

# Credibility and Inflation Expectations in Emerging Economies

## Credibilidade e Expectativas de Inflação em Economias Emergentes

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### Resumo

Este estudo é uma contribuição à literatura sobre credibilidade e seu efeito sobre a distribuição entre o comportamento *forward-looking* e o comportamento *backward-looking* para a formação de expectativas de inflação no caso de economias emergentes. Com base em dados coletados a partir de sete economias emergentes que fazem uso do sistema de metas para inflação (Brasil, Chile, Colômbia, México, Polônia, África do Sul, e Turquia), este artigo analisa quanto a credibilidade associada com a meta de inflação contribui para ancorar as expectativas de inflação. Os resultados denotam que embora a credibilidade seja relevante para reduzir as expectativas de inflação, estes países apresentam baixa credibilidade monetária e, portanto, o comportamento *backward-looking* é predominante para a formação de expectativas de inflação. Em suma, a evidência apresentada neste estudo indica que a adoção do sistema de metas para inflação em economias emergentes não representa uma estrutura capaz de ancorar as expectativas de inflação.

**Palavras-chave:** credibilidade, expectativas de inflação, metas de inflação, economias emergentes.

### Abstract

This study is a contribution to the literature concerning credibility and its effect on the distribution between forward-looking behavior and backward-looking behavior for formation of inflation expectations in the case of emerging economies. Based on data gathered from seven inflation targeting emerging economies (Brazil, Chile, Colombia, Mexico, Poland, South Africa, and Turkey), this paper analyzes how much the credibility associated with the inflation target contributes to anchoring expectations. The findings denote that although credibility is relevant to reduce inflation expectations, these countries present low monetary credibility and thus the backward-looking behavior is predominant for the formation of inflation expectations. In brief, the evidence presented in this study indicates that the adoption of inflation targeting in emerging economies does not represent a framework able to anchor inflation expectations.

**Key words:** credibility, inflation expectations, inflation targeting, emerging economies.

**JEL classification:** E52, E58, E31, E37.

## 1. Introduction

Nowadays there exists a consensus that credibility is a key tool for managing monetary policy. As pointed out by Woodford (2004), the success for a central bank in the management of the monetary policy depends on the extent to which the expectations of the public are reshaped by the announced targets. The adoption of inflation targeting for several central banks since the 1990s is a clear demonstration that there is a belief that the announcement of targets is a framework to anchor inflation expectations. This is a point that deserves attention. A huge amount of literature concerning inflation targeting shows the advantages and the disadvantages of this monetary regime and, in particular, highlights that a condition for success is the presence of credibility.<sup>1</sup>

The essence of credibility is the belief by the public in the probability of a successful execution of a policy. In the context of inflation targeting, there is no doubt that credibility is a forward-looking concept and it is directly connected with inflation expectations. In the case of inflation target, inflation expectations is the heart of the system. The main idea is that the success of inflation targeting can represent a lower social cost (lower sacrifice ratio) because a disinflation process can be reached through a decrease in inflation expectations without an increase in the interest rate. Hence, how to achieve this performance? Credibility is the answer to this question. In other words, inflation can be reduced without cost (through inflation expectations transmission) only in the case that the public believes that the central bank has competence to reach the announced target.

A natural positive issue that concerns monetary policymakers that makes use of inflation targeting is how the public responds to the announced targets. When the public believes in the announced target, and thus there exists credibility, inflation expectations are anchored and the central bank is able to guide expectations. In contrast, in the case where the public does not believe in the targets, the benefits due to the adoption of inflation targeting are not observed. In this context, some studies are concerned with the direct impact of inflation targets on expected inflation. Based on an analysis which considers five targeting developed countries, Johnson (2002 and 2003) observed that targets reduced the level of expected inflation. Levin, Natalucci, and Piger (2004), making use of the same developed countries for the period 1994 to 2003, found that inflation targeting has played a role in anchoring inflation expectations and in reducing inflation persistence.

In the last years some studies have attempted to show empirical evidence on the relation between credibility and inflation taking into account deviations from the inflation target. In general, these studies are concerned with the main determinants of credibility. Bordo and Siklos (2016), based on a sample for up to eighty economies from 1980 to 2014 observed that inflation target and central bank transparency are the main determinants of credibility. Neuenkirch and Tillmann (2014) in an investigation for five developed economies concluded that inflation expectations are sensitive to deviations from the target. Yigit (2010) in an analysis for eight developed economies found a reduction in inflation memory after the adoption of inflation targeting.

There exist few studies regarding the effect of monetary policy credibility on inflation and public inflation expectations for emerging economies. Yuxiang and Chen (2010) in an analysis based on a survey about inflation in the Chinese economy in 2008 observed that credibility helps to stabilize inflation expectations. In an analysis for the

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<sup>1</sup> See de Mendonça and de Guimarães e Souza (2012) for an analysis with the largest sample of countries (180) in the literature on inflation targeting.

