

THE ACCURACY OF MACROECONOMIC FORECASTS IN THE YEARS 2006 - 2011

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Abstract

The paper deals with the forecast accuracy of the real gross domestic product growth rate and the annual inflation rate (harmonized index of consumer prices respectively) for the Czech Republic and France in the years 2006 – 2011. The results are based on the Theil's forecast accuracy coefficient and the data graphics analysis. The Czech Ministry of Finance data which were published every July of the years 2004 – 2010 are used in the paper. Also the European Commission data which were published in its forecasts every autumn of the years 2004 – 2010 are used in the paper.

Key words: Forecast; product growth rate; inflation rate

JEL Code: E37

Introduction

Many public and private institutions process and publish forecasts of key macroeconomic variables. The subject of this paper is to evaluate the accuracy of predictions of selected variables from the perspective of economic recession of 2009.

The paper evaluates the quality of forecasts of two characteristics that are crucial from the perspective of the corporate sector: the growth rate of real gross domestic product and price level changes expressed in the consumer price index (CPI) changes. Their development actually predicts changes in aggregate demand.

Predictions are concerning the expected development of economies of two countries: the Czech Republic and France.

In terms of time there is examined the period between years 2006 and 2011. The reason is obvious. Between 2006 and 2008 there was relatively smooth economic development. You should therefore forecast both of the above mentioned macroeconomic characteristics are relatively accurate. The problem for forecasters should then be an estimation of rupture in the development of the economy that occurred in 2009. How exactly and how early the various

institutions that publish forecasts of these economies predict the financial crisis and recession, which is fully developed in 2009?

For the Czech Republic, the paper analyzes the data of the Ministry of Finance of the Czech Republic (MF). Their analysis is based on the Macroeconomic Forecasts which is published on a quarterly basis. In this paper, we analyse the data published by the Ministry in their predictions always in July of the corresponding year.

For France, the paper monitors the accuracy of the European Economic Forecast. This forecast is published twice a year – like a spring and autumn predictions. These predictions are accompanied by interim forecasts, usually also twice a year. For our analysis we have used data from the autumn European Economic Forecast for each corresponding year.

We always compare the value actually achieved (GDP growth or CPI) with the predicted value, which was published by the relevant institution one or two years before. For example, we compare the annual rate of inflation in the Czech Republic actually reached in 2010 to the inflation rate for the same year 2010 estimated by the Czech Ministry of Finance in July 2009 and in July 2008.

Firstly, we will use graphical analysis.

Secondly, graphical analysis is verified by the computation of the percentage value of the estimate error. For the calculation, the Theil forecast accuracy coefficient (TH) is used in the form:

$$T_H^2 = \frac{\sum (y_i - P_i)^2}{\sum y_i^2}$$
$$T_H = \sqrt{T_H^2} \text{ (*100 in \%)}$$

where:

P_i is the forecasted value

y is the real value of the variable and

i is time

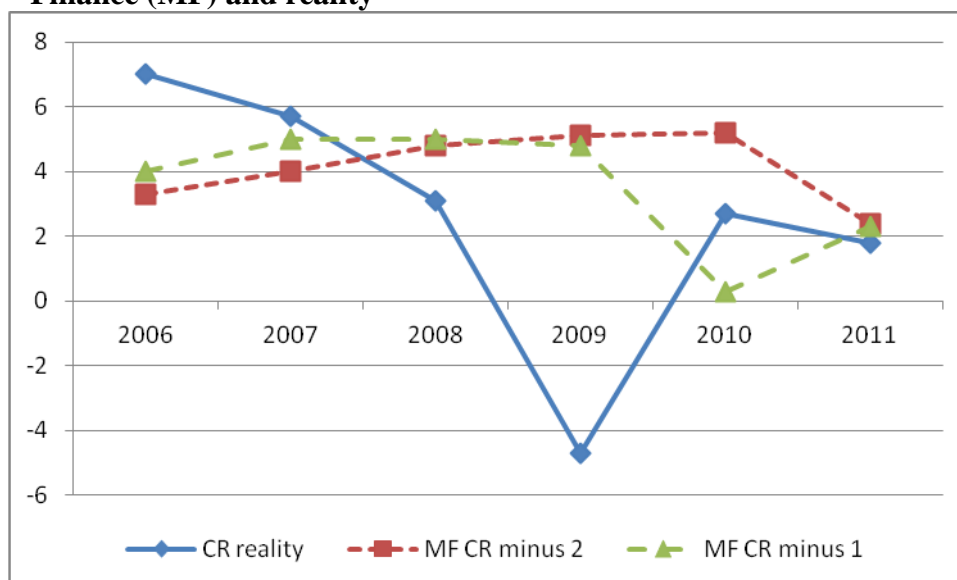
In the case of Theil coefficient, we calculate the percentage magnitude of the estimate error, i.e. the smaller is its value the better the extrapolation of the observed variable is.

