Central bank credibility: determinants and measurement
A cross-country study

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Abstract

This paper proposes a new measure of central bank credibility - the credibility index calculated on the basis of the key determinants of central bank credibility suggested in the literature. The index described in the present study is compiled for nine different countries: the Czech Republic, Hungary, Slovakia, Poland, Chile, Brazil, Turkey, United Kingdom and Sweden, for the years 1999-2007. Next, the results are cross-checked with other credibility measures based on inflation expectations of two groups of economic agents. The conducted analysis demonstrates that the credibility index may be considered a relevant and consistent credibility measure that, in addition to being time-variant, offers advantage of being fully comparable between countries.

Key words: central bank, monetary policy, credibility
JEL Classification: C22; D12; D84; E52; E5

1. Introduction

Central bank credibility has become a focal issue in the modern literature on monetary policy. This credibility is commonly defined as the ability of monetary authorities to manage inflation expectations of economic agents. Theoretical considerations lead to the conclusion that if inflation expectations of economic agents are high, the process of disinflation tends to be longer and more costly in terms of output loss. Hence, a central bank that can manage inflation expectations should be able to conduct a more effective monetary policy. However, this theoretical claim has proved to be difficult to verify empirically because of the fact that credibility is a qualitative concept, which does not lend itself readily to measuring. To solve this problem, the present study proposes a comprehensive index of central bank credibility with the aim to facilitate empirical work in that area.

To date, empirical studies attempting to measure central bank credibility have relied on one of the two approaches: either a quantification of credibility determinants (credibility creation approach) or quantification of credibility effects (credibility impact approach). The first method selects and quantifies a factor that, according to a commonly accepted view, influences central bank credibility. For instance, in a number of studies central bank independence was used as a proxy of credibility.

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However, such a measure may not be fully reliable because credibility, as a multidimensional phenomenon, may be influenced by many other determinants. Moreover, characteristics such as independence are relatively stable, in contrast to credibility, which is considered to change gradually in time.

According to the second approach, central bank credibility is measured on the basis of variables which are influenced by credibility. These variables include inflation expectations and long term interest rates. For some countries, especially less developed and transition economies, problems may arise with availability of data. To obtain reliable data on long-term interest rates, well-developed financial markets are needed, a condition that is not fulfilled in many countries. As far as inflation expectations are concerned, a possible heterogeneity of expectations of various groups of economic agents results in the need to make a decision whose expectations to analyze in this context.

This study makes use of the first of these approaches, the credibility creation approach, and encompasses the main determinants of central bank credibility. The remainder of the paper examines the components of the credibility index in detail, and is organized as follows. Section 2. provides an overview of the literature investigating the determinants of central bank credibility. Section 3. describes the detailed structure of the credibility index. Next, the section 4. presents compiled index values for the nine countries covered by the study and then proceeds to compare the obtained results (developed indices) with credibility measures that, by contrast, use the credibility-impact approach. Finally, the last section offers some conclusions.

2. Determinants of Central Bank Credibility

The construction of the credibility index is based on the quantification of the main determinants of the central bank credibility. In this study, results of a survey conducted by Blinder (2000) constituted a starting point to select the main characteristics that contribute to central bank credibility. In the survey, the respondents were invited to provide their opinions on how a central bank can build or create credibility. To achieve this aim, Blinder designed seven questions that specified factors believed to enhance credibility and then asked his respondents to rate those factors using a one-to-five scale. As the most significant features contributing to the credibility of a central bank the respondents indicated a history of honesty (a history of living up to its word), central bank independence and a history of fighting inflation. Not a much lower score was assigned to transparency of monetary policy was scored and a small fiscal deficit or debt. However, some factors that the theoretical literature and empirical studies consider important were omitted in the survey. Aiming to amend that, the present paper is addressing two additional factors: accountability of a central bank and a quality of institutions in a given country.

Transparency of monetary policy is regarded as a matter of great importance in the literature and in practice of modern central banking, in particular in the inflation targeting framework. The relationship between transparency and credibility was discussed in several important articles, including Cukierman and Meltzer (1986), Faust and Svensson (2001), Jensen (2002) and Geraats (2001). The general conclusion is that a higher degree of transparency is beneficial for central bank credibility. Transparency makes it easier for the private sector to infer the true intentions of the monetary policymakers. As such, transparency makes the expectations of the economic agents more sensitive to actions of the central bank. Hence, a central bank that cares about its reputation becomes less willing to create inflation surprises. As a result, the inflation bias is smaller.

The empirical verification of the relationship suggested by the theoretical literature is difficult because both concepts – transparency and credibility – are difficult to measure. However, the creation of some transparency indices (e.g. Fry et al. (2000), Chortareas et al. (2002), Eijffinger and Geraats (2006)) enabled studies concerning the relationship between transparency and other macroeconomic variables. Credibility was proxied by average inflation, inflation expectations (anchoring of inflation expectations), long-term interest rates and sacrifice ratio. A link between transparency and credibility is suggested by several studies, including Cecchetti and Krause (2002), Geraats et al. (2006), Levin et al. (2004), van der Cruisen and Demertzis (2005) and Gürkaynak et al. (2006).

The second feature, independence, is commonly regarded as one of the most important conditions for a central bank to be credible. Debate on this issue was initiated by the famous Rogoff's concept of the conservative central banker (Rogoff, (1985)). According to Rogoff's model, the appointment of an independent, conservative central banker should lead to a reduced inflation bias. However, the empirical studies were inconclusive in this matter and the results often contradicted intuition, a possible explanation being that the indices of independence were imperfect (independence *de jure* vs. independence *de facto*).[2] The beneficial role played by independence was evidenced by Alesina and Summers (1993), de Haan and Kooi (1997), Eijffinger et al. (1998). However, Fuhrer (1997) found no evidence for the "credibility bonus" of the independent central bank. No relationship between independence and credibility was found by Posen (1998), either. In his famous study he tested several hypotheses that could be empirically verified and found no evidence that greater independence leads to greater credibility. These results, apparently inconsistent with economic intuition, led some authors to formulate hypotheses about some other factors influencing the linkage between central bank independence and credibility (e.g. Hutchison and Walsh (1998), Posen (1993), Hayo (1998)).

Despite some puzzling results concerning the relationship between central bank independence and central bank credibility, it seems to be a commonly accepted view in macroeconomics that

[2] The most important independence measures were created by Bade and Parkin (1977), Grilli et al. (1991), Cukierman (1992), Alesina and Summers (1993), Cukierman and Webb (1995).

independence is an important condition for the central bank to be credible to economic agents. Consequently, independence has been included as a component of the credibility index.

Central bank transparency and independence are inseparably connected with central bank accountability. While academic considerations regarding accountability focus mainly on the role of institutions in democratic societies, they also lead to questions about a possible impact of accountability on monetary policy outcomes and credibility of monetary policymakers. If monetary policy is conducted by independent institution that is chaired by individuals who have not been elected in a democratic manner, such persons should be held accountable for their actions. Hence, accountability may be viewed as an important factor improving the quality of monetary policymaking. Accountability may be analyzed in the following three aspects: 1) decisions about the explicit definition and ranking of objectives of monetary policy; 2) transparency of actual monetary policy, and 3) question of who bears final responsibility with respect to monetary policy (Eijffinger, Hoeberichts, (2002)). A highly significant aspect of central bank accountability, transparency of monetary policy, has been discussed separately. At this point, it should only be mentioned that there is no common agreement on what scope of information the central bank should publish (e.g. Buiter (1999) vs. Issing (1999), Goodhart (2001) vs. Svensson (2002)).

With respect to the third aspect of accountability, the final responsibility for monetary policy, Eijffinger and Hoeberichts show that if the final responsibility shifts in the direction of the government, the inflation expectations increase. As a result, the credibility of monetary policy is lower. Nevertheless, it seems to be generally agreed that to legitimize the central banks actions some kind of democratic control over the central bank should be established. Most commonly, such control is implemented through the requirement to report or explain policy actions to the parliament or the government, but it is also possible to employ some forms of overriding mechanism or dismissal procedures for the central bank governor.

A history of honesty has been interpreted in this paper as the conducted policy being in accordance with announced goals of monetary policy. This is the most intuitive way of gaining credibility. If the central bank sets inflation targets, to pursue and achieve them in a consistent manner is but a natural way leading to anchoring inflation expectations in the inflation target. A history of honesty has been ranked first by both central bankers and academics in the Blinder's survey concerning ways of building credibility. Another factor ranked high in that survey, a history of fighting inflation, may seem very close to a history of having successfully achieved inflation targets. In practice, in many countries it may be virtually the same, but conceptually these two issues should be distinguished. The importance of low past inflation for building credibility is stressed in the early theoretical literature. Past inflation record is the key issue in reputation models (e.g. Barro and Gordon (1983), Backus and Driffil (1985)).

The credibility determinants discussed above are directly connected with the institutional arrangements concerning the central bank or related to the way, in which monetary policy is conducted or. Still, there may be other factors that influence credibility of monetary policy, but they are beyond the central bank's direct control. Two such factors have been included in the study: the public debt and the quality of institutions in a given country. There is ample literature investigating the link between public debt and inflation, following the discussion initialized by the famous "unpleasant monetarist arithmetic" by Sargent and Wallace (1981). The authors demonstrate that in the environment marked by fiscal dominance and high public debt, the monetary authorities eventually lose control over inflation. Inflationary pressures caused by high debt undermine credibility of monetary policy. On the other hand, Reinhart and Sack (2000) argue that low public debt should help keep the inflation expectations low.

Finally, the way the central bank in a given country and its ability to fulfill its tasks (translating to its credibility) is perceived may be biased by the perceived overall quality of institutions in that country. If the country's institutions generally lack quality, the people are more likely to expect that the central bank would also be ineffective in its actions. In this study, as in some other empirical studies, the quality of institutions was expressed by a country risk rating. Country risk measure was used, for instance, Calderón et. al (2003) as a proxy for credibility of macroeconomic policies.

3. The Index for Central Bank Credibility

This section describes the construction of the credibility index employing the aforesaid credibility determinants. The credibility index ranges from 0 to 100, where 0 means no credibility and 100 full credibility. It consists of seven parts (sub-indices) and each sub-index is based on one of the determinants of credibility described in the previous section. Each of the composite factors has been quantified in such a manner that it also ranges from 0 to 100. In the following subsections the construction of the index is described in details.

3.1. Achievement of Announced Monetary Policy Targets

In the Blinder's survey, respondents identified a history of "doing what the central bank said it would do" as the main factor contributing to the central bank's credibility. In cases where publicly announced monetary polity targets exist this factor may be assessed by the degree to which the targets have been achieved. In this study, the assessment has been made twofold:

- as the scope of time in which target variable (inflation) remained within announced target boundaries, and
- as the size of deviations of inflation from target.

The reason for assessing the meeting of targets in such a way is the fact that central banks may set inflation targets in various manners. Naturally, in terms of credibility, it is important how often the central bank has achieved its targets. But it also seems to matter for credibility whether inflation targets were missed with a wide target range (e.g. in Brazil) or with a point target (initially in Chile). Moreover, it is rather larger deviations of inflation from target than smaller ones that are likely to have a greater impact on credibility.