Brazilian economy, de Mendonça and Tostes (2015) analyzed the effect of monetary policy credibility on exchange rate pass-through and found that credibility is only relevant for reducing inflation for the market prices. Montes et al. (2016) also in an analysis of the Brazilian economy for the period 2003 to 2015 concluded that transparency (a measure of credibility) is an important tool in reducing disagreement about inflation expectations.

This study is a contribution to the empirical literature concerning credibility and its effect on the distribution between forward-looking behavior and backward-looking behavior for the formation of inflation expectations in the case of emerging economies. In order to present empirical evidence on how much credibility contributes to anchoring inflation expectations to the target in the case of emerging economies, a simple, but elucidative framework is adopted. In contrast with previous studies, this analysis builds a bridge between the rule for inflation expectations originally proposed by Bonfim and Rudebusch (2000) and a time-varying credibility index originally proposed by de Mendonça (2007) and de Mendonça and Galveas (2013). This framework has solid underpinnings because the rule for inflation expectations is a benchmark for several studies (e.g. Neuenkirch and Tillmann, 2014; and Tesfaselassie and Schaling, 2010), while the credibility index is already applied in several studies for emerging economies (e.g. Montes et al., 2016; Ciro and de Mendonça, 2016; Leveuge, Lucotte, and Ringuedé, 2015; and Doğan and Bozdemir, 2014). The economic data, including inflation expectations, is gathered from seven central banks of the emerging inflation targeting economies under analysis (Brazil, Chile, Colombia, Mexico, Poland, South Africa, and Turkey).

The evidence presented in this study indicates that the adoption of inflation targeting in emerging economies does not represent a framework able to anchor inflation expectations. Although, credibility is relevant to reduce inflation expectations, the lack of commitment of central banks in emerging economies with the inflation targets denotes that the backward-looking behavior is predominant for the formation of inflation expectations. This paper is organized as follows. The next section presents a performance of monetary policy credibility for the countries under analysis through a time-varying index. Section 3 presents evidence on how much credibility associated with inflation targets helps to anchor inflation expectations. Section 4 presents empirical evidence in order to observe whether monetary policy credibility is, in fact, relevant to the determination of inflation expectations. The last section presents the conclusion.

## **2. Monetary policy credibility performance**

It is well-accepted that credibility may be measured by the difference between public inflation expectations regarding the target. This view matches pretty well with the classical definition of credibility made by Cukierman and Meltzer (1986, p. 1180) - “(...) the absolute value of the difference between the policymaker’s plans and the public’s beliefs about those plans.” The same is still valid in Blinder’s (2000, p. 1422) words: “A central bank is credible if people believe it will do what it says.” Therefore, in practice, this definition means to observe how inflation expectations are close to the target over time.

Since inflation expectations represent a key element in the analysis regarding credibility, the first step is to get the information that is made available by the central banks. This is not a simple task because even after adoption of inflation targeting most central banks in emerging economies do not present time series about inflation expectations. Even in the case of central banks that have inflation expectations series,

most of these expectations are available only for the short-term horizon (current year). This is a problem because the use of information regarding the current year does not permit checking whether inflation target is anchoring expectations or not. Of course the use of longer horizons represents the “first best” in this analysis, however, due to the lack of information, this study is constrained to consider only information on medium-term (one year ahead). In this context, constrained by available information from central banks, this analysis is based on quarterly data (see table 1) of the following inflation targeting emerging economies: Brazil, Chile, Colombia, Mexico, Poland, South Africa, and Turkey.