1. Growth rate of gross domestic product

We will begin the analysis by the examining of the annual real gross domestic product growth rate. The solid line on the Figure 1 shows the actual development of this magnitude in the years 2006 to 2011 in the Czech Republic. Similarly, Figure 2 displays the actual development of the annual growth rate of real GDP from 2006 to 2011 in France by a solid line.

The other curves in the Figure 1 indicate the Ministry of Finance forecasts the growth rate of Czech gross domestic product since 2006, always in July of that year. The dashed line (with triangles marks) indicates one year old prediction. This means that the prediction for 2009 was published in July 2008.

Fig. 1: Growth rate of gross domestic product: prediction of the Czech Ministry of Finance (MF) and reality



Source: own computation on the base of Czech Ministry of Finance data www.mfcr.cz (April 2012)

Similarly, the dotted line (with square marks) indicates the prediction which was made two years before. This means that the prediction for year 2009 was published in July 2007.

Figure 1 shows that analysts of the Ministry of Finance (MF) managed fairly solid estimate of the growth rate of real GDP forecasts for 2006 and 2007 years. For 2008, forecasts began to diverge from reality - they were too optimistic. Excessive optimism is also reflected in the forecast of the real GDP growth for 2009, which was published not only in July 2007 but also in July 2008.

Estimate which was made two years ahead is usually less accurate than the forecast published one year ahead. But it is interesting that in this case, the analysts' optimism remained completely unchanged in both forecasts and they were not able to discover the coming recession.

Here Czech analysts completely failed to predict the turning point in the real GDP growth, i.e. the fall of the Czech economy into the recession of 2009.

We can reach the same conclusions when we evaluate the accuracy of the same forecasts by the Theil index.

Firstly, we consider the Ministry of Finance forecasts of the real GDP growth rates for the years from 2006 to 2008. Their's coefficient in this period reached the value $TH = 46\%$ for two-year forecast and 38% for the year prognosis.

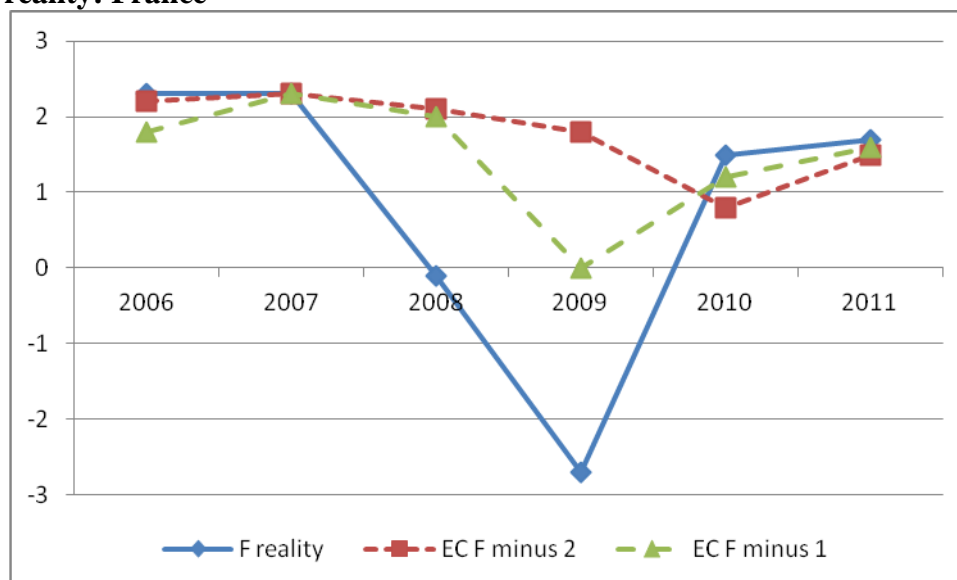
Now we extend the period of 2009. We consider the predictions of the Ministry of Finance from 2004 to 2008, i.e. real GDP growth from 2006 to 2009. The value of Theil's coefficient is now dramatically increases: $TH = 101\%$ for two-year forecast and $TH = 96\%$ for the year prognosis.