The scope of time in which inflation targets were met is expressed as the percentage of months in the year in which inflation remained within the target bounds. In cases where there were only short-term inflation targets set for the end of subsequent years, the targets have been interpolated to obtain target values for each month.[3] If the short-term targets were subject to change during a year, 25% of the index value have been subtracted in order for possible negative impact of such occurrences on central bank credibility to be taken into account.[4]

The second element in the assessment of accuracy in hitting inflation targets is the size of deviations of inflation from target. To be incorporated in the credibility index, the deviations are transformed with the use of the following formula:

[1.] $\frac{100}{e^{0.5|\inf - tar|}}$,

where inf stands for inflation and tar for target set for the corresponding period.[5]

The transformation is designed in such a way, that, for inflation on the target level, the sub-index amounts to 100, which is the maximum value. When the deviations of inflation from target increase, the function converges non-linearly to 0. Because the function is non-linear, for the deviations of inflation from target amounting to 1.5 p.p., the value of the formula decreases approximately by half, while, for the deviations of approx. 10 p.p. the value returned by the formula is virtually zero.[6]

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[3] With regard to variety of solutions within the inflation targeting framework in various countries the method of calculating the index has been adapted to these individual solutions. For instance, in Chile point inflation targets have been set for some years. In this study, the target was considered to be met if inflation did not deviate from the target by more than +/- 0.2 p.p. In Turkey for the most of the period under consideration the target was unsymmetrical, so the target was considered to be met if inflation was below target. In Slovakia targets were set for several inflation indices: CPI for the end of the year, yearly average CPI and net inflation. In order to obtain monthly targets the following transformation has been adopted: $tar_i=ai^2+bi+c$, where $c=tar_0$ and $\frac{1}{12}\sum_{i=1}^{12} tar_i = \bar{tar}_{12}$ (where tar_i- target for the ith month of year, tar_0 – target for the end of the previous year, tar_{12} – target for the average yearly inflation).

[4] It was the case in Slovakia in 2000, Poland in 1999 and 2002, Brazil in 2003 (inflation target changes), and Hungary in 2003 (exchange rate target change).

[5] A similar formula was used by Kia and Patron (2004) to measure the transparency of the U.S. monetary policy.

[6] In the case of Hungary the deviations from target were calculated only for inflation targets although the target were set also for exchange rate. The first inflation target was set for 2001 r. However, the exchange rate policy, including exchange rate targets, were shaped in such a manner to achieve preferred inflation rate. In this study it has been assumed that this preferred inflation rate was inflation rate foreseen in budget plan. These values were used for calculation for the years in which no explicit inflation targets were set.

The two discussed elements taken into account while assessing realization of targets by central banks are included with equal weights. Hence the first part of credibility index may be presented as the following function:

$$[2.]\ CI_1 = 0.5 \cdot (\%\, of\ time) + 0.5 \cdot \frac{100}{e^{0.5|\inf - tar|}}.$$

3.2. Past Inflation Performance

The past inflation record is undoubtedly one of the most important factors that influence central bank credibility. The monetary authorities who are capable of conducting disinflation successfully or of stabilizing inflation at low levels will probably enjoy higher credibility. Nevertheless, inflation is driven not only by domestic factors. Therefore, to allow for price changes on the global markets without affecting the credibility index, past inflation rates have been expressed in the index in relation to inflation in developed countries, where inflation is relatively low and stable.

Thus the second sub-index of the credibility measure has the following form:

$$[3.]\ CI_2 = \begin{cases} 0 & for\ \overline{\pi}_t \geq 20\% \\ 100 - \dfrac{100}{20 - \overline{\pi}_t^{devel}}(\overline{\pi}_t - \overline{\pi}_t^{devel}) & for\ \overline{\pi}_t^{devel} < \overline{\pi}_t < 20\% \\ 100 & for\ \overline{\pi}_t \leq \overline{\pi}_t^{devel} \end{cases}$$

where: $\overline{\pi}_t$ denotes the average inflation in a given country during the past three years and $\overline{\pi}_t^{devel}$ - the average inflation rate in developed countries during the past three years.

The sub-index CI_2 amounts to 0, if the average inflation during past three years exceeded 20%, and to 100, if the average inflation was lower than average inflation during the past three years in developed countries. In other cases the credibility depends on the difference between average past inflation in the given country and average past inflation in developed countries – the higher the difference is, the lower the credibility index. At the same time it is assumed that a higher rate in the average inflation in developed countries will result in a stronger impact of the inflation difference on credibility. A function of this form designed to assess central bank credibility was used by Cecchetti and Krause (2000). In their study inflation expectations were used instead of country-specific past inflation while inflation target was used in place of past inflation in developed countries. They also assumed that with inflation expectations higher than 20% the central bank has no credibility.[7]

[7] The authors assumed that inflation expectations were equal to average inflation during past 5 years.

3.3. Transparency of Monetary Policy

The next item to include in the credibility index advocated in the present study is transparency of monetary policy. As mentioned before, transparency is regarded as a major factor contributing to central bank credibility. For this reason, it has become a focal point for inflation targeting strategies recently implemented by a considerable number of central banks. Transparency of monetary policy, just like credibility, is a qualitative characteristic, and thus one which is not easy measure. Despite this difficulty, some transparency indices have been designed and are now well-established in the literature (for instance indices proposed by Fry et al. (2000), Chortareas et al. (2002), Eijffinger and Geraats (2006)). In this study transparency is quantified with the use of the index proposed by Fry et al. (2000). It is a comprehensive index, capturing all important aspects of credibility. Moreover, the same authors invented also independence and accountability indices used in this study, the implication being that these measures should be relatively consistent.

With respect to the credibility index it is assumed that its respective components would be time-variant. For this reason, separate transparency indices have been compiled for each country on an annual basis. The questionnaire used to calculate the index is presented in Annex 1. and the index values for each country from the sample in Annex 2.

Hence the third component of the credibility index is being rendered as follows:
[4.] CI_3= *transparency index.*

3.4. Central Bank Independence

Central bank independence is another characteristic that has profound effects on credibility, according to the view prevalent in the economic. As is the case with transparency, independence has been quantified using the method developed by Fry et al. (2000).

[5.] CI_4= *independence index.*

The independence measure has a form of an index and is based on answers to a specific questionnaire. It has also been computed separately for each year. However, the independence index proved much more stable than the transparency index, for most countries in the sample guaranteed the central banks formal independence before 1999. It should be noted that the independence index measures the independence *de jure* while there might be some more significant changes in the independence *de facto*. The independence *de facto* is much more difficult to measure, so the most known and widely used independence indices measure the independence *de jure*.
The questionnaire used to calculate the independence index is presented in Annex 1. and country-specific values are presented in Annex 2.

3.5. Central Bank Accountability

The feature that is strongly linked to the central bank's transparency and independence is the bank's accountability. The reason for implementing means to enhance transparency and accountability is the widespread belief that independent institutions in democratic societies need some form of democratic control.

As already mentioned, central bank accountability is quantified with the use of the accountability index constructed by Fry et al. (2000). However, the original index has been modified slightly, since there was one area on which it was found to overlap with the independence index. Specifically, both the independence index and the original accountability index intended to capture the role of the government in setting the inflation target. The government's participation in deciding the inflation target lowers independence but increases accountability. It may be argued that central bank credibility, particularly in less developed countries, tends to be enhanced when it is only the central bank that sets inflation targets. Consequently, the accountability index has been modified to remove that issue from the scope of the index. The relevant questionnaire and index values are presented in Annex 1. and 2. respectively.

[6.] CI_5 = *accountability index.*

3.6. Country Risk

The country-specific risk may be partially associated with how institutions are perceived in a given country. The assessment of the overall quality of institutions has an additional effect on the perception of the quality of monetary policy, and thus has an important bearing on central bank credibility. This view is reflected in a number of studies, in which central bank credibility (or broadly speaking – credibility of macroeconomic policies) is proxied with a measure of country risk. Similarly, this study has also included such a measure, namely the country risk rating published twice a year by Euromoney. The country risk sub-index for a given country amounts to the average score obtained by this country in a given year.

[7.] CI_6 = *average score in country risk rating.*

3.7. Public Debt

Finally, the last component of the credibility index is a sub-index for public debt. As already pointed out, the larger public debt grows, the higher expectations for future inflation are or, in other words, the lower the perceived ability of the central bank to control inflation, resulting in central bank's loosing some of its credibility. Since credibility is negatively correlated to the value of the public debt figure, the following formula is used to secure the relationship and transform it in such a way that the sub-index falls within the range from 0 to 100:

$$[8.]\ CI_7 = \begin{cases} 0 & if \quad \frac{debt}{GDP} \cdot 100 > 100 \\ 100 \cdot (1 - \frac{debt}{GDP}) \cdot \frac{10}{7} & if \quad 30 \le \frac{debt}{GDP} \cdot 100 \le 100 \\ 100 & if \quad \frac{debt}{GDP} \cdot 100 < 30 \end{cases}$$

where *debt* stands for the general government debt.

While designing the sub-index, it was assumed that a level of public debt lower than 30% of GDP does not harm the central bank's credibility. In contrast, a level of public debt higher than 100% of GDP is assumed to be so significant that the sub-index is equal to zero. For the public debt in ranges from 30% to 100% of GDP the credibility depends linearly on debt.

3.8. The Weights

The credibility index presented in this study consists of seven sub-indices. However, the seven determinants of credibility reflected by the sub-indices may influence credibility with different strength. Hence the weights on respective sub-indices have been differentiated accordingly. The strength with which the particular attribute affects credibility has been proxied by the average score of the attribute given by the respondents in Blinder's survey. The scores given by central bankers have been adopted as a basic variant. The weight of each sub-index is the relation of the average score of the given factor to the sum of the average scores of all factors considered. Since Blinder's survey fail to include central bank accountability and country risk an assumption has been made that the weight of accountability is equal to the weight of transparency of monetary policy while the weight of country risk is equal to the weight of public debt. All the weights sum up to unity.

$$[9.]\ CI = 0.16 \cdot CI_1 + 0.14 \cdot CI_2 + 0.14 \cdot CI_3 + 0.154 \cdot CI_4 + 0.14 \cdot CI_5 + 0.133 \cdot CI_6 + 0.133 \cdot CI_7$$

In order to check the sensitivity of the index to a change of the weight system, four alternative weight systems have been adopted:

– variant I – calculated with the assumption that monetary policy outcomes are more important for central bank credibility;

$$[10.]\ CI = 0.25 \cdot CI_1 + 0.25 \cdot CI_2 + 0.1 \cdot CI_3 + 0.1 \cdot CI_4 + 0.1 \cdot CI_5 + 0.1 \cdot CI_6 + 0.1 \cdot CI_7$$

– variant II – equal weights;

$$[11.]\ CI = \frac{1}{7} \cdot CI_1 + \frac{1}{7} \cdot CI_2 + \frac{1}{7} \cdot CI_3 + \frac{1}{7} \cdot CI_4 + \frac{1}{7} \cdot CI_5 + \frac{1}{7} \cdot CI_6 + \frac{1}{7} \cdot CI_7$$

– variant III – calculated with the assumption that the institutional aspects (independence, transparency and accountability) are relatively more important for credibility;

$$[12.]\ CI = 0.1 \cdot CI_1 + 0.1 \cdot CI_2 + 0.2 \cdot CI_3 + 0.2 \cdot CI_4 + 0.2 \cdot CI_5 + 0.1 \cdot CI_6 + 0.1 \cdot CI_7$$

– variant IV – calculated on the basis of the average scores of academic economists in Blinder's survey.[8]

[13.] $CI = 0.17 \cdot CI_1 + 0.15 \cdot CI_2 + 0.13 \cdot CI_3 + 0.16 \cdot CI_4 + 0.13 \cdot CI_5 + 0.13 \cdot CI_6 + 0.13 \cdot CI_7$

Table 1. presents some basic statistics obtained for the credibility index calculated with different weight variants.

