedging Behaviour of Czech Exporting Firms
13/2011	Michal Franta Roman Horváth Marek Rusnák	Evaluating Changes in the Monetary Transmission Mechanism in the Czech Republic
12/2011	Jakub Ryšánek Jaromír Tonner Osvald Vašíček	Monetary Policy Implications of Financial Frictions in the Czech Republic
11/2011	Zlataše Komárková Adam Geršl Luboš Komárek	Models for Stress Testing Czech Banks' Liquidity Risk
10/2011	Michal Franta Jozef Baruník Roman Horváth Kateřina Šmídková	Are Bayesian Fan Charts Useful for Central Banks? Uncertainty, Forecasting, and Financial Stability Stress Tests
9/2011	Kamil Galuščák Lubomír Lízal	The Impact of Capital Measurement Error Correction on Firm-Level Production Function Estimation
8/2011	Jan Babecký Tomáš Havránek Jakub Matějů Marek Rusnák Kateřina Šmídková Bořek Vašíček	Early Warning Indicators of Economic Crises: Evidence from a Panel of 40 Developed Countries
7/2011	Tomáš Havránek Zuzana Iršová	Determinants of Horizontal Spillovers from FDI: Evidence from a Large Meta-Analysis
6/2011	Roman Horváth Jakub Matějů	How Are Inflation Targets Set?
5/2011	Bořek Vašíček	Is Monetary Policy in the New EU Member States Asymmetric?
4/2011	Alexis Derviz	Financial Frictions, Bubbles, and Macroprudential Policies
3/2011	Jaromír Baxa Roman Horváth Bořek Vašíček	Time-Varying Monetary-Policy Rules and Financial Stress: Does Financial Instability Matter for Monetary Policy?
2/2011	Marek Rusnák Tomáš Havránek Roman Horváth	How to Solve the Price Puzzle? A Meta-Analysis
1/2011	Jan Babecký	Sustainable Real Exchange Rates in the New EU Member States:

	Aleš Bulíř Kateřina Šmídková	What Did the Great Recession Change?
15/2010	Ke Pang Pierre L. Siklos	Financial Frictions and Credit Spreads
14/2010	Filip Novotný Marie Raková	Assessment of Consensus Forecast Accuracy: The Czech National Bank Perspective
13/2010	Jan Filáček Branislav Saxa	Central Bank Forecasts as a Coordination Device
12/2010	Kateřina Arnoštová David Havrlant Luboš Růžička Peter Tóth	Short-Term Forecasting of Czech Quarterly GDP Using Monthly Indicators
11/2010	Roman Horváth, Kateřina Šmídková Jan Zápál	Central Banks' Voting Records and Future Policy
10/2010	Alena Bičáková Renata Pašaličová Zuzana Prelcová	Who Borrows and Who May Not Repay?
9/2010	Jan Babecký Luboš Komárek Zlataše Komárková	Financial Integration at Times of Financial (In)Stability
8/2010	Kamil Dybczak Peter Tóth David Voňka	Effects of Price Shocks to Consumer Demand. Estimating the QUAIDS Demand System on Czech Household Budget Survey Data
7/2010	Jan Babecký Philip Du Caju Theodora Kosma Martina Lawless Julián Messina Tairi Rõõm	The Margins of Labour Cost Adjustment: Survey Evidence from European Firms
6/2010	Tomáš Havránek Roman Horváth Jakub Matějů	Do Financial Variables Help Predict Macroeconomic Environment? The Case of the Czech Republic
5/2010	Roman Horváth Luboš Komárek Filip Rozsypal	Does Money Help Predict Inflation? An Empirical Assessment for Central Europe
4/2010	Oxana Babecká Kucharčuková Jan Babecký Martin Raiser	Gravity Approach for Modelling International Trade in South-Eastern Europe and the Commonwealth of Independent States: The Role of Geography, Policy and Institutions
3/2010	Tomáš Havránek Zuzana Iršová	Which Foreigners Are Worth Wooing? A Meta-Analysis of Vertical Spillovers from FDI
2/2010	Jaromír Baxa Roman Horváth Bořek Vašíček	How Does Monetary Policy Change? Evidence on Inflation Targeting Countries
1/2010	Adam Geršl Petr Jakubík	Relationship Lending in the Czech Republic
15/2009	David N. DeJong Roman Liesenfeld	Efficient Likelihood Evaluation of State-Space Representations