It is true that indicator significantly "penalize" a unique and significantly worse result in forecasting and on the contrary, it brings a distinctive "bonus" for well estimated sudden breaks in the development of predicted values.

It is reason why Theil's coefficient provides quite poor results for the entire period 2006 - 2011. The value of Theil's coefficient is now $TH = 99\%$ for two-year forecast and $TH = 94\%$ for the year prognosis.

Again this does not mean anything else than that the explanatory power of prediction deteriorated significantly. Czech analysts were not able to predict the recession not only two years but also one year before its beginning. The calculation is so consistent with previous graphical analysis.

Fig. 2: Growth rate of gross domestic product: prediction of the European Commission and reality: France



Source: own computation on the base of European Commission data <http://ec.europa.eu> (April 2012)

In contrast, the predictions of the European Commission analysts for French economy were more accurate. They were more successful to discover the beginning of the recession.

Strictly speaking, this statement applies only to annual GDP growth rate forecasts, as shown in Figure 2.

In accordance with Figure 1, the solid line indicates the actual growth rate of real GDP, the dashed line indicates two-year forecasts and the dotted line indicates the annual forecasts.

Figure 2 indicates that the European Commission analysts have provided quite solid estimate of the growth rate of real GDP for 2006 and 2007 years. For 2008, forecasts for France began to diverge from reality – as two years as the year forecasts were too optimistic.

Until 2008 is forecast inaccuracy realised by the EC and Czech Ministry of Finance very similar. The situation has changed in 2009. We know Czech analysts stood absolutely optimistic for year 2009 (as in the two year as in the year prediction). But EC analysts were very optimistic only in their 2009 forecast which was published two years before. With regard to the ongoing processes in the global economy, they corrected their views in 2008 and they decreased the estimate of real GDP growth rate for 2009 significantly.

Their forecast results for France are significantly better than the results of Czech analysts for the Czech economy. But the fact that their predictions are still too optimistic remains.

Generally speaking, we can say that EC analysts provided better estimate of coming recession than their Czech counterparts.

This statement we can confirm by the Theil's coefficient again.

We start again with the European Commission forecasts of the French real GDP growth rates for the years from 2006 to 2008. Theil's coefficient in this period had got the value $TH = 68\%$ for two-year forecast and 66% for the year prognosis. A little bit worse than Czech one.

Now we extend the period of 2009. We consider the predictions for the real GDP growth from 2006 to 2009. Like in the Czech forecast, the value of Theil's coefficient for two-year forecast dramatically increases: $TH = 118\%$. But the magnitude of Theil's coefficient for the year prognosis is much better than the Czech analysts reached: $TH = 82\%$.

Again the results confirm that indicator brings a distinctive "bonus" for well estimated sudden breaks in the development of predicted values. It is reason why Theil's coefficient provides quite poor results for the entire period 2006 – 2011 in the two years forecast and quite good result for the year forecast.. The value of Theil's coefficient is now $TH = 106\%$ for two-year forecast and $TH = 72\%$ for the year prognosis.

2. Price level changes

Macroeconomic theory quite thoroughly explains the link between the output gap (or the real GDP growth rate) and the inflation rate. If the positive product gap is in the economy (usually associated with the relatively high real GDP growth rate), we can expect a relatively high rate of inflation. The opposite feedback is also valid: if economy is characterised by a negative product gap (and relatively low positive or even negative real GDP growth rates) low rate of inflation or even deflation is expected.