Table 1. Comparison of credibility indices obtained with various weight variants[9]

Country	Average index value	Standard deviation	Minimum	Maximum	Rank according to the average value
Basic variant					
Poland	71.14	7.90	59.68	84.18	5
Czech Republic	77.95	7.63	65.73	87.01	4
Hungary	69.88	5.79	60.38	78.15	7
Slovakia	70.99	6.12	61.62	81.67	6
Chile	81.11	4.81	71.79	85.98	3
Brazil	66.73	6.26	57.91	77.23	8
Turkey	53.77	12.81	35.18	68.70	9
UK	91.87	0.68	90.84	92.56	1
Sweden	88.13	5.54	80.03	94.11	2
Variant I					
Poland	66.62	12.09	49.41	85.86	7
Czech Republic	74.76	10.93	56.35	87.63	4
Hungary	67.75	7.83	56.03	79.96	5
Slovakia	67.12	7.56	56.67	81.32	6
Chile	80.15	7.16	66.94	87.65	3
Brazil	64.66	8.95	51.90	78.02	8
Turkey	45.63	14.64	24.99	62.55	9
UK	93.17	0.76	91.77	93.84	1
Sweden	86.08	7.95	76.08	94.06	2
Variant II					
Poland	71.57	7.60	60.23	83.93	5
Czech Republic	78.51	7.25	66.91	87.06	4
Hungary	69.61	5.79	59.49	77.51	7
Slovakia	71.27	6.02	62.10	81.65	6
Chile	81.49	4.49	72.63	86.01	3
Brazil	66.91	5.89	58.79	77.23	8
Turkey	53.36	12.46	35.70	68.83	9
UK	92.04	0.70	91.01	92.74	1
Sweden	88.42	5.13	80.61	94.20	2
Variant III					
Poland	74.67	6.40	64.87	85.04	5
Czech Republic	80.09	6.05	71.13	87.22	4
Hungary	72.11	5.67	61.56	79.08	7
Slovakia	73.81	4.92	65.98	81.50	6
Chile	82.10	3.60	74.52	85.61	3
Brazil	71.52	4.09	66.30	78.76	8
Turkey	60.63	13.55	38.83	75.62	9
UK	91.94	0.55	90.89	92.48	1
Sweden	91.62	3.69	85.70	95.71	2

Source: Own calculation

As can be easily observed, the ranking of the countries according to average credibility index in the period 1999-2007 is the same in three out of four variants (including the basic variant). Only the

[8] The differences between the results with this variant of weights and the results with the basic variant of weights were so small that this variant has been excluded from the further analysis.

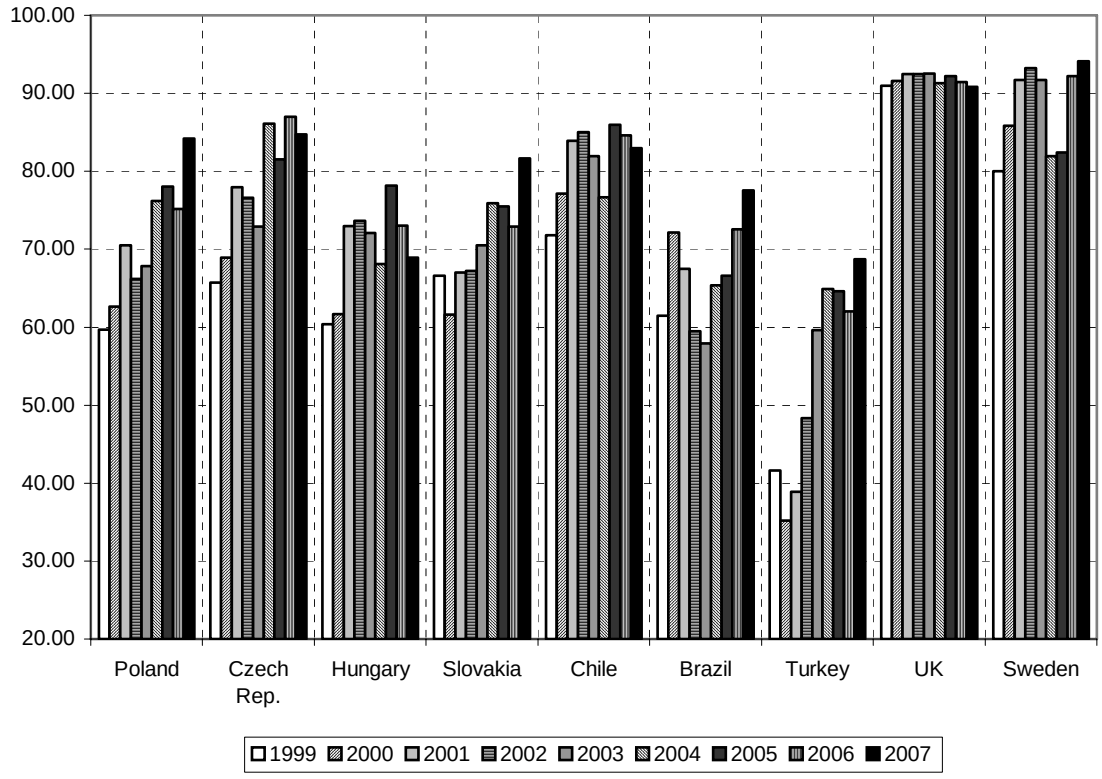
[9] Statistics computed for the index values in years 1999-2007.

ranking according to the first alternative variant varies slightly from the other ranking results – Poland and Hungary swapped places in relation to all the other rankings. This variant is also characterized by a higher dispersion. A more detailed analysis (not reported in this paper) proved that the index is sensitive to a change of weights only to a very limited extend.

4. Credibility Index – Results

The results of the compiled credibility index for the nine countries in the period 1999-2007 are presented in the Figure 1. The detailed results, with the values of sub-indices for each year, are shown in Annex 2.

Figure 1. Credibility index values



Source: Own preparation

On the basis of the presented results it may be stated that the credibility expressed by the credibility index generally increased in the period under consideration in the analyzed countries. The most significant change between the year 1999 and 2007 was recorded for the Central Bank of Turkey, whereas the most stable index values were noted for the Bank of England. During the most of the analyzed period, the Bank of England was the most credible central bank in the sample. However, the Riksbank managed to seize the lead in the last two years covered by the study. The least credible central banks in 2007 were the Central Bank of Turkey and the National Bank of Hungary which

obtained very similar results. As far as the respective components of the credibility index are concerned, an increase in credibility was caused mainly by three factors: past inflation, effectiveness in hitting inflation targets and transparency of monetary policy. On average, the Bank of England was most successful in meeting its inflation targets, while least effective was the National Bank of Poland. However, NBP in line with the Czech National Bank made the greatest progress in this respect between the years 1999 and 2007. Also, these two central banks lowered inflation to the lowest levels (apart from the Bank of England and the Riksbank, which had lowest inflation rates during this period). At the end of this period, the highest inflation was in Turkey.

A significant increase could be noted in transparency of monetary policy in the analyzed countries. All the central banks in the sample improved their transparency in this period. In the year 2007, judging by the transparency index, the Riksbank and the Central Bank of Chile were most transparent. Not too far behind came the Bank of England. However, the most significant improvement was made by the Central Bank of Turkey. The most considerable improvement was achieved in the aspect of transparency concerning publication of macroeconomic forecast and forward-looking analyses. The National Bank of Slovakia was the least transparent central bank within the sample.

The other factors changed to a considerably lesser extent. Central bank independence did not change much because by 1999 most of the central banks in the sample had already implemented the most important reforms in this field. None of the central banks had full independence, according to the independence index, yet they had a high degree of independence. In 2007, the Central Bank of Brazil was least independent, whereas the Riskbank was most independent. Also, the NBP, the CNB and the NBS were granted a high degree of formal independence.

Accountability was the factor that was least variable during the analyzed period. All the central banks announced numerical policy targets and all were subject to some form of parliamentary or governmental monitoring. The only difference between the countries could be noticed in the existence of formal procedures to be executed if targets were missed. Such procedures existed in the four countries, i.e. in Brazil, Sweden, Turkey, and UK.

Also, only slight changes were noted in the factors exogenous to monetary policy. From 1999, country risk fell in all the countries from the sample. On average, the lowest risk was associated with Sweden and UK while it was highest in Turkey and Brazil. The most considerable progress in this field was made by Slovakia. From 1999 to 2007, public debt increased in two countries: Poland and Hungary. Hungary and Turkey were the countries with the largest debt. The least indebted countries were the Czech Republic, Slovakia and Chile.

The summary of the aforementioned results, i.e. the rankings of the analyzed countries regarding the respective sub-indices of the credibility index, is presented in Table 2. The ratings apply to the year 2007.

Table 2. Ranking of countries according to respective sub-indices in year 2007

	Target realization	Past inflation	Transparency	Independence	Accountability	Country risk	Public debt
Poland	3	1	3	2	2	6	5
Czech Rep.	6	2	4	2	2	3	1
Hungary	9	4	5	4	2	4	7
Slovakia	5	5	8	3	2	7	1
Chile	7	3	1	6	2	5	1
Brazil	4	6	7	8	1	8	4
Turkey	8	7	6	5	1	9	6
UK	1	1	2	7	1	1	3
Sweden	2	1	1	1	1	2	2

Source: Own calculation

4.1. Comparison with Other Measures of Central Bank Credibility

In order to check the correctness of the proposed index, the obtained values of the credibility index have been compared to results obtained using other credibility measures. In the literature there are suggested credibility measures based on inflation expectations of economic agents. Credibility measures based on inflation expectations are calculated with the use of quite a different set of variables from those employed in the proposed credibility index, so it seemed interesting to compare their results. Two measures based on inflation expectations suggested in the theoretical literature have been calculated:

– the deviations of inflation expectations from inflation target (e.g. Faust and Svensson (2001)),
– the weight of inflation target in formation of inflation expectations (e.g. Bomfim and Rudebusch (2000)).

Inflation expectations may be different depending on the analyzed group of agents. For this reason, the above mentioned measures have been calculated for two groups of agents: financial analysts and consumers. However, the data are not homogeneous for all the countries, so it complicates conclusions to some extent. Moreover, the data on consumer inflation expectations are not available for some countries. The description of the data is presented in Annex 3.