**Table 1**  
*Inflation expectations and inflation - descriptive statistics*

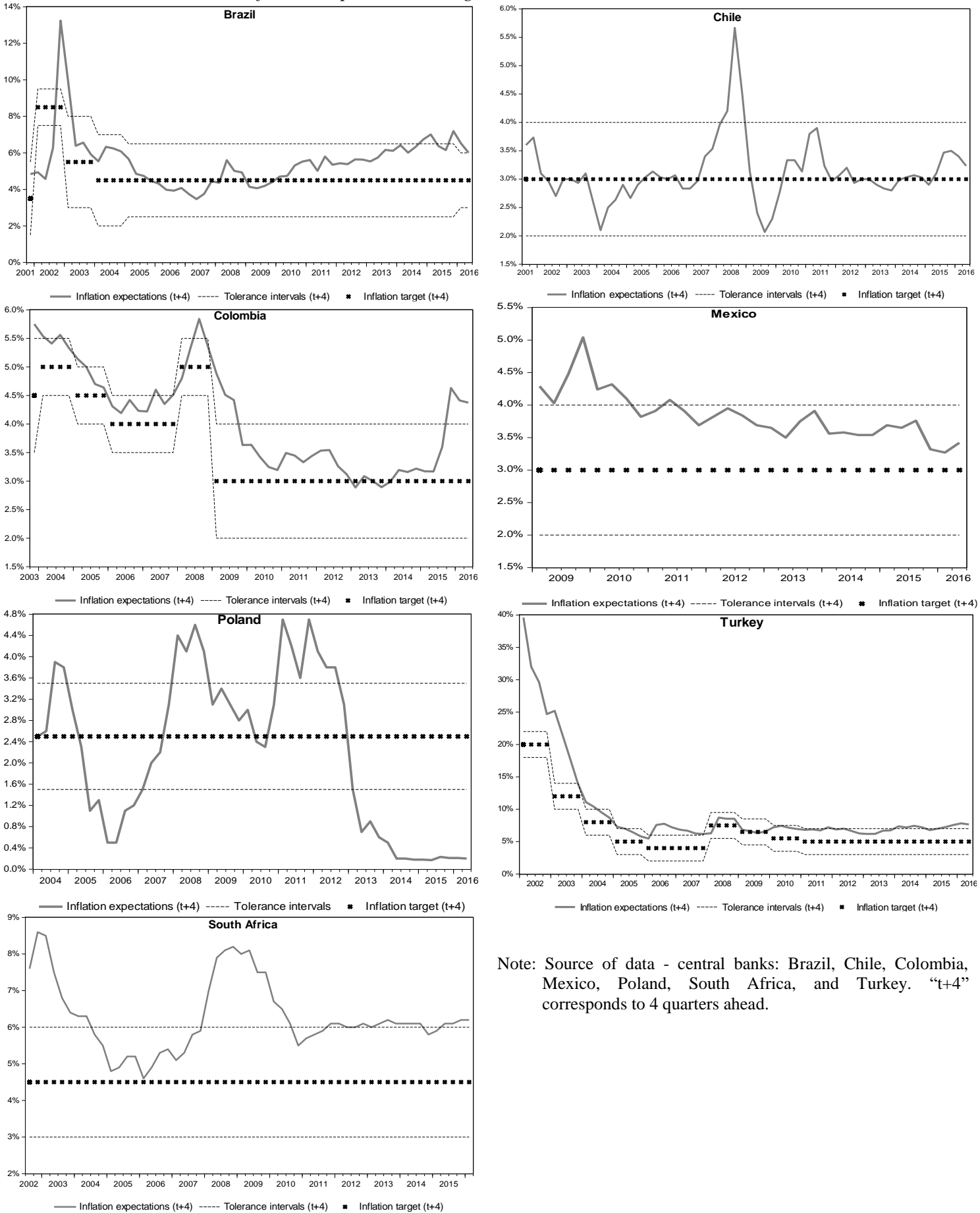
Countries	Availability	Mean		Median		Maximum		Minimum		Stand. dev.	
		EINF	INF	EINF	INF	EINF	INF	EINF	INF	EINF	INF
Brazil	2001q4-2016q2	5.5	6.8	5.5	6.2	13.2	16.6	3.5	3.0	1.5	2.8
Chile	2001q3-2016q2	3.1	3.3	3.0	3.1	5.7	9.5	2.1	-1.4	0.6	2.1
Colombia	2003q4-2016q2	4.1	4.4	4.2	4.4	5.8	8.6	2.9	1.8	0.9	1.8
Mexico	2009q1-2016q2	3.8	3.8	3.8	3.7	5.0	6.0	3.3	2.1	0.4	0.9
Poland	2001q4-2016q2	2.2	2.2	2.4	2.3	4.7	4.8	0.2	-1.3	1.5	1.8
South Africa	2002q1-2016q1	6.3	5.8	6.1	5.5	8.6	13.1	4.6	0.3	1.0	2.8
Turkey	2002q1-2016q1*	9.8	12.0	7.2	8.8	39.6	65.1	5.5	4.0	7.1	10.5

Note: Source of data - central banks (survey of expectations - average): Brazil, Chile, Colombia, Mexico, Poland, South Africa, and Turkey. \* This study assumes as the beginning of this series the adoption of full-fledge inflation targeting in Turkey. *EINF* is the mean of the expected rate of inflation over next 4 quarters. *INF* is the inflation measured by Consumer Price Index - in 4 quarters (exception is Brazil that uses the National Consumer Price Index).

All countries under consideration in this study make use of tolerance intervals in the inflation targeting system. The use of this mechanism is because monetary policy is conducted under uncertainty (unforeseen events) which can imply inflation to overshoot or undershoot the target. Furthermore, central banks can use a deliberate strategy to stabilize the economy. However, systematic and large deviations from the inflation target erode credibility. In addition, the use of large tolerance intervals impairs the formation of inflation expectations. In case of the lack of reliability, inflation public expectations incorporate the upper bound of the interval, which results in more time to achieve price stability.

Figure 1 shows how inflation expectations are close to the target and if they are inside the tolerance intervals over time. In general, it is observed that inflation expectations, with the exception of Chile and Poland, have been persistently above the target. Furthermore, in all cases there are periods where inflation expectations exceed the tolerance intervals. In particular, it seems that the strong international crisis 2007/08 was responsible for this observation in most cases.