We move on now to the analysis of annual average rate of inflation forecasts in the Czech Republic for the years 2006 to 2011.

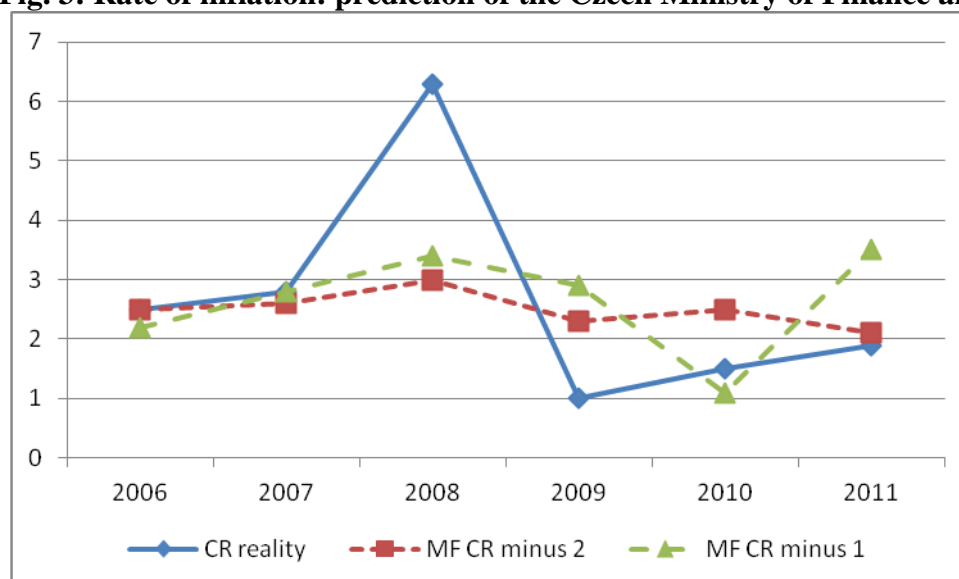
In a previous part of this paper, we reported that the Ministry of Finance staff has quite a solid estimate growth rate of real GDP forecasts for 2006 and 2007. This also corresponds to fairly good estimate of the inflation rate, as illustrated in Figure 3.

For 2008, forecast of the annual real GDP growth rate was optimistic. It resulted to the underestimation of the inflation rate in the forecast for this year.

For 2009, the annual real GDP growth rate forecast deviated from reality – it was too optimistic again. Excessive optimism is reflected in the prediction of the annual rate of inflation: its estimate for 2009 was too high again.

The link between the growth rate of real GDP and inflation rate was valid. However, the forecasters utterly failed to predict a turning point in the GDP growth, they were also unsuccessful in developing an estimate of annual inflation rates. Error estimate of the inflation rate is not so great as it was in the case of real GDP growth estimate.

Fig. 3: Rate of inflation: prediction of the Czech Ministry of Finance and reality



Source: own computation on the base of Czech Ministry of Finance data www.mfcr.cz (April 2012)

Similar conclusions can be reached if we use Theil's forecast accuracy coefficient. Two-year forecast for the years 2006 to 2008 shows the value $TH = 45 \%$, the annual prognosis is associated with the value $TH = 40 \%$. Now extend the period for the years 2006 to 2009. Two-year forecast for the years 2006 to 2009 shows the value $TH = 48 \%$ and the annual forecast value $TH = 47 \%$.

Finally, we have calculated Theil's forecast accuracy coefficient for the years 2006 to 2011. Two-year forecast for the years 2006 to 2008 shows the value $TH = 47 \%$, the annual prognosis is associated with the value $TH = 49 \%$.

It is therefore concluded that estimates of inflation are more accurate than estimates of real GDP growth.

In this context, it should be noted that the Czech central bank has got the goal to achieve the annual inflation rate of 2 % (with a deviation of 1 percentage point). By 2010, this was the 3 % annual inflation rate (again, with a tolerance of 1 percentage point). This provides an anchor for analysts and for their estimates.