4.1.1. The credibility index and the deviations of inflation expectations from the inflation target

The comparison of credibility index and the deviations of inflation expectations from the inflation target is based on correlations between these two credibility measures. Since the number of observations was low for the respective countries, the correlations have been calculated jointly for all the countries. The deviations of inflation expectations from the inflation target may be computed in several ways. In this study the following deviation measures have been used:

– the absolute deviations of inflation expectations from the inflation target (yearly average) – as the simplest credibility measure, consistent with definition of credibility,
– the absolute deviations of inflation expectations from the inflation target relative to the target (yearly average) – a measure used to facilitate the comparison between individual countries,
– the absolute deviations of inflation expectations, smoothened by the Hodrick-Prescott filter, from the inflation target (yearly average) – a measure used because in the case of a few countries there were only available short-term inflation expectations which may be sensitive to transitory shocks,
– the absolute deviations of inflation expectations, smoothened by the Hodrick-Prescott filter, from the inflation target relative to the target (yearly average).

All the deviations have been calculated from the center of the target range.

The Table 3. presents the correlation of the credibility index with all the above-listed measures of deviations of inflation expectations of two groups of agents from the inflation target. The study considered only inflation targets that were known at the time of forming the inflation expectations and that were set for the time horizon for which the expectations were formed.

Table 3. Correlations of credibility index with respective measures of deviations of inflation expectations from inflation target

Deviation measure	Group of agents	
	Analysts	Consumers*
Dev.	-0.63***	-0.57***
Prob.	0.00	0.00
Dev./tar.	-0.60***	-0.42***
Prob.	0.00	0.01
Dev. HP	-0.70***	-0.49***
Prob.	0.00	0.00
Dev. HP/tar	-0.67***	-0.49***
Prob.	0.00	0.00
Number of observations	63	42

*In the case of consumers only data for European countries from the sample were available so the number of observations is lower.
Note: Dev. - absolute deviations of inflation expectations from the inflation target, Dev./tar. - absolute deviations of inflation expectations from the inflation target relative to the target, Dev. HP - absolute deviations of inflation expectations, smoothened by Hodrick-Prescott filter, from the inflation target, Dev. HP/tar. - absolute deviations of inflation expectations, smoothened by Hodrick-Prescott filter, from the inflation target relative to the target; *** significant at 1% level

Source: Own calculations

The results show that the correlation between the credibility index and the deviations of inflation expectations from the inflation target is strong, negative and statistically significant. It should be noted that the correlation is stronger in the case of expectations of financial analysts than it is in the case of consumer expectations. However, all the results obtained confirm a significant relationship. The smaller the deviations of inflation expectations from the inflation target are, indicating higher

credibility, the higher the credibility index is.[10] The results suggest that the analyzed credibility measures are consistent.

4.1.2. The credibility index and the weight attached to the inflation target in formation of inflation expectations by economic agents

The theoretical considerations suggest that the higher central bank credibility is, the more the economic agents should be convinced that the announced inflation target would be met. Consequently, the weight of inflation target in forming inflation expectations should be higher. In order to assess the weight of inflation target, the following equations of inflation expectations have been estimated:

[14.] $\pi^{e}_{T|t} = a_1 \cdot \pi^{tar}_{T} + a_2 \cdot \pi^{0}_{t} + a_3 \cdot gap_{t-2} + a_4 \cdot \Delta e_t$ [11]

where $\pi^{e}_{T|t}$ stands for inflation expectations formed at time *t* for period *T*, π^{tar}_{T} – inflation target for period *T*, known at the moment of forming expectations, π^{0}_{t} – inflation rate known at time *t*, gap_{t-2} – unemployment gap at time *t-2*[12], Δe_t – nominal exchange rate percentage change[13].

[15.] $\pi^{e}_{T|t} = \lambda \cdot \pi^{tar}_{T} + (1-\lambda) \cdot \pi^{0}_{t}$.

As in the previous case, the inflation expectations of the two groups of agents, financial analysts and consumers, have been used. In this case, the credibility measure to be compared with the credibility index is the coefficient on the inflation target in estimated equations. An increase in the coefficient value can be interpreted as an increase in credibility. Additionally, the coefficient on past inflation may be observed. A decrease in the coefficient value indicates that the expectations become less adaptive, which may also be a sign of higher credibility.

In order to allow for a change in the coefficients, the equations have been estimated using the 36-months rolling window regressions. The results are presented below:[14]

I. Results of estimation of Equation [14.]

[10] In order to verify the robustness of the results, apart from the Pearson correlation coefficient (which assumes the linear relationship), the Spearman rang correlation coefficient has been calculated (not reported in this paper). The results for the financial analysts expectations were very similar to those obtained in the case of the Pearson correlation. The Spearman rang correlation was lower than the Pearson correlation in the case of consumer inflation expectations, however still quite high. Only with respect to the last deviations measure the correlation was not significant statistically.

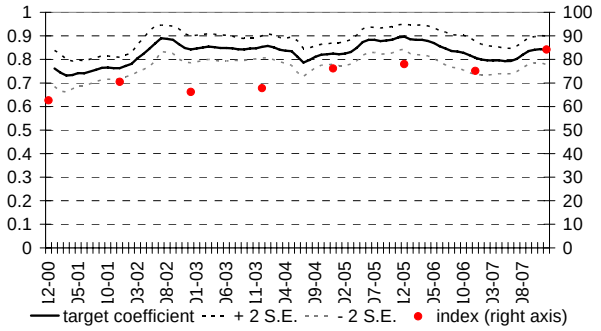
[11] Such specification of inflation expectations equation was used by Bevilaqua et al. (2007) in their study for Brazil.

[12] The unemployment gap was calculated using the Hodrick-Prescott filter. Only in the case of Brazil the equation was estimated with the output gap, because of the lack of consistent data for unemployment in the whole period. The output gap was calculated by filtering the output data with the Hodrick-Prescott filter.

[13] In order to avoid excessive volatility, the nominal exchange rate percentage change during 6 months has been calculated. In the case of European countries (except for UK) the exchange rate of euro to domestic currency was used while in the case of the remaining countries – the U.S. dollar exchange rate.

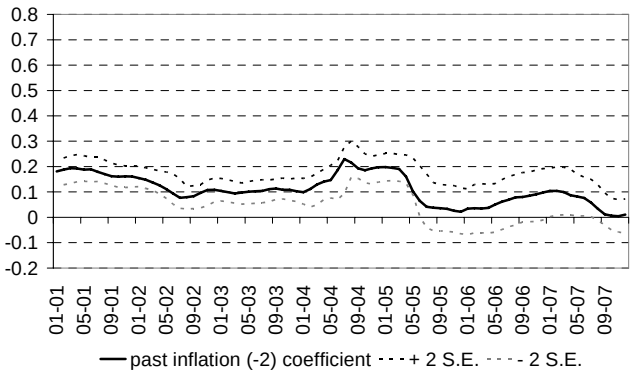
[14] The figures represent an estimated coefficient and a band of +/-2 S.E. The coefficient on inflation target is compared to the credibility index in corresponding time period.

Figure 2. Coefficient by inflation target in equation of analysts' inflation expectations in Poland



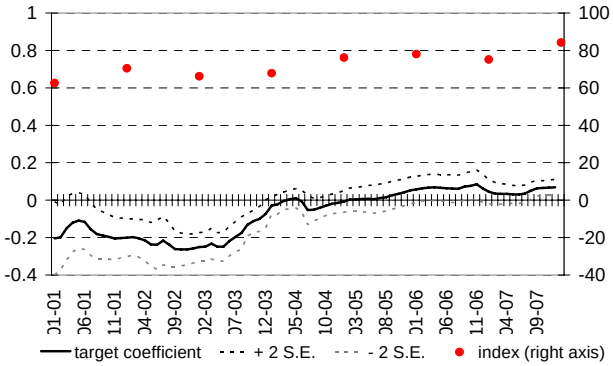
Source: Own calculations

Figure 3. Coefficient by past inflation in equation of analysts' inflation expectations in Poland



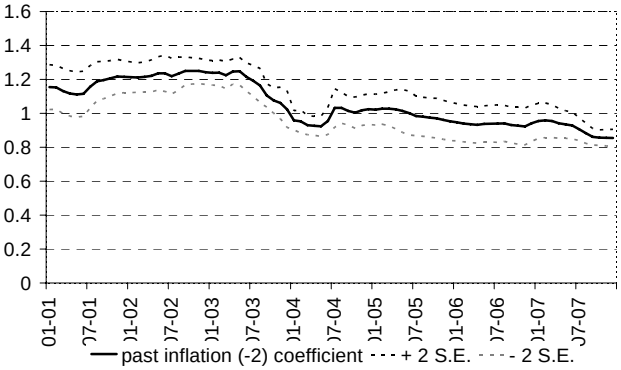
Source: Own calculations

Figure 4. Coefficient by inflation target in equation of consumers' inflation expectations in Poland



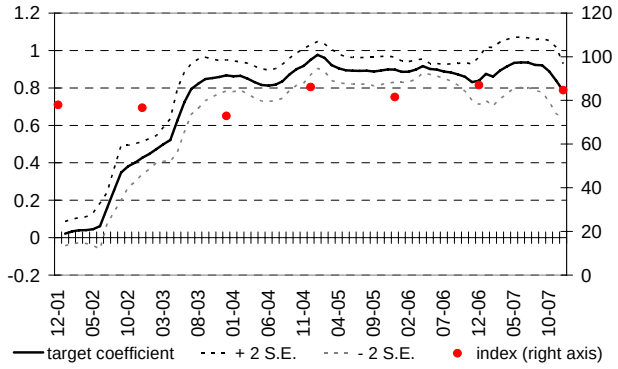
Source: Own calculations

Figure 5. Coefficient by past inflation in equation of consumers' inflation expectations in Poland



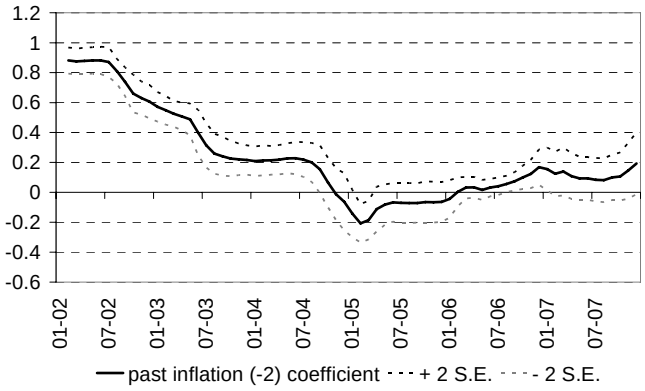
Source: Own calculations

Figure 6. Coefficient by inflation target in equation of analysts' inflation expectations in the Czech Rep.



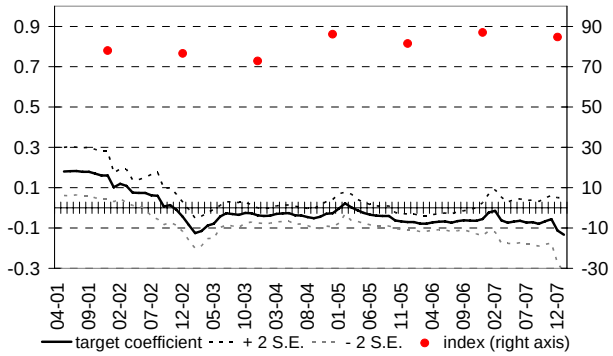
Source: Own calculations

Figure 7. Coefficient by past inflation in equation of analysts' inflation expectations in the Czech Rep.