---

	Guilherme V. Moura Jean-Francois Richard Hariharan Dharmarajan	
14/2009	Charles W. Calomiris	Banking Crises and the Rules of the Game
13/2009	Jakub Seidler Petr Jakubík	The Merton Approach to Estimating Loss Given Default: Application to the Czech Republic
12/2009	Michal Hlaváček Luboš Komárek	Housing Price Bubbles and their Determinants in the Czech Republic and its Regions
11/2009	Kamil Dybczak Kamil Galuščák	Changes in the Czech Wage Structure: Does Immigration Matter?
10/2009	Jiří Böhm Petr Král Branislav Saxa	Perception is always Right: The CNB's Monetary Policy in the Media
9/2009	Alexis Derviz Marie Raková	Funding Costs and Loan Pricing by Multinational Bank Affiliates
8/2009	Roman Horváth Anca Maria Podpiera	Heterogeneity in Bank Pricing Policies: The Czech Evidence
7/2009	David Kocourek Filip Pertold	The Impact of Early Retirement Incentives on Labor Market Participation: Evidence from a Parametric Change in the Czech Republic
6/2009	Nauro F. Campos Roman Horváth	Reform Redux: Measurement, Determinants and Reversals
5/2009	Kamil Galuščák Mary Keeney Daphne Nicolitsas Frank Smets Pawel Strzelecki Matija Vodopivec	The Determination of Wages of Newly Hired Employees: Survey Evidence on Internal Versus External Factors
4/2009	Jan Babecký Philip Du Caju Theodora Kosma Martina Lawless Julián Messina Tairi Rõõm	Downward Nominal and Real Wage Rigidity: Survey Evidence from European Firms
3/2009	Jiří Podpiera Laurent Weill	Measuring Excessive Risk-Taking in Banking
2/2009	Michal Andrlé Tibor Hlédik Ondra Kameník Jan Vlček	Implementing the New Structural Model of the Czech National Bank
1/2009	Jan Babecký Kamil Dybczak	The Impact of Population Ageing on the Czech Economy

---

**CNB Research and Policy Notes 2009–2012**

3/2011	František Brázdik Michal Hlaváček Aleš Maršál	Survey of Research on Financial Sector Modeling within DSGE Models: What Central Banks Learn from It
2/2011	Adam Geršl Jakub Seidler	Credit Growth and Capital Buffers: Empirical Evidence from Central and Eastern European Countries
1/2011	Jiří Böhm Jan Filáček Ivana Kubicová Romana Zamazalová	Price-Level Targeting – A Real Alternative to Inflation Targeting?

**CNB Economic Research Bulletin 2009–2012**

April 2012	Macroeconomic Forecasting: Methods, Accuracy and Coordination
November 2011	Macro-Financial Linkages: Theory and Applications
April 2011	Monetary Policy Analysis in a Central Bank
November 2010	Wage Adjustment in Europe
May 2010	Ten Years of Economic Research in the CNB
November 2009	Financial and Global Stability Issues
May 2009	Evaluation of the Fulfilment of the CNB's Inflation Targets 1998–2007

**Selected Journal Publications by CNB Staff 2009–2012**

Antal, J., Filáček, J., Frait, J., Horváth, R., Kotlán, V. and Skořepa, M. (2009): Monetary Policy Strategies before Euro Adoption: The Art of Chasing Many Rabbits. *AUCO Czech Economic Review* 3(2), 176–198.

Arnoštová, K., Havrlant, D., Růžička, L. and Tóth, P. (2011): Short-Term Forecasting of Czech Quarterly GDP Using Monthly Indicators. *Czech Journal of Economics and Finance*, 61(6), 566–583.

Babecká Kucharčuková, O., Babecký, J. and Raiser, M. (2012): Gravity Approach for Modelling International Trade in South-Eastern Europe and the Commonwealth of Independent States: The Role of Geography, Policy and Institutions. *Open Economies Review*, 23(2), 277–301.

Babecká Kucharčuková, O. (2009): Transmission of Exchange Rate Shocks into Domestic Inflation: The Case of the Czech Republic. *Czech Journal of Economics and Finance*, 59(2), 137–152.

Babecký, J. and Campos, N. F. (2011): Does Reform Work? An Econometric Survey of the Reform-Growth Puzzle. *Journal of Comparative Economics*, 39(2), 140–158.

Babecký, J., Du Caju, P., Kosma, T., Lawless, M., Messina, J. and Røðm, T. (2010): Downward Nominal and Real Wage Rigidity: Survey Evidence from European Firms. *Scandinavian Journal of Economics*, 112(4), 643–910.

Babecký, J. and Podpiera, J. (2011): Inflation Forecast Errors in the Czech Republic: Evidence from a Panel of Institutions. *Eastern European Economics*, 49(1), 72–83.