Now we analyze how the European Commission analysts have been successful in estimating of the price level in France. For this purpose, we follow the prediction and the actual values of harmonised index of consumer prices (HICP). The Figure 4 illustrates this problem.

Between 2006 and 2007 HICP forecasts were very accurate and they were basically approaching the reality.

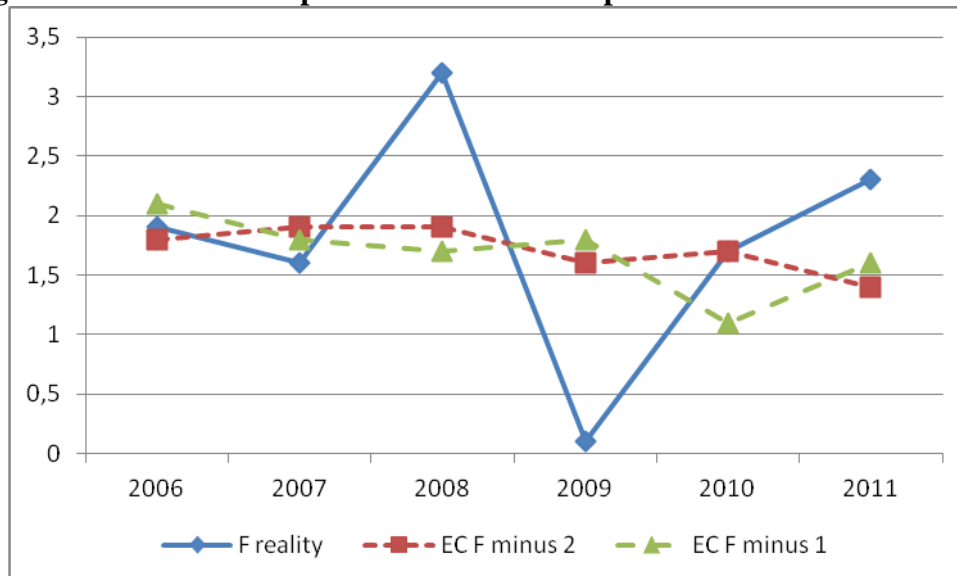
From 2008 to 2011 forecasts predict a relatively stable development of the HICP. But the reality was different. HICP has fluctuated to a greater extent than forecasters have expected. Again, however, the HICP projections show a smaller error than forecasts of the growth rate of the real GDP.

Similar conclusions can be reached if we use Theil's forecast accuracy coefficient. Two-year forecast for the years 2006 to 2008 shows the value $TH = 33 \%$, the annual prognosis is associated with the value $TH = 38 \%$. Two-year forecast for the years 2006 to 2009 shows the value $TH = 50 \%$ and the annual forecast value is $TH = 56 \%$.

Finally, we have calculated Theil's forecast accuracy coefficient for the years 2006 to 2011. Two-year forecast for the years 2006 to 2011 shows the value $TH = 44 \%$, the annual prognosis is associated with the value $TH = 50 \%$.

If the error estimate is calculated over the year 2009 the coefficient again shows that the deterioration of the estimate is worse. But the deterioration of the estimate is not so dramatic as the case with annual forecasts of the real GDP growth was.

Fig. 4: Rate of inflation: prediction of the European Commission and reality: France



Source: own computation on the base of European Commission data <http://ec.europa.eu> (April 2012)

We can also compare the results of price level predictions provided by analysts for the Czech Republic and France. It can be stated that the predictions' results are very similar, as follows from the calculated values of the Theil's forecast accuracy coefficient.

In conclusion, we will make one (gloating) note. We compare the above analysed forecasts with the conclusions of the primitive model which is based on the assumption of static adaptive expectations.

This naive model assumes that the true value of the variable from the current year is automatically used as the expected value of the following year. Example: if a actual growth rate of real output in 2008 was 2.5 %, the model with static adaptive expectations implies that in 2009 the real GDP growth is 2.5% again.

If the value of Theil's coefficient is greater than 1 (or greater than 100 %) it is indicated a naive model is more successful in predicting than the above mentioned forecasts. If the value of Theil's coefficient is lower than 1 (or less than 100 %) the forecasts of EC or the Czech Ministry of Finance are more successful in predicting.