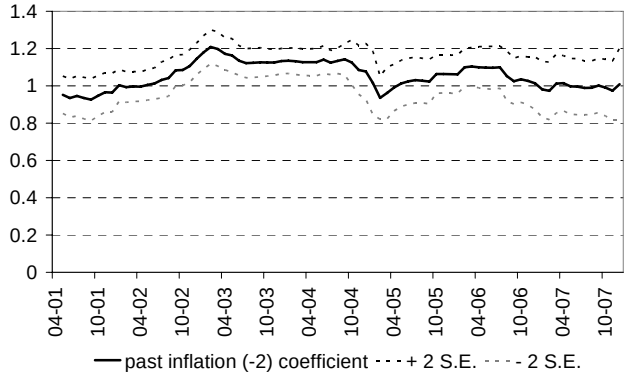
Source: Own calculations

Figure 8. Coefficient by inflation target in equation of consumers' inflation expectations in the Czech Rep.



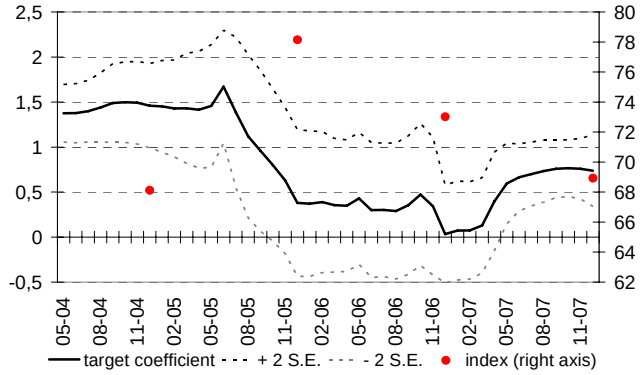
Source: Own calculations

Figure 9. Coefficient by past inflation in equation of consumers' inflation expectations in the Czech Rep.



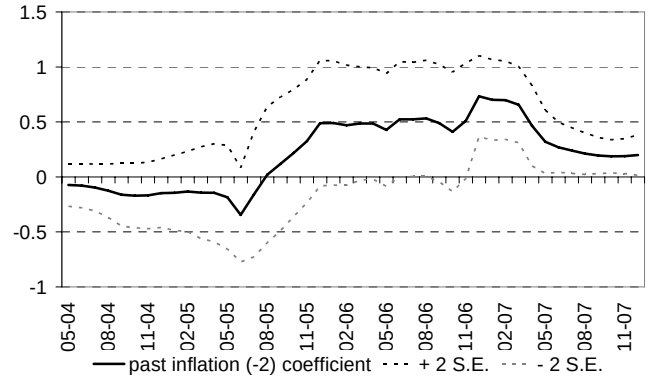
Source: Own calculations

Figure 10. Coefficient by inflation target in equation of analysts' inflation expectations in Hungary



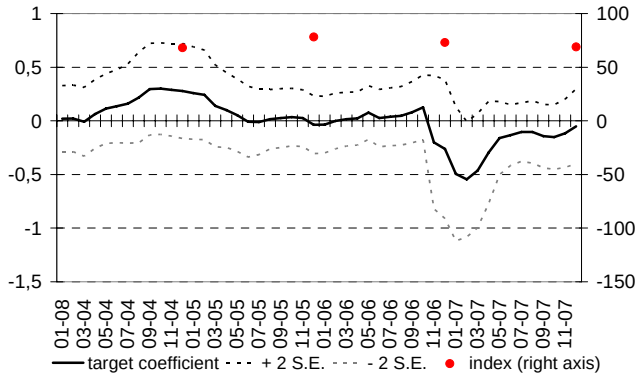
Source: Own calculations

Figure 11. Coefficient by past inflation in equation of analysts' inflation expectations in Hungary



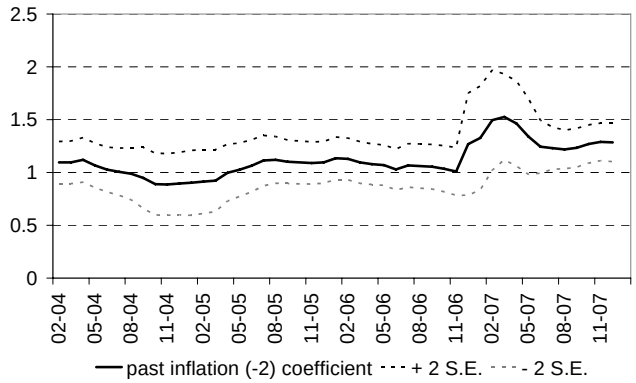
Source: Own calculations

Figure 12. Coefficient by inflation target in equation of consumers' inflation expectations in Hungary



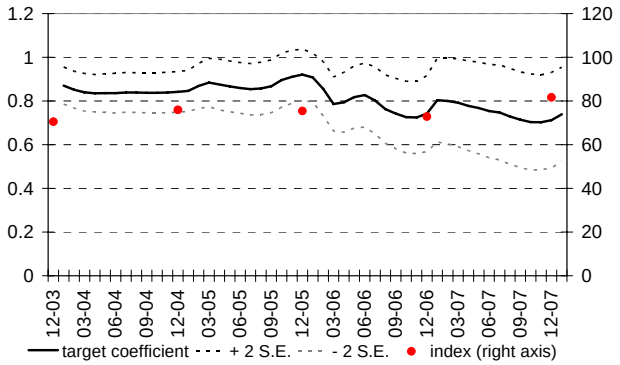
Source: Own calculations

Figure 13. Coefficient by past inflation in equation of consumers' inflation expectations in Hungary



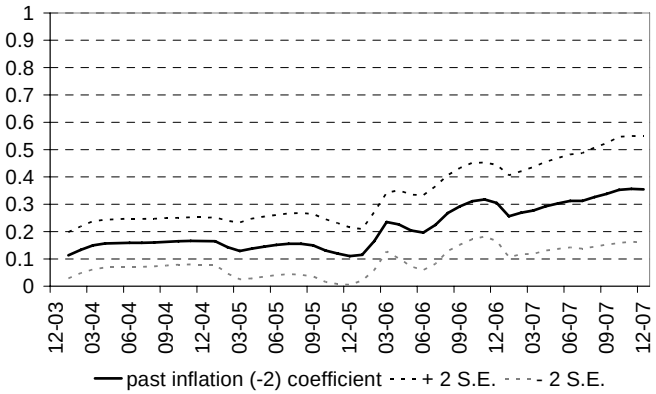
Source: Own calculations

Figure 14. Coefficient by inflation target in equation of analysts' inflation expectations in Slovakia



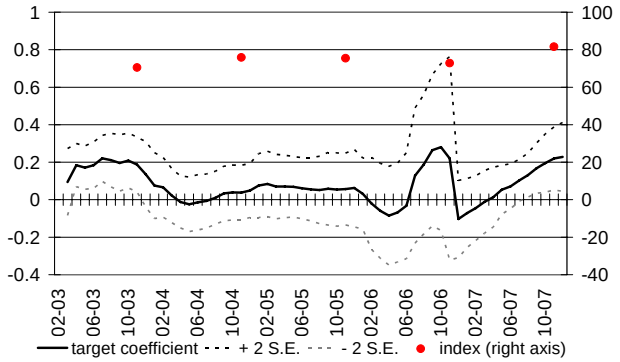
Source: Own calculations

Figure 15. Coefficient by past inflation in equation of analysts' inflation expectations in Slovakia



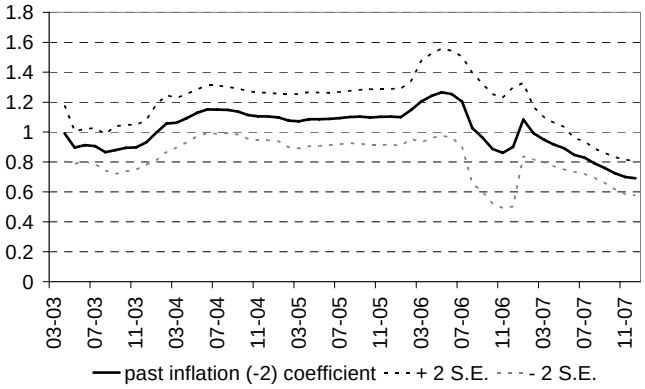
Source: Own calculations

Figure 16. Coefficient by inflation target in equation of consumers' inflation expectations in Slovakia



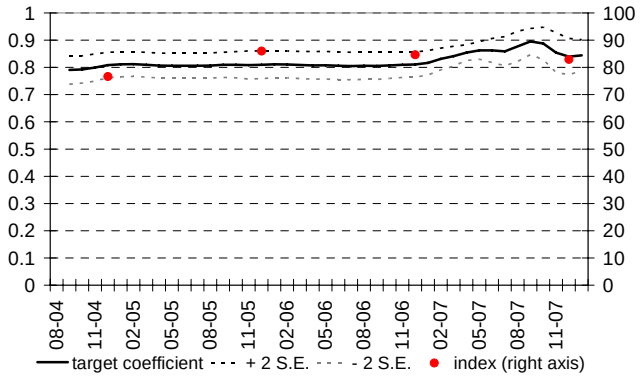
Source: Own calculations

Figure 17. Coefficient by past inflation in equation of consumers' inflation expectations in Slovakia



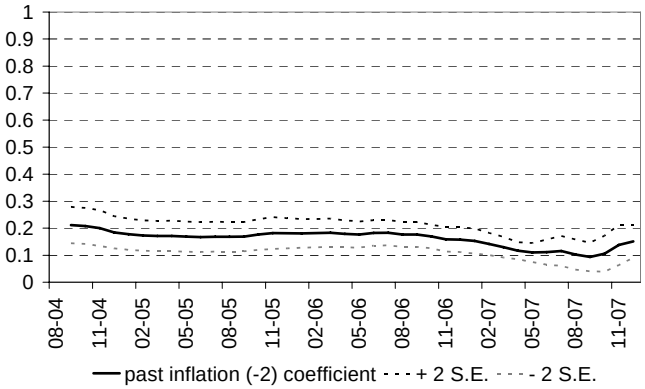
Source: Own calculations

Figure 18. Coefficient by inflation target in equation of analysts' inflation expectations in Chile



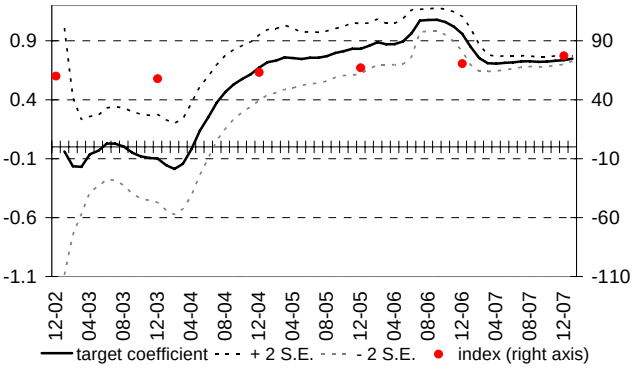
Source: Own calculations

Figure 19. Coefficient by past inflation in equation of analysts' inflation expectations in Chile