Böhm, J., Filáček, J., Kubicová, I. and Zamazalová, R. (2012): Price-Level Targeting—A Real Alternative to Inflation Targeting? *Czech Journal of Economics and Finance*, 62(1), 2–26.

Böhm, J., Král, P. and Saxa, B. (2012): Czech National Bank's Monetary Policy in the Media. *European Journal of Political Economy*, 28(3), 341–357.

Borys Morgese, M., Franta, M. and Horváth, R. (2009): The Effects of Monetary Policy in the Czech Republic: An Empirical Study. *Empirica*, 36(4), 419–443.

Brázdík, F. (2011): An Announced Regime Switch: Optimal Policy for the Transition Period. *Czech Journal of Economics and Finance*, 61(5), 411–431.

Brůha, J. and Podpiera, J. (2011): The Dynamics of Economic Convergence: The Role of Alternative Investment Decisions. *Journal of Economic Dynamics and Control*, 35(7), 1032–1044.

Brůha, J. and Podpiera, J. (2010): Real Exchange Rate in Emerging Economies: The Role of Different Investment Margins. *Economics of Transition*, 18(3), 599–628.

Brůha, J., Podpiera, J. and Polák, S. (2010): The Convergence Dynamics of a Transition Economy: The Case of the Czech Republic. *Economic Modelling*, 27(1), 116–124.

Brůha, J. (2011): An Empirical Small Labor Market Model for the Czech Economy. *Czech Journal of Economics and Finance*, 61(5), 434–449.

Cincibuch, M., Holub, T. and Hurník, J. (2009): Central Bank Losses and Economic Convergence. *Czech Journal of Economics and Finance*, 59(3), 190–215.

Coricelli, F. and Horváth, R. (2009): Price Setting and Market Structure: An Empirical Analysis of Micro Data in Slovakia. *Managerial and Decision Economics*, 31(2–3), 209–233.

Derviz, A. (2011): Real Implications of Bursting Asset Price Bubbles in Economies with Bank Credit. *Czech Journal of Economic and Finance*, 61(1), 92–116.

Derviz, A. and Podpiera, J. (2011): Lending Behavior of Multinational Bank Affiliates. *Risk Governance and Control: Financial Markets and Institutions*, 1(1), 19–36.

Fabiani, S., Galuščák, K., Kwapil, C., Lamo, A. and Røðm, T. (2010): Wage Rigidities and Labor Market Adjustment in Europe. *Journal of the European Economic Association*, 8(2–3), 497–505.

- Fidrmuc, J. Horváth, R. and Horváthová, E. (2010): Corporate Interest Rates and the Financial Accelerator in the Czech Republic. *Emerging Markets Finance and Trade*, 46(4), 41–54.
- Fišer, R. and Horváth, R. (2010): Central Bank Communication and Exchange Rate Volatility: A GARCH Analysis. *Macroeconomics and Finance in Emerging Market Economies*, 2(1), 25–31.
- Frait, J., Komárek, L. and Komárková, Z. (2011): Monetary Policy in a Small Economy after Tsunami: A New Consensus on the Horizon? *Czech Journal of Economic and Finance*, 61(1), 5–33.
- Franta, M., Libich, J. and Stehlík, P. (2011): The Big Picture of Monetary-Fiscal Interactions. *Economic Papers*, 30(1), 6–14.
- Franta, M., Saxa, B. and Šmídková, K. (2010): The Role of Inflation Persistence in the Inflation Process in the New EU Member States. *Czech Journal of Economics and Finance*, 60(6), 480–500.
- Galuščák, K. and Pavel, J. (2012): Taxes and Benefits: Work Incentive Effects of Policies. *Czech Journal of Economics and Finance*, 62(1), 27–43.
- Geršl, A. and Jakubík, P. (2012): How Important Is the Adverse Feedback Loop for the Banking Sector? *Journal of Economics*, 60(1), 32–49.
- Geršl, A. and Jakubík, P. (2011): Relationship Lending in Emerging Markets: Evidence from the Czech Republic. *Comparative Economic Studies*, 53(4), 575–596.
- Geršl, A. and Komárková, Z. (2009): Liquidity Risk and Banks' Bidding Behavior: Evidence from the Global Financial Crisis. *Czech Journal of Economics and Finance*, 59(6), 577–592.
- Havránek, T. and Iršová, Z. (2011): Estimating Vertical Spillovers from FDI: Why Results Vary and What the True Effect Is. *Journal of International Economics*, 85(2), 234–244.
- Havránek, T. and Iršová, Z. (2010): Meta-Analysis of Intra-Industry FDI Spillovers: Updated Evidence. *Czech Journal of Economics and Finance*, 60(2), 151–174.
- Havránek, T. and Iršová, Z. (2010): Measuring Bank Efficiency: A Meta-Regression Analysis. *Prague Economic Papers*, 4/2010, 24–43.
- Havránek, T. and Iršová, Z. (2010): On the Intensity of International Subsidy Competition. *Theoretical and Applied Economics*, 17(2), 25–54.
- Havránek, T. (2010): Rose Effect and the Euro: Is the Magic Gone? *Review of World Economics*, 146(2), 241–261.
- Havránek, T. (2009): The Supply of Foreign Direct Investment Incentives: Subsidy Competition in an Oligopolistic Framework. *Prague Economic Papers*, 2/2009, 131–155.
- Hlaváček, M. and Komárek, L. (2011): Regional Analysis of Housing Price Bubbles and their Determinants in the Czech Republic. *Czech Journal of Economic and Finance*, 61(1), 67–91.
- Horváth, R. (2009): The Time-Varying Policy Neutral Rate in Real Time: A Predictor for Future Inflation? *Economic Modelling*, 26(1), 71–81.
- Horváth, R. and Matějů, J. (2011): How Are Inflation Targets Set? *International Finance*, 14(2), 265–300.
- Horváth, R. and Rusnák, M. (2009): How Important Are Foreign Shocks in a Small Open Economy? The Case of Slovakia. *Global Economy Journal*, 9(1), Article 5.
- Jakubík, P. and Seidler, J. (2009): Corporate Insolvency and Macroeconomic Determinants. *Journal of Economics*, 7(57), 619–633.
- Jakubík, P. and Teplý, P. (2011): The JT Index as an Indicator of Financial Stability of Corporate Sector. *Prague Economic Papers*, 2/2011, 157–176.
- Janáček, K. (2011): Asset Price Bubbles (Introduction). *Czech Journal of Economic and Finance*, 61(1), 2–4.