**Figure 1**  
*Inflation Expectations, targets and tolerance intervals*



Note: Source of data - central banks: Brazil, Chile, Colombia, Mexico, Poland, South Africa, and Turkey. “t+4” corresponds to 4 quarters ahead.

As pointed out by Blinder (2000, p. 1421): “If the central bank has an explicit, publicly announced target for some variable  $x$  ( $x =$  inflation, say), then the gap between the target and market expectations can be taken as an objective measure of credibility.” Based on this idea, the literature offers several indices that takes into account the magnitude of the difference between the public inflation expectations and the inflation target (credibility is high when there exists convergence between expectations and the target).

Cecchetti and Krause (2002) proposed a well-known index. This index indicates maximum credibility when the inflation expectation is equal to or less than the target. In contrast, the index denotes no credibility when inflation expectations exceed 20%. After this limit, the authors assume that the monetary authority loses the control over inflation. In this framework, credibility decreases as inflation expectations deviates from the target and approaches 20%.

In the strand of the empirical analysis with credibility indices, similar to Bonfim and Rudebusch (2000), Bordo and Siklos (2016) build a central bank credibility index that takes into consideration the deviation of inflation expectations and the time-varying inflation target. Moreover, the authors assume  $\pm 1\%$  interval around the inflation target. The authors consider that the loss of credibility is greater when expectations miss the target outside the interval.

The above-mentioned indices are a good representation of the empirical literature on central bank credibility. However, they fall short for an analysis concerning credibility in inflation targeting in emerging economies. Cecchetti and Krause’s (2002) index considers the unreal limit of 20% for a central bank not to have credibility. It is important to highlight that the adoption of inflation targeting is clearly a commitment by the central bank in an attempt to keep the inflation at acceptable levels (normally an inflation lower than two digits). Furthermore, this index attributes maximum credibility when the expected inflation is lower than the target. This assumption is not acceptable because some emerging economies as, for example that of Poland, have experienced deflation, which in turn, obviously is a problem. The index presented by Bordo and Siklos (2016) has as an essential component a target range of  $\pm 1\%$ . This is a drawback because it is not reasonable simply to neglect the inflation intervals that are announced by each central bank. The inflation intervals are part of the inflation targeting system in most countries.

In order to analyze monetary policy credibility performance in inflation targeting emerging economies, a good index must comprehend its framework: (i) how the expected inflation for at least one year ahead converges to the announced target for the same period; (ii) whether inflation expectations are inside or outside of the tolerance intervals stated by the central bank; (iii) the use of information that is available from central banks (economic transparency); (iv) the presentation of the outcome is intuitive; (v) that it permits the time series of the index being up-to-date; (vi) easy to compute; and (vii) proven as a successful application for the case of inflation targeting emerging economies.

A time-varying monetary credibility index that fits well for this analysis is that introduced by de Mendonça (2007) and de Mendonça and Galveas (2013). The index proposed by these authors fills up all points mentioned above and, in particular, it has already been used in applications for several emerging economies.<sup>2</sup> In brief, the index makes use of the public’s forward-looking behavior on inflation and represents a useful tool for measuring the public’s trust vis-à-vis the ability of the central bank to achieve the

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<sup>2</sup> As examples of the use of this credibility index, see Montes et al. (2016); Ciro and de Mendonça (2016); Levieuge, Lucotte, and Ringuédé (2015); de Mendonça and Tostes (2015); Doğan and Bozdemir, (2014); Salle, Senegas, and Yildizoglu (2013); Montes (2013); Khemiri and Ali (2012); Montes and Tiberto (2012); and Dieters (2010).