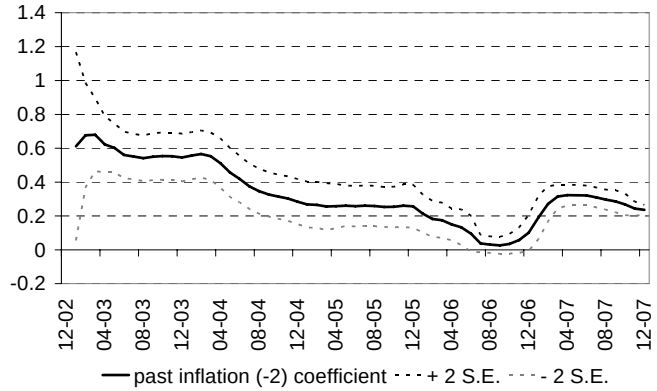
Source: Own calculations

Figure 20. Coefficient by inflation target in equation of analysts' inflation expectations in Brazil



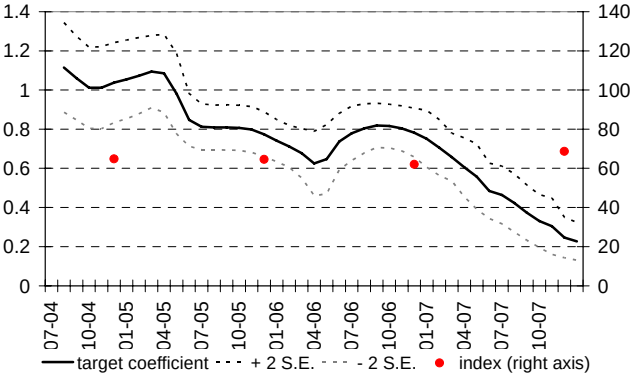
Source: Own calculations

Figure 21. Coefficient by past inflation in equation of analysts' inflation expectations in Brazil



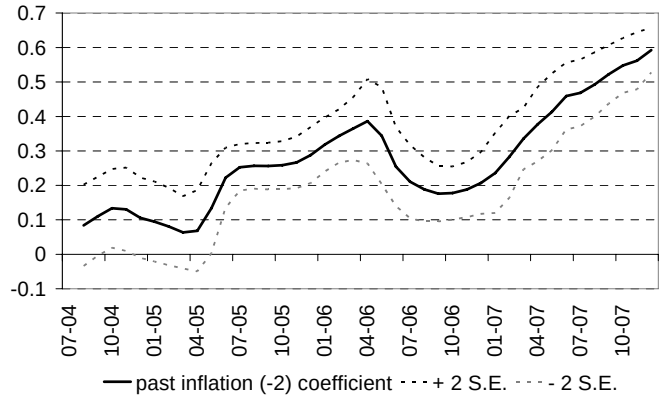
Source: Own calculations

Figure 22. Coefficient by inflation target in equation of analysts' inflation expectations in Turkey



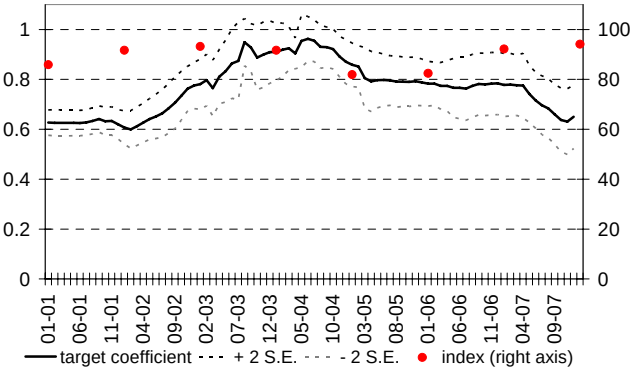
Source: Own calculations

Figure 23. Coefficient by past inflation in equation of analysts' inflation expectations in Turkey



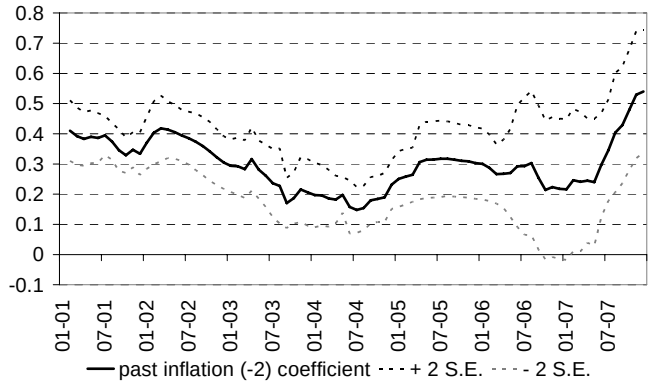
Source: Own calculations

Figure 24. Coefficient by inflation target in equation of consumers' inflation expectations in Sweden



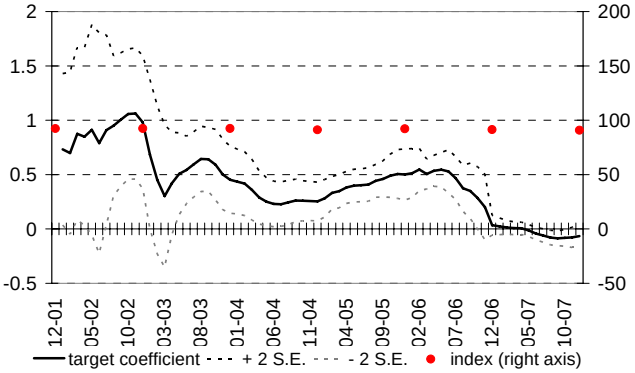
Source: Own calculations

Figure 25. Coefficient by past inflation in equation of consumers' inflation expectations in Sweden



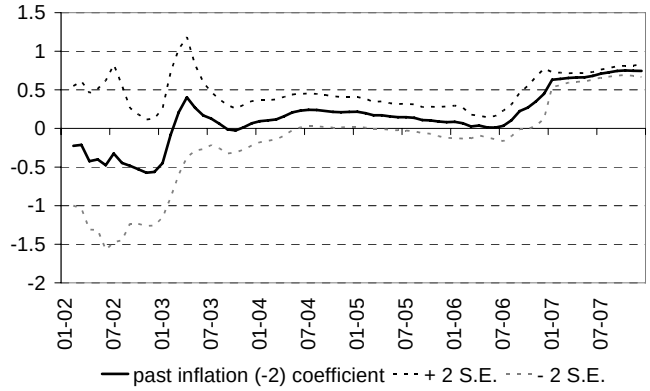
Source: Own calculations

Figure 26. Coefficient by inflation target in equation of consumers' inflation expectations in United Kingdom



Source: Own calculations

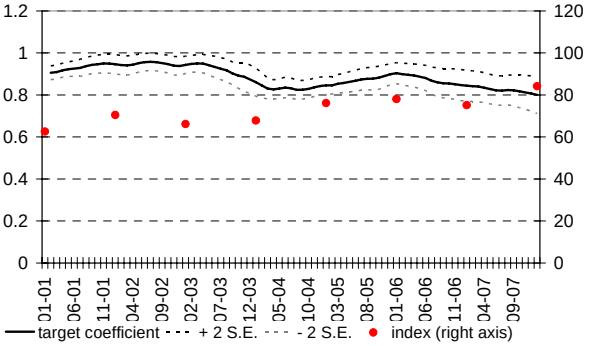
Figure 27. Coefficient by past inflation in equation of consumers' inflation expectations in United Kingdom



Source: Own calculations

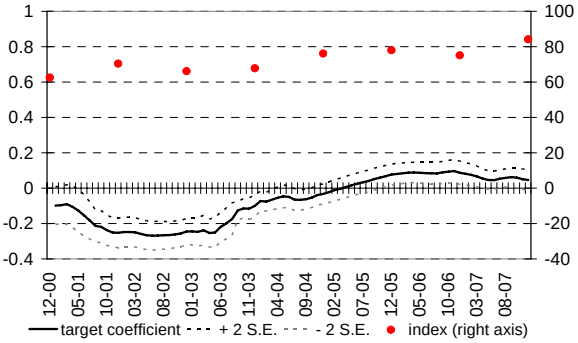
II. Results of estimation of Equation [15.]

Figure 28. Coefficient by inflation target in equation of analysts' inflation expectations in Poland



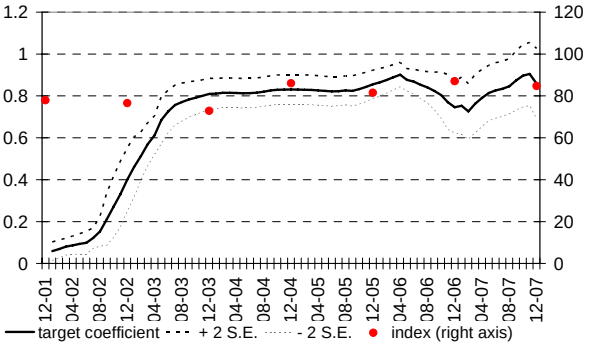
Source: Own calculations

Figure 29. Coefficient by inflation target in equation of consumers' inflation expectations in Poland



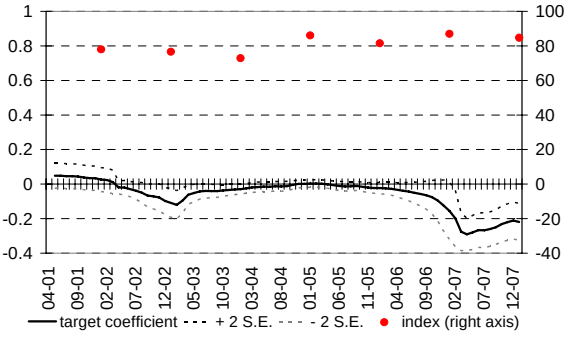
Source: Own calculations

Figure 30. Coefficient by inflation target in equation of analysts' inflation expectations in the Czech Rep.



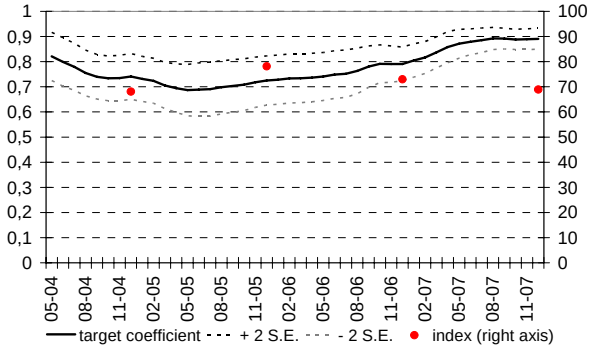
Source: Own calculations

Figure 31. Coefficient by inflation target in equation of consumers' inflation expectations in the Czech Rep.