- Komárek, L. and Kubicová, I. (2011): The Classification and Identification of Asset Price Bubbles. *Czech Journal of Economic and Finance*, 61(1), 34–48.
- Munzi, T. and Hlaváč, P. (2011): Inflation Targeting and Its Impact on the Nature of the Money Supply and the Financial Imbalances. *Politická ekonomie*, 59(4), 435–453.
- Murárik, R. (2011): Price Setting Behaviour in the Czech Republic, Micro Data Evidence. *Statistika - Economy and Statistics Journal*, 2/2011, 24–41.
- Novotný, F. and Raková, M. (2011): Assessment of Consensus Forecasts Accuracy: The Czech National Bank Perspective. *Czech Journal of Economics and Finance*, 61(4), 348–366.
- Novotný, F. (2011): Exchange rate effects in a globalized economy: Evidence from the Czech Republic. *Journal of Economics/Ekonomický časopis*, 59(6), 636–646.
- Podpiera, J. and Raková, M. (2009): The Price Effects of Emerging Retail Markets. *Eastern European Economics*, 47(1), 92–105.
- Polanský, J., Tonner, J. and Vašíček, O. (2011): Parameter Drifting in a DSGE Model Estimated on Czech Data. *Czech Journal of Economics and Finance*, 61(5), 510–524.
- Seidler, J., Jakubík, P. and Horváth, R. (2009): Estimating Expected Loss Given Default in an Emerging Market: The Case of Czech Republic. *Journal of Financial Transformation*, 27, 103–107.
- Seidler, J. and Jakubík, P. (2009): Implied Market Loss Given Default in the Czech Republic: Structural-Model Approach. *Czech Journal of Economics and Finance*, 59(1), 20–40.
- Šopov, B. and Seidler, J. (2011): Yield Curve Dynamics: Regional Common Factor Model, *Prague Economic Papers*, 2/2011, 140–156.
- Vašíček, B. (2010): Monetary Policy Rules and Inflation Processes in Open Emerging Economies: Evidence for 12 New EU Members. *Eastern European Economics*, 48(4), 36–58.
- Vašíček, B. (2011): Inflation Dynamics and the New Keynesian Phillips curve in Four Central European countries. *Emerging Markets Finance and Trade*, 47(5), 71–100.

## Forthcoming Journal Publications

Babecký, J., Du Caju, P., Kosma, T., Lawless, M., Messina, J. and Rõõm, T. (2012): How do European Firms Adjust their Labour Costs when Nominal Wages are Rigid? *Labour Economics*, forthcoming.

Baxa, J., Horváth, R. and Vašíček, B. (2012): Time-Varying Monetary-Policy Rules and Financial Stress: Does Financial Instability Matter for Monetary Policy? *Journal of Financial Stability*, forthcoming.