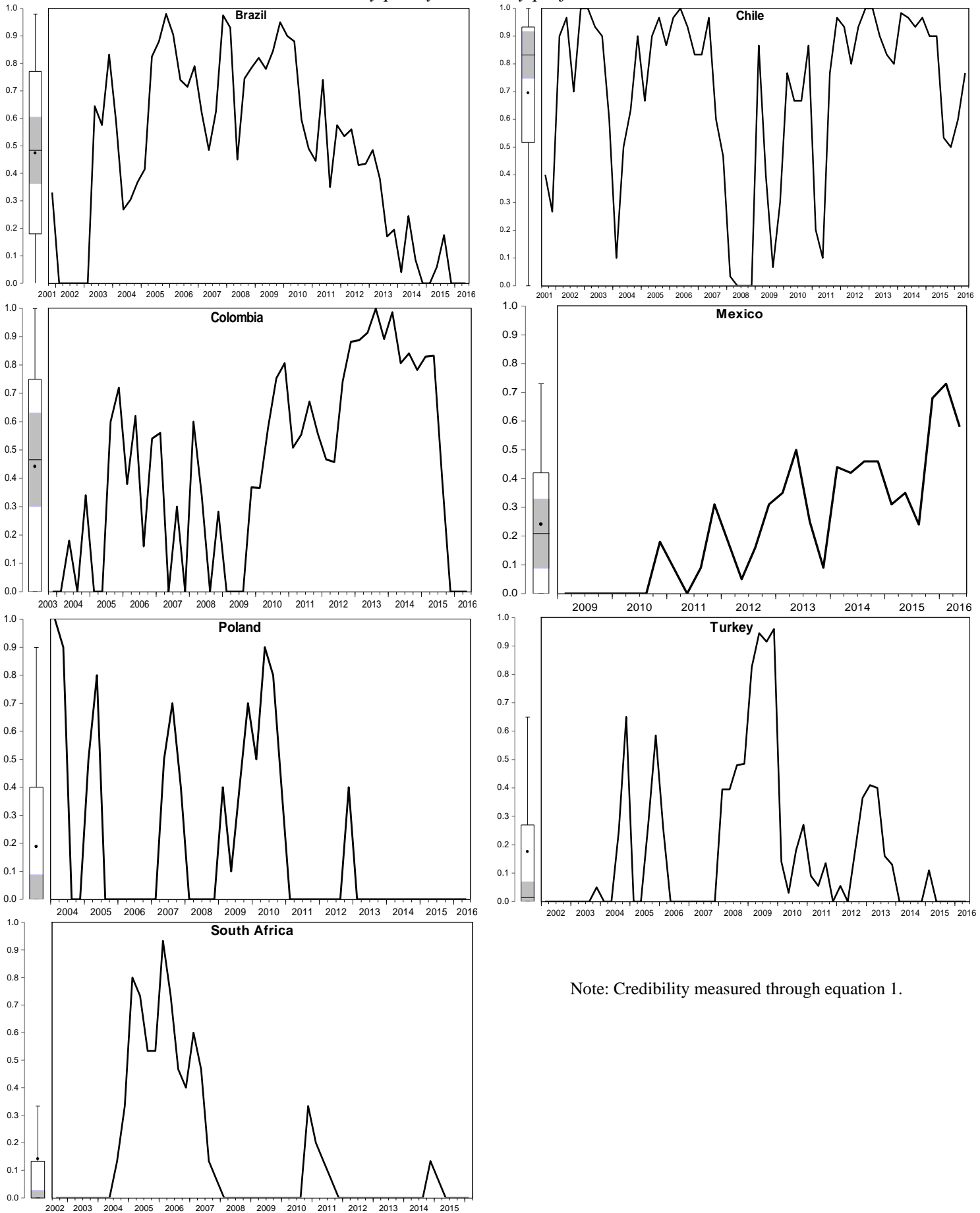
inflation target. In specific, credibility is maximum ( $CRED=1$ ) when the inflation expectations for the next 4 quarters ( $E_t(INF_{t+4})$ ) is exactly the inflation target 4 quarters ahead ( $INF_{t+4}^*$ ). In the case where the inflation exceeds the limits of the tolerance interval stated by the central bank  $[INF_{t+4}^{lower\_bound}, INF_{t+4}^{upper\_bound}]$ , credibility is null ( $CRED=0$ ). Furthermore, the index assumes a value between 0 and 1 when inflation expectations are inside the interval  $[INF_{t+4}^{lower\_bound}, INF_{t+4}^{upper\_bound}]$  and decreases as expectations deviate from the target. Hence, the scale of the index is from 0 to 1, and it is a result of:

$$(1) \quad CRED_t = \left\{ \begin{array}{ll} 1 & \text{if } E_t(INF_{t+4}) = INF_{t+4}^* \\ 1 - \frac{1}{INF_{t+4}^{bound} - INF_{t+4}^*} [E_t(INF_{t+4}) - INF_{t+4}^*] & \text{if } INF_{t+4}^{lower\_bound} < E_t(INF_{t+4}) < INF_{t+4}^{upper\_bound} \\ 0 & \text{if } E_t(INF_{t+4}) \geq INF_{t+4}^{upper\_bound} \text{ or } E_t(INF_{t+4}) \leq INF_{t+4}^{lower\_bound} \end{array} \right\} .$$

Figure 2 shows the performance of monetary credibility index for the seven emerging economies under analysis. In general, figure 2 shows that the performance of the monetary policy credibility of the countries in the analysis was not good. The average credibility index for all countries is 0.34. The positive highlight is the Chilean economy (average of 0.7). Brazil and Colombia have an intermediate position (average credibility is 0.47 and 0.44, respectively) but the index presents a clear deterioration in the last period. Although Mexico presents a trend of improvement in the index over time, the average is low (0.24). Negative highlights are Poland, Turkey, and South Africa (average credibility index is 0.19, 0.18, and 0.14, respectively). This result is particularly interesting because it reveals that while Turkey and South Africa fight against inflation expectations greater than the upper bound, Poland has the opposite situation (inflation expectations lower than the lower bound). At the end, it is possible to see that all countries present a good performance in some moments however, with the exception of Chile, they are not able to maintain this level.