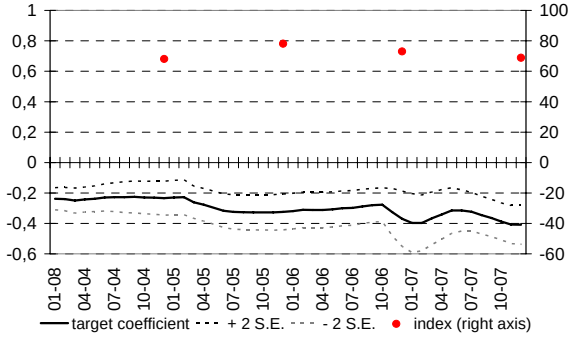
Source: Own calculations

Figure 32. Coefficient by inflation target in equation of analysts' inflation expectations in Hungary



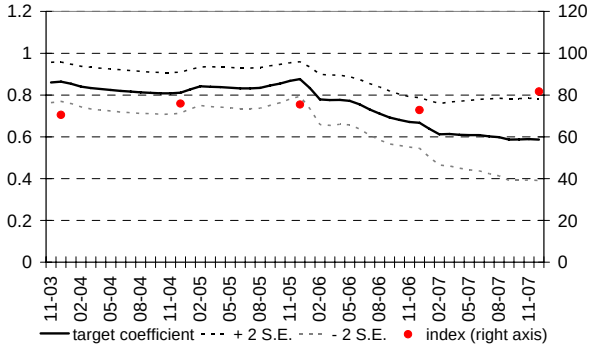
Source: Own calculation

Figure 33. Coefficient by inflation target in equation of consumers' inflation expectations in Hungary



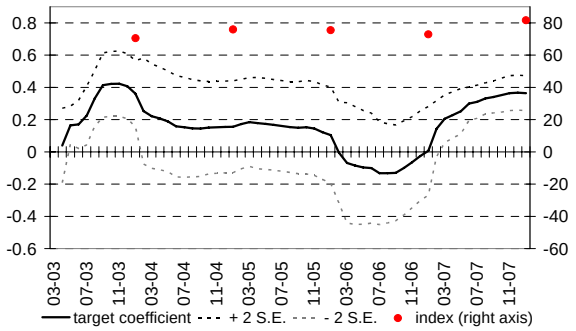
Source: Own calculations

Figure 34. Coefficient by inflation target in equation of analysts' inflation expectations in Slovakia



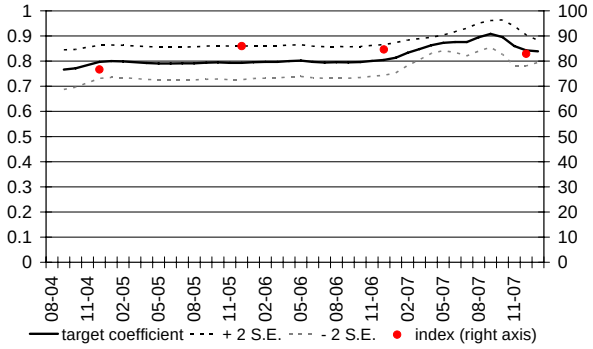
Source: Own calculations

Figure 35. Coefficient by inflation target in equation of consumers' inflation expectations in Slovakia



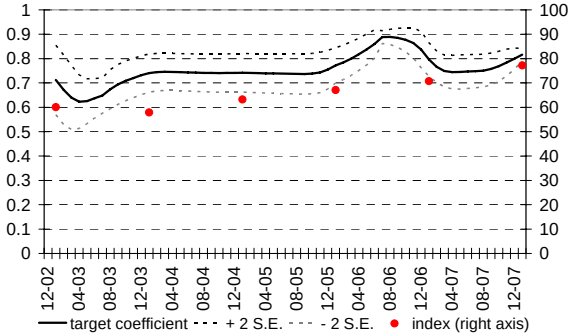
Source: Own calculations

Figure 36. Coefficient by inflation target in equation of analysts' inflation expectations in Chile



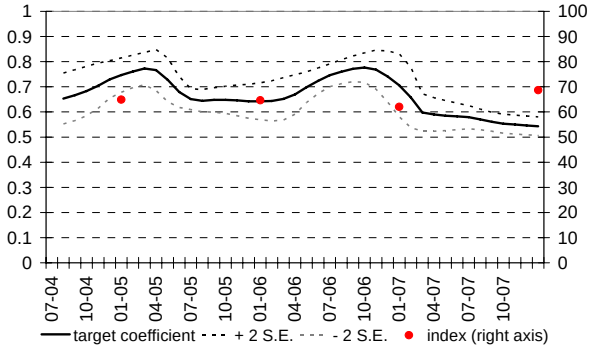
Source: Own calculations

Figure 37. Coefficient by inflation target in equation of analysts' inflation expectations in Brazil



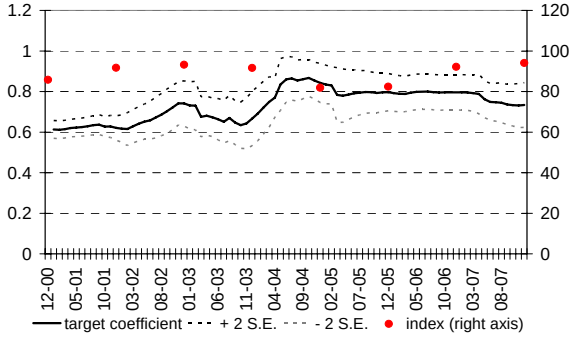
Source: Own calculations

Figure 38. Coefficient by inflation target in equation of analysts' inflation expectations in Turkey



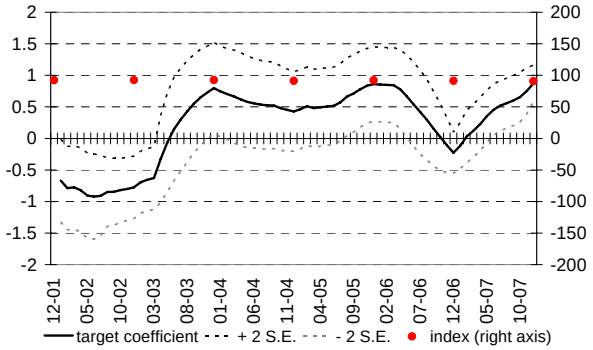
Source: Own calculations

Figure 39. Coefficient by inflation target in equation of consumers' inflation expectations in Sweden



Source: Own calculations

Figure 40. Coefficient by inflation target in equation of consumers' inflation expectations in United Kingdom



Source: Own calculations

The presented results lead to two important conclusions. Firstly, there are noticeable differences between inflation expectations of the two groups of economic agents: financial analysts and consumers. In those countries where it was possible to obtain comparable data on inflation expectations of financial analysts and consumers the weight of the inflation target in forming inflation expectations was notably higher in the case of financial analysts than in the case of consumers. Consumers were backward-looking to a considerably higher degree and attached a higher weight to past inflation while forming inflation expectations. Hence it may be concluded that the credibility of central banks was greater among financial analysts than it was among consumers. Secondly, it seems that the two compared credibility measures, namely credibility index and the weight of the inflation target in forming the inflation expectations, are consistent to a considerable extent. However, it should be mentioned that the comparison has focused rather on the direction of changes than on the levels of the compared variables. Of course, it is very easy to show opposite cases, e.g. in the case of Turkey the coefficient on inflation expectations in equation [14.] falls while the credibility index increases or in the case of UK the coefficient in equation [14.] also falls while the index does not change. However, the number of such cases is rather small and it seems that the credibility index reflects the credibility

changes suggested by the changes in the weights of the inflation target in forming inflation expectations, in particular when the financial analysts' expectations are taken into account.

The findings obtained in this study lead to the conclusion that the credibility index and the credibility measures based on inflation expectations of economic agents are to a large extent consistent and give a similar picture of central bank credibility. It should be stressed that the credibility index is a measure based on the credibility creation approach while the other measures (the deviations of inflation expectations from the inflation target and the weight attached to the inflation target while forming inflation expectations) are based on the credibility impact approach, so the set of variables used to calculate these measures is entirely different. Taking this into account, it may be stated that the similarities in the results obtained using both the credibility index and the other two credibility measures are sufficient to consider the credibility index to be an appropriate measure of central bank credibility.

5. Conclusions

The presented results suggest that the credibility index proposed in this study constitutes a relevant and consistent credibility measure. It offers the advantages of being fully comparable between countries and of being time-variant, features that designate it as a suitable instrument in studies that attempt to investigate macroeconomic effects of central bank credibility. The index is also well-founded on theoretical grounds as well as on the findings of existing empirical studies. The results obtained with the use of the index suggest that the central banks from the sample increased their credibility in the period 1999-2007, especially in the countries where credibility had been low.

The credibility measure proposed in this paper can be used in empirical studies to verify the hypotheses with respect to credibility of monetary policy formulated in theoretical literature. Specifically, it is postulated that central bank credibility plays a prominent role in macroeconomic processes: it enhances effectiveness with which monetary policy goals are achieved, reduces disinflation costs or reduces the trade-off between the inflation volatility and output volatility. To verify these theoretical conceptions empirically might be a viable direction for further research.

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Annex 1.

Transparency measure – questionnaire

Questions	Question weight	Scores	Categories of answers
Explanation of policy decisions			
1. Central bank provides explanations on day policy changed?	1.5	100 0	Yes No
2. Explanations provided when policy-makers meet and do not change policy?	0.3	100 50 0	Yes Sometimes No
3. Policy decisions discussed in standard bulletins and reports?	2	100 50 0	At least twice a year At least annually No
4. Minutes of policy meetings published	1	100 50 0	Within a month of meeting More than a month after No
5. Voting patterns published	0.5	100 0	Yes No
Published forward-looking analysis			
6. Forward-looking analysis in standard bulletins and reports	2	100 50 25 0	More than annually At least annually Unspecified Otherwise
7. Form of publication	1.5	100 50 25 0	Words, one of numbers or graphs One of words, numbers or graphs Unspecified None
8. Risk to forecast published	1	100 50 0	Words and one of number or graphs One of words, numbers or graphs None
9. Discussion of past forecast errors	1	100 50 0	Yes Sometimes No
Assessment and Analysis			
10. Analysis in standard bulletins and reports	2	100 50 0	More than annually At least annually Otherwise
11. Frequency of speeches	1.5	100 66 33 0	At least monthly At least quarterly Less than quarterly/occasional Never, almost never
12. Working papers and other research publications	1	100 66 33 0	More than 10 each year More than 5 each year More than 2 /occasional Never

Source: Fry et al. (2000), pp. 78-79.

Independence measure – questionnaire

Questions	Question weight	Scores	Categories of answers
1. To what extend do statutory objectives provide the central bank with a clear focus on price stability?	1	100 75 50 25 0	Only goal is price, monetary or currency stability Price stability + financial stability objectives and non-conflicting monetary stability objectives Price stability + conflicting objectives No statutory objectives Only goals other than price stability
2. To what extend does the central bank determine the setting of policy targets?	1	100 50 0	Only central bank sets an explicit target (for either inflation, money or the exchange rate) or there are no explicit targets Both central bank and government have a role in setting an explicit target (for either inflation, money or the exchange rate). Only government sets a target (for either inflation, money or the exchange rate)
3. To what extend does the central bank determine the adjustment of monetary policy instruments?	2	100 65 33 0	Central bank decides on changes in instruments and no representative of government attends the meeting of monetary policy makers, other than as an observer Central bank decides on changes to instruments and a representative of government attends the meeting of monetary policy makers Central bank and government have a role in setting instruments Central bank role in setting instruments is limited
4. To what extend are there limits on central bank financing of the fiscal deficit?	2	100 75 50 25 0	Prohibited, never used, or amounts so small and for short periods independence in no way affected Narrow, well enforced limits exist Limits exist that are usually enforced Wide limits exist and some procedures exist when limits are missed No limits or little enforcement
5. How long is the term of office of the Governor?	0.5	100 86 71 57 43 29 14	8 years or above 7 years 6 years 5 years 4 years 3 years Term can exceed 3 years

Source: Fry et al. (2000), pp.70-71.