Bulíř, A., Čihák, M. and Šmídková, K. (2012): Writing Clearly: The ECB's Monetary Policy Communication. *German Economic Review*, forthcoming.

Derviz, A., and M. Raková (2012): Parent Influence on Loan Pricing by Czech Banks. *Prague Economic Papers*, forthcoming.

Galuščák, K., Keeney, M., Nicolitsas, D., Smets, F., Strzelecki, P. and Vodopivec, M. (2012): The Determination of Wages of Newly Hired Employees: Survey Evidence on Internal versus External Factors. *Labour Economics*, forthcoming.

Havránek, T., Horváth, R. and Matějů, J. (2012): Monetary Transmission and the Financial Sector in the Czech Republic. *Economic Change and Restructuring*, forthcoming.

Havránek, T. and Iršová, Z. (2012): A Meta-Analysis of Bank Efficiency Measurement in Transitional Countries. *Transformations in Business and Economics*, forthcoming.

Havránek, T., Iršová, Z. and Janda, K. (2012): Demand for Gasoline is More Price-Inelastic than Commonly Thought. *Energy Economics*, forthcoming.

Novotný, F. (2012): The Link between the Brent Crude Oil Price and the US Dollar Exchange Rate. *Prague Economic Papers*, forthcoming.

Rusnák, M., Havránek, T. and Horváth, R. (2012): How to Solve the Price Puzzle? A Meta-Analysis. *Journal of Money, Credit and Banking*, forthcoming.

Vašíček, B. (2012): Is Monetary Policy in the New EU Member States Asymmetric? *Economic Systems*, 36(2), forthcoming.

## CNB Research Open Day

The CNB Research Open Day 2012 will be held in the Czech National Bank's Commodity Exchange (Plodinová Burza) building on **Monday, 21 May 2012**. This half-day conference will provide an opportunity to see some of the best of the CNB's current economic research work, to learn about the CNB Call for Research Projects 2013 and to meet CNB researchers informally.

Please note that places will be subject to availability owing to the limited capacity of the conference facility. To secure your place please register at [www.cnb.cz](http://www.cnb.cz), direct link:

[http://www.cnb.cz/en/research/seminars\\_workshops/research\\_open\\_day\\_2012\\_form.html](http://www.cnb.cz/en/research/seminars_workshops/research_open_day_2012_form.html)

### Programme

Monday, 21 May 2012

The Czech National Bank's Commodity Exchange (Plodinová Burza) building,  
Senovážné nám. 30, Praha 1

- |       |   |
|-------|---|
| 8.30  | Registration & Morning Coffee   |
| 9.00  | Introduction and ERD Award 2012: Lubomír Lízal, Bank Board Member, CNB  |
| 9.10  | CNB Research in 2012, Kateřina Šmídková, Executive Director, ERD, CNB   |
| 9.20  | <i>"How to Solve the Price Puzzle? A Meta-Analysis,"</i> by Marek Rusnák, <u>Tomáš Havránek</u> and Roman Horváth, CNB  |
| 9.40  | Discussion: Jakob de Haan, de Nederlandsche Bank  |
| 9.55  | Q&A   |
| 10.05 | <i>"Financial Frictions, Bubbles, and Macroprudential Policies,"</i> by <u>Alexis Derviz</u> , CNB  |
| 10.25 | Discussion: Gregory de Walque, National Bank of Belgium   |
| 10.40 | Q&A   |
| 10.50 | Coffee  |
|       | Chair: Kateřina Šmídková, CNB   |
| 11.15 | <i>"Early Warning Indicators of Economic Crises: Evidence from a Panel of 40 Developed Countries,"</i> by Jan Babecký, Tomáš Havránek, Jakub Matějů, Marek Rusnák, Kateřina Šmídková and <u>Bořek Vašíček</u> , CNB |
| 11.35 | Discussion: Peter Dunne, Central Bank of Ireland  |
| 11.50 | Q&A   |
| 12.00 | <i>"Firm-Level Labour Demand: Adjustment in Good Times and During the Crisis,"</i> by Jan Babecký, <u>Kamil Galuščák</u> and Lubomír Lízal, CNB   |
| 12.20 | Discussion: Paweł Strzelecki, Narodowy Bank Polski  |
| 12.35 | Q&A   |
| 12.45 | Lunch   |
| 14.00 | Information Meeting for Prospective Authors of CNB Research Projects  |



Czech National Bank  
Economic Research Department  
Na Příkopě 28, 115 03 Prague 1  
Czech Republic

tel.: +420 2 2441 2321

fax: +420 2 2441 4278

<http://www.cnb.cz>

e-mail: [research@cnb.cz](mailto:research@cnb.cz)