**Figure 2**

*Monetary policy credibility performance*



Note: Credibility measured through equation 1.



### 3. The relation between credibility and inflation expectations anchor

Taking into account the convergence of inflation expectations to inflation target, the effect of the monetary credibility can be analyzed through a convex combination between the inflation target four quarters ahead ( $INF_{t+4}^*$ ) and the distributed lag of past inflation in the last four quarters ( $a_1INF_{t-1} + a_2INF_{t-2} + a_3INF_{t-3} + a_4INF_{t-4}$ ). In this framework, credibility is the weight of the inflation target in the determination of inflation expectations and the lack of credibility is the weight of past inflation rates. Hence, making some adaptations in a simple rule for inflation expectations that is common in the literature (see Bonfim and Rudebusch, 2000; Tesfaselassie and Schaling, 2010; and Neuenkirch and Tillman, 2014), the reduced form approach is based on:

$$(2) \quad E_t(INF_{t+4}) = CRED_t \times INF_{t+4}^* + (1 - CRED_t) \times (a_1INF_{t-1} + a_2INF_{t-2} + a_3INF_{t-3} + a_4INF_{t-4})$$

The interpretation of the equation above is straightforward, in the case of full credibility ( $CRED=1$ ) the term regarding past inflation is not relevant and thus inflation expectations are completely anchored to the inflation target. In contrast, when there is no credibility ( $CRED=0$ ) inflation target is not relevant and thus inflation expectations is a result of past inflation. When there exists credibility, but it is not maximum (that is,  $0 < CRED < 1$ ), inflation expectations are a result of the combination of both inflation target and past inflation. In brief, this framework permits observing how much of the inflation expectations is explained by the inflation target and the past inflation considering the credibility effect.

Although the above idea is compelling, the main challenge is how to introduce a measure of credibility in equation (2). However, this is not a problem if the credibility index introduced in the previous ( $CRED$ ) section is used. Besides the advantages of using the credibility index (see equation 1), the fact that the index has a score between 0 and 1, that is  $[0,1]$ , maintains the intuition of equation (2). Therefore, the credibility index ( $CRED$ ) is a perfect match to be applied in this framework.

With information on inflation expectations, inflation target, inflation, and credibility in hand, almost everything is ready for the analysis. The inconvenience is the lack of information regarding the coefficients on past inflation ( $a_1, a_2, a_3$ , and  $a_4$ ). In order to overcome this situation, equation (2) is rewritten in a manner that the estimation of parameters through Ordinary Least Squares can be generated. Therefore,

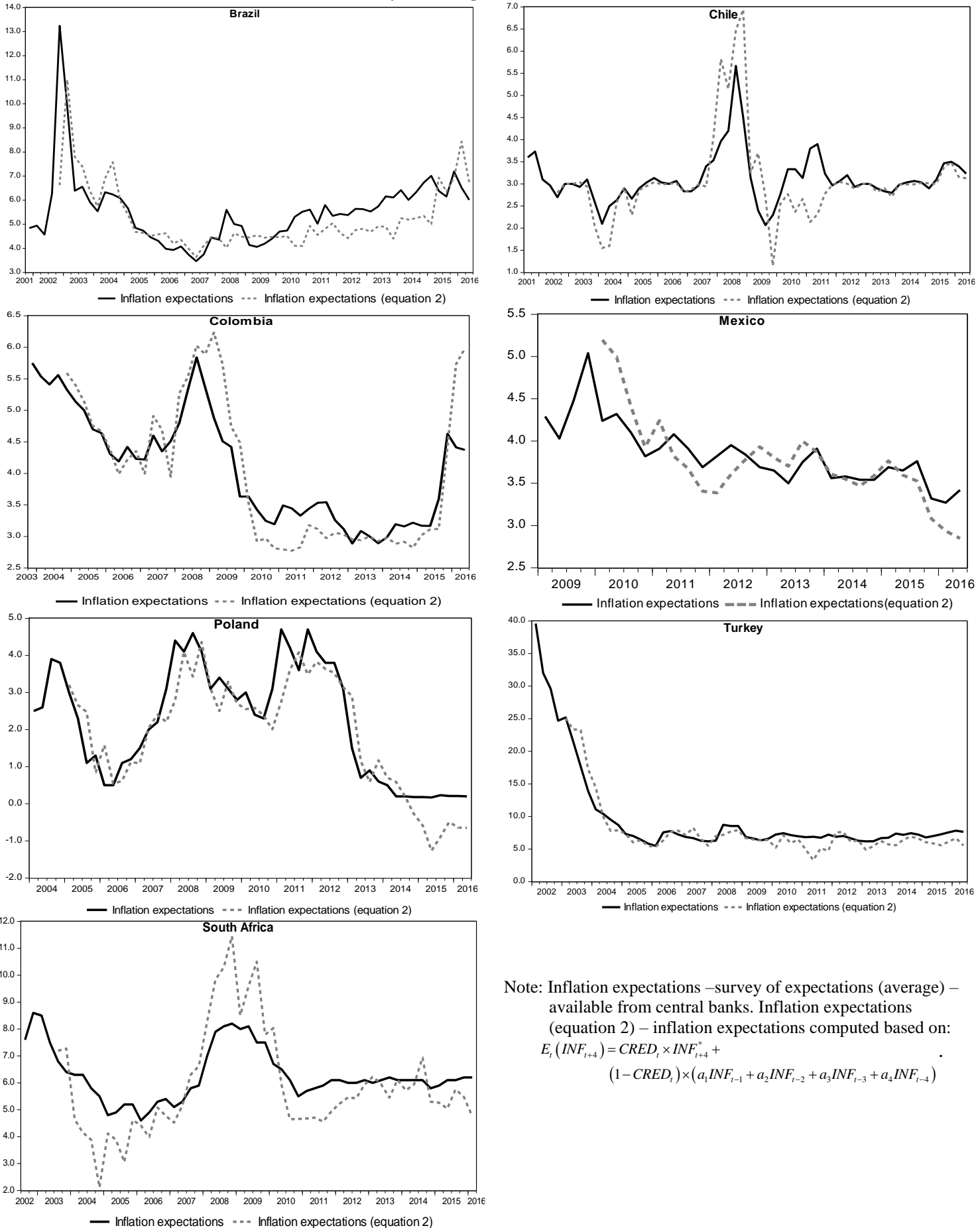
$$(3) \quad \frac{E_t(INF_{t+4}) - CRED_t \times INF_{t+4}^*}{1 - CRED_t} = a_1INF_{t-1} + a_2INF_{t-2} + a_3INF_{t-3} + a_4INF_{t-4}$$