Accountability measure – questionnaire

Questions	Question weight	Scores	Categories of answers
Accountability to a specific target			
1. Is there a specific published target?	1.5	100 0	Yes No
2. Do procedures exist for when the target is missed?	1.5	100 50 0	Recognized formal procedures exist Informal procedures exist, or if central bank reports instruments set in conjunction with government No
Accountability to government or in general			
1. Central bank subject to monitoring by legislature?	3	100 50 0	Yes Irregularly, or if instrument independence limited No

Source: Fry et al. (2000), p. 77

Annex 2.

Values of the credibility index

		Poland	CR	Hungary	Slovakia	Chile	Brazil	Turkey	UK	Sweden
1999										
1. Target realization	% time in target	6.25	0.00	100.00	16.67	0.00	33.33	41.67	100.00	16.67
	Dev. from target	40.71	8.36	77.88	54.08	61.69	37.67	47.40	87.65	47.38
2. Past inflation		24.81	59.26	7.00	76.67	76.48	63.17	0.00	100.00	100.00
3. Transparency		65.84	81.72	41.79	62.69	79.70	73.31	33.33	94.34	94.97
4. Independence		86.23	86.23	82.38	85.15	82.08	62.62	69.77	77.46	97.77
5. Accountability		75.00	75.00	75.00	75.00	75.00	100.00	37.50	100.00	100.00
6. Country risk		62.06	61.96	65.75	48.33	64.31	41.74	48.25	90.87	90.33
7. Public debt		84.19	100.00	55.57	85.57	100.00	66.37	55.71	80.57	49.14
INDEX		59.68	65.73	60.38	66.59	71.79	62.81	41.61	90.95	80.03
2000										
1. Target realization	% time in target	0.00	0.00	100.00	6.25	25.00	91.67	0.00	100.00	41,67
	Dev. from target	18.44	41.25	19.20	36.65	73.87	62.37	0.02	80.99	57,76
2. Past inflation		47.27	70.36	31.65	66.55	82.36	81.84	0.00	100.00	100.00
3. Transparency		65.84	74.94	52.48	64.97	90.68	77.71	31.07	98.11	100.00
4. Independence		93.92	86.23	82.38	85.15	82.08	62.62	69.77	77.46	97.77
5. Accountability		75.00	75.00	75.00	75.00	75.00	100.00	37.50	100.00	100.00
6. Country risk		62.63	61.67	63.54	50.70	64.65	49.36	50.71	91.69	91.66
7. Public debt		90.29	100.00	65.43	70.86	100.00	56.70	60.86	84.29	65.14
INDEX		62.61	68.92	61.65	61.62	77.17	72.41	35.18	91.55	85.86
2001										
1. Target realization	% time in target	41.67	66.67	100.00	33.33	91.67	66.67	0.00	100.00	100,00
	Dev. from target	55.66	69.48	82.02	64.83	74.19	43.11	0.07	82.79	72,56
2. Past inflation		56.10	78.87	47.27	55.92	86.89	81.78	0.00	100.00	100.00
3. Transparency		70.24	74.94	67.28	68.00	93.83	84.37	39.03	98.11	100.00
4. Independence		93.92	86.23	86.23	92.85	82.08	62.62	85.15	77.46	97.77
5. Accountability		75.00	75.00	75.00	75.00	75.00	100.00	100.00	100.00	100.00
6. Country risk		61.48	63.59	71.15	55.32	67.10	49.92	47.46	92.70	92.89
7. Public debt		89.14	100.00	68.45	72.86	100.00	50.10	0.00	89.00	63.86
INDEX		70.47	77.96	72.94	67.05	83.93	68.99	38.89	92.45	91.71
2002										
1. Target realization	% time in target	0.00	33.33	100.00	8.33	100.00	0.00	16.67	100.00	100.00
	Dev. from target	19.30	44.65	79.32	57.18	78.24	15.63	19.51	82.85	86.65
2. Past inflation		68.32	90.79	57.13	55.80	90.61	75.98	0.00	100.00	100.00
3. Transparency		74.77	74.94	70.31	75.43	92.25	84.37	78.19	98.11	100.00
4. Independence		93.92	93.92	86.23	92.85	82.08	62.62	85.15	77.46	97.77
5. Accountability		75.00	75.00	75.00	75.00	75.00	100.00	100.00	100.00	100.00
6. Country risk		65.21	67.06	69.71	60.32	65.38	45.56	45.24	92.71	93.38
7. Public debt		82.57	100.00	63.25	80.86	100.00	50.16	10.00	89.29	66.14
INDEX		66.20	76.62	73.65	67.19	84.99	60.07	48.30	92.50	93.20
2003										
1. Target realization	% time in target	0.00	0.00	65.63	16.67	66.67	0.00	75.00	100.00	91.67
	Dev. from target	34.45	17.80	65.14	66.30	66.69	4.30	85.37	85.62	75.28
2. Past inflation		78.41	91.51	65.96	69.37	92.44	69.49	0.00	100.00	100.00
3. Transparency		74.77	82.50	80.69	75.43	93.83	88.91	78.19	98.11	100.00
4. Independence		93.92	93.92	86.23	92.85	82.08	62.62	85.15	77.46	97.77
5. Accountability		75.00	75.00	75.00	75.00	75.00	100.00	100.00	100.00	100.00
6. Country risk		64.63	66.57	69.87	59.19	65.69	46.10	44.44	93.25	93.57
7. Public debt		75.57	99.86	60.03	82.29	100.00	42.23	21.29	87.57	66.43

		Poland	CR	Hungary	Slovakia	Chile	Brazil	Turkey	UK	Sweden
INDEX		67.81	72.88	72.05	70.52	81.92	57.91	59.63	92.56	91.69
2004										
1. Target realization	% time in target	41.67	75.00	50.00	50.00	16.67	50.00	100.00	100.00	0.00
	Dev. from target	50.40	75.54	20.36	80.06	42.57	31.45	100.00	72.59	44.80
2. Past inflation		94.87	97.80	74.84	75.27	93.59	54.94	0.00	100.00	97.99
3. Transparency		83.12	93.83	80.69	75.43	96.97	88.91	78.19	98.11	100.00
4. Independence		93.92	93.92	86.23	92.85	82.08	62.62	85.15	77.46	97.77
5. Accountability		75.00	75.00	75.00	75.00	75.00	100.00	100.00	100.00	100.00
6. Country risk		64.58	68.12	69.28	63.87	66.18	47.99	48.49	93.99	94.03
7. Public debt		77.57	99.43	58.07	83.71	100.00	49.45	33.00	85.14	68.00
INDEX		76.15	86.12	68.12	75.93	76.66	63.26	64.90	91.30	81.91
2005										
1. Target realization	% time in target	50.00	33.33	100.00	33.33	91.67	100.00	100.00	100.00	0.00
	Dev. from target	62.50	54.83	84.36	67.12	78.33	36.57	100.00	89.62	46.72
2. Past inflation		98.35	100.00	79.16	74.41	97.99	55.28	0.00	100.00	100.00
3. Transparency		83.12	93.83	86.98	79.97	96.97	86.64	67.61	98.11	100.00
4. Independence		93.92	93.92	86.23	92.85	82.08	62.62	85.15	77.46	97.77
5. Accountability		75.00	75.00	75.00	75.00	75.00	100.00	100.00	100.00	100.00
6. Country risk		64.73	68.60	68.20	64.14	65.03	48.68	47.13	93.10	94.41
7. Public debt		75.57	99.71	54.86	94.00	100.00	46.63	43.43	82.71	68.29
INDEX		78.03	81.54	78.15	75.48	85.98	67.11	64.62	92.22	82.43
2006										
1. Target realization	% time in target	16.67	75.00	66.67	0.00	83.33	100.00	33.33	100.00	83.33
	Dev. from target	48.87	80.89	48.73	53.24	67.60	63.04	31.41	84.05	73.75
2. Past inflation		99.44	100.00	83.50	76.62	98.33	59.04	25.37	100.00	100.00
3. Transparency		87.65	93.83	90.12	79.97	96.97	88.91	89.28	98.11	100.00
4. Independence		93.92	93.92	86.23	92.85	82.08	62.62	85.15	77.46	97.77
5. Accountability		75.00	75.00	75.00	75.00	75.00	100.00	100.00	100.00	100.00
6. Country risk		66.12	68.87	68.91	65.14	66.00	51.05	50.31	92.24	94.18
7. Public debt		74.86	99.86	49.14	99.43	100.00	49.29	52.71	81.14	75.71
INDEX		75.15	87.01	73.02	72.87	84.63	70.74	62.05	91.45	92.22
2007										
1. Target realization	% time in target	83.33	58.33	50.00	75.00	58.33	100.00	50.00	91.67	83.33
	Dev. from target	78.11	67.32	9.11	77.58	62.26	60.88	34.10	81.95	84.38
2. Past inflation		100.00	98.88	85.69	84.83	98.13	79.31	53.74	100.00	100.00
3. Transparency		93.94	93.83	91.07	75.57	100.00	84.37	89.28	99.06	100.00
4. Independence		93.92	93.92	86.23	92.85	82.08	62.62	85.15	77.46	97.77
5. Accountability		75.00	75.00	75.00	75.00	75.00	100.00	100.00	100.00	100.00
6. Country risk		68.39	70.87	69.01	67.01	68.44	53.75	51.00	92.69	94.46
7. Public debt		75.57	100.00	48.86	100.00	100.00	80.10	60.57	81.43	83.29
INDEX		84.18	84.72	68.93	81.67	82.93	77.23	68.70	90.84	94.11

Source: Own calculations

Annex 3.

Inflation expectations data description

Country	Group of economic agents	Source	Expectations horizon	Frequency of data	Beginning of time-series
Poland	Financial analysts	Reuters	11 months	Monthly	01. 1999
Poland	Consumers	NBP	12 months	Monthly	01. 1999
Czech Rep.	Financial analysts	Reuters (net inflation) and CNB (CPI)	12 months	Monthly	01. 1999

Country	Group of economic agents	Source	Expectations horizon	Frequency of data	Beginning of time-series
Czech Rep.	Consumers	Łyziak and Stanisławska (2007)	12 months	Quarterly Monthly	01. 1999 01. 2001
Hungary	Financial analysts	Reuters	December of the next year	Monthly (median)	06. 2001
Hungary	Consumers	Łyziak and Stanisławska (2007)	12 months	Monthly	06. 2001
Slovakia	Financial analysts	NBS	December of the current year	Monthly	12. 2000
Slovakia	Consumers	Łyziak and Stanisławska (2007)	12 months	Monthly	04. 2000
Chile	Financial analysts	CBC	11 and 23 months	Monthly	09. 2001
Brazil	Financial analysts	BCB	12 months	Monthly	01. 2000
Turkey	Financial analysts	CBT	12 months	Monthly	08. 2001
Sweden	Financial analysts	Riksbank	2 years	Quarterly	1st quarter 1999 r.
Sweden	Consumers	National Institute of Economic Research	12 months	Monthly	01. 1999
UK	Financial analysts	BoE	2 years	Quarterly	1st quarter 1999
UK	Consumers	Łyziak and Stanisławska (2007)	12 months	Monthly	01. 1999