If we look at the Theil's coefficient values for the annual inflation rate, we can state that the forecasts of EC or the Czech Ministry of Finance are more accurate than naive model of static adaptive expectations.

It cannot be apply to forecasts of the growth rate of real GDP which includes year 2009. If we consider a two-year prognosis naive model of static adaptive expectations wins the forecasts of EC and also the Czech Ministry of Finance. If we consider an annual prognosis

the naive model of static adaptive expectations provides the same results as the forecasts of the Czech Ministry of Finance.

Conclusion

The paper evaluates forecasts of two variables that are crucial from the perspective of the corporate sector: the growth rate of real gross domestic product and price level changes. Their development actually predicts changes in aggregate demand.

Graphical analysis and the Theil's forecast accuracy coefficient show that the annual growth rate of real output estimated by the Ministry of Finance and the European Commission for the years 2006 to 2008 was relatively accurate. The problem is connected with the same quantity estimate for 2009. Forecasts failed to determine the break point in the economic cycle and have failed to identify in advance the beginning of the recession. It is fully valid for a two-year forecasting time horizon, for the Czech Republic even in the annual time horizon.

Commenting on Macroeconomic Forecast of the Ministry of Finance of the Czech Republic from July 2010, the authors state that "The period of turmoil in financial markets and real economy, creating difficult conditions for statistical capture the main financial flows and flows of goods and services that take place in the economy The objective consequence is the increased volatility in the data base and the need for gradual refinement of published data. The instability of the quarterly national accounts data, of course, has got the impact on the ability to capture the future development by the economic forecasts." (Box C.1.1, Refining the results of the quarterly national accounts).

We can only agree with this statement. We however believe that economy forecasts are not based only on statistics from previous periods. The authors must apply also the qualitative analysis of the economy. In our opinion, it should be crucial for the critical year 2009 forecast, but the qualitative analysis was probably underestimated. Forecasts cannot be based solely on statistics.

Estimated annual rate of inflation (or HICP) is made in relation to the expected growth rate of real output. The forecasts of the annual rate of inflation are more accurate than the growth rate of real output forecasts. Even here, however, is true that the prognosis accuracy decreased in connection with the recession of 2009.

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Annexes

Tab. 1: Real growth of the gross domestic product – Czech Republic (%)

year	2006	2007	2008	2009	2010	2011
CR reality	7	5,7	3,1	-4,7	2,7	1,8
MF CR minus 2	3,3	4	4,8	5,1	5,2	2,4
MF CR minus 1	4	5	5	4,8	0,3	2,3

Notes: MF CR minus 2 = forecast precedes reality 2 years, i.e. the forecast for 2010 was published on July 2008.

MF CR minus 1 = forecast precedes reality 1 year, i.e. the forecast for 2010 was published on July 2009.

Sources: Macroeconomic prediction, July of corresponding year

Tab. 2: Inflation rate – Czech Republic (%)

year	2006	2007	2008	2009	2010	2011
CR reality	2,5	2,8	6,3	1	1,5	1,9
MF CR minus 2	2,5	2,6	3	2,3	2,5	2,1
MF CR minus 1	2,2	2,8	3,4	2,9	1,1	3,5

Notes: see tab. 1

Sources: European economic forecast - autumn of corresponding year

Tab. 3: Real growth of the gross domestic product – France (%)

year	2006	2007	2008	2009	2010	2011
F reality	2,3	2,3	-0,1	-2,7	1,5	1,7
EC F minus 2	2,2	2,3	2,1	1,8	0,8	1,5
EC F minus 1	1,8	2,3	2	0	1,2	1,6

Notes: see tab. 1

Sources: European economic forecast – autumn of corresponding year

Tab. 4: Harmonised index of consumer prices – France (%)

Year	2006	2007	2008	2009	2010	2011
F reality	1,9	1,6	3,2	0,1	1,7	2,3
EC F minus 2	1,8	1,9	1,9	1,6	1,7	1,4
EC F minus 1	2,1	1,8	1,7	1,8	1,1	1,6

Notes: see tab. 1

Sources: European economic forecast – autumn of corresponding year

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