Now, it is easy to obtain the parameters ( $a_1, a_2, a_3$ , and  $a_4$ ) from the equation above. After finding the parameters, it is possible to build the time series on inflation expectations from equation (2). Figure 3 shows the result of this application for the seven countries under analysis. The graphs suggest that the inflation expectations computed through equation (2) represent a good approximation to those gathered from survey of expectations of each central bank.

Although inflation expectations obtained from equation (2) seem well-adjusted to inflation expectations available from the central banks, the quality of the forecast needs to be checked. With this objective, the forecast error ( $FE$ ) is computed as a result of the difference between the inflation expectations for the next four quarters gathered from central banks ( $E_t(INF_{t+4})$ ) and the forecast of the expectations ( $E_t^F(INF_{t+4})$ ) computed from equation (2), that is:

$$(4) \quad FE_t = E_t(INF_{t+4}) - E_t^F(INF_{t+4})$$

**Figure 3**  
Inflation expectations



Note: Inflation expectations –survey of expectations (average) – available from central banks. Inflation expectations (equation 2) – inflation expectations computed based on:

$$E_t(INF_{t+4}) = CRED_t \times INF_{t+4}^* + (1 - CRED_t) \times (a_1 INF_{t-1} + a_2 INF_{t-2} + a_3 INF_{t-3} + a_4 INF_{t-4})$$

Figure 4 shows the time-varying forecast error for all countries in this study. Therefore, it allows one to see if the inflation expectations from equation (2) are prone to overestimation or to underestimation of the inflation expectations from central banks. Furthermore, Mean Error ( $ME$ ) and Mean Absolute Error ( $MAE$ ) are presented as statistics regarding the quality of the forecasts. The average of the forecast errors ( $ME$ ) denotes magnitude and direction of the projections while  $MAE$  is related to the accuracy of the forecasts. These statistics are computed as follows:

$$(5) \quad ME = \frac{1}{n} \sum_{i=1}^n FE_i \quad \text{and} \quad MAE = \frac{1}{n} \sum_{i=1}^n |FE_i|,$$

where:  $n$  is the number of observations.

In addition to  $ME$  and  $MAE$ , figure 4 also includes a test for unbiasedness and efficiency by estimating:

$$(6) \quad E_t(INF_{t+4}) = \alpha + \beta E_t^F(INF_{t+4}) + \varepsilon,$$

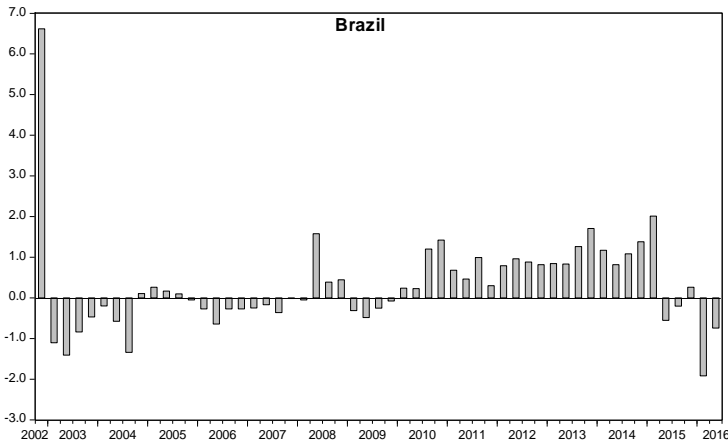
where:  $\alpha$  and  $\beta$  are unknown parameters, and  $\varepsilon$  is the error term.

According to Holden and Peel (1990), a sufficient condition for  $E_t^F(INF_{t+4})$  to be an unbiased forecast of  $E_t(INF_{t+4})$  is that  $\alpha=0$  and  $\beta=1$ . Moreover, a test for autocorrelation (existence of some degree of persistence) through lagrange multiplier (LM) test is applied to detect autocorrelation in the residuals.

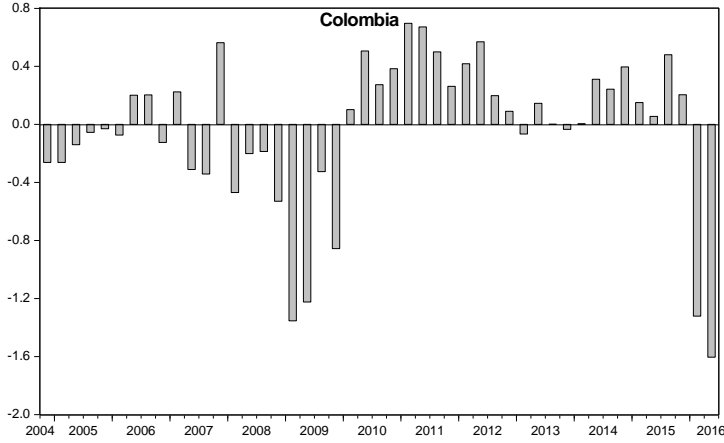
The results in figure 4 indicate that, with the exception of Colombia and Mexico, the projections making use of equation (2) underestimate the inflation expectations from central banks (positive forecast error). However, the results of the statistics and tests indicate that the use of equation (2) to forecast inflation expectations has good quality. In all countries,  $MAE$  is lower than 1, and the unbiasedness and autocorrelation tests approved the efficiency of the forecasts.

Since inflation expectations obtained from equation (2) represent a good proxy for inflation expectations made available from the central banks, it is possible to observe how the interaction between inflation target and credibility explains the expectations. In this context, figure 5 shows the decomposition of inflation expectations as computed from equation (2). Therefore, it is possible to see whether inflation expectations are a result of a backward-looking process. In other words, this case would represent a situation where the lack of credibility implies that the past inflation determines the expectations. In contrast, if the credibility is maximum there is a perfect convergence of expectations to the inflation target, and thus, the central bank has the power to anchor expectations.

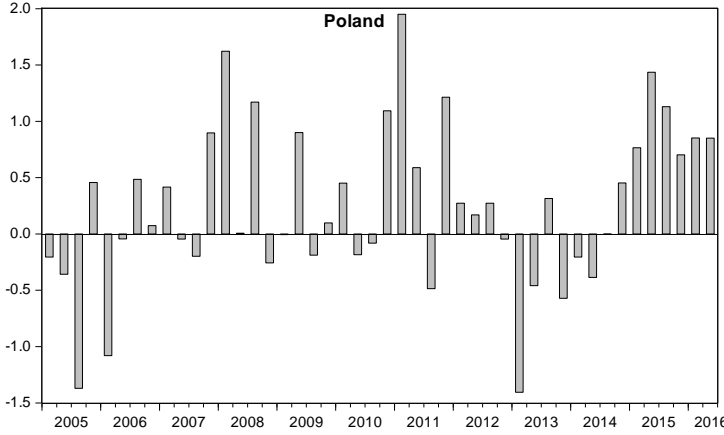
**Figure 4**  
*Forecast error*



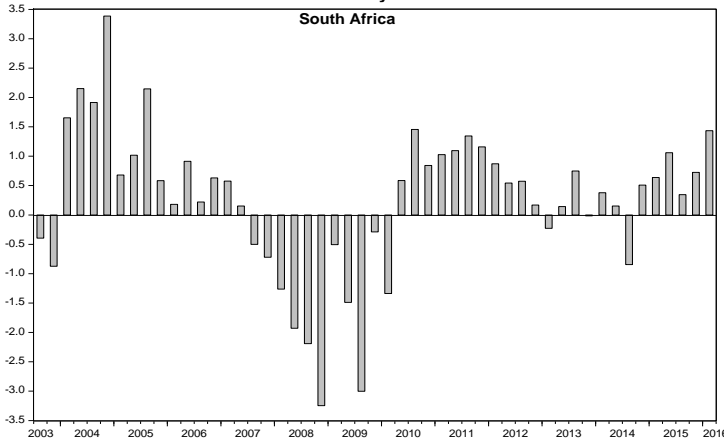
**ME = 0.312 MAE = 0.779 Accuracy: No bias = 8.637\*\* No corr = 4.232\*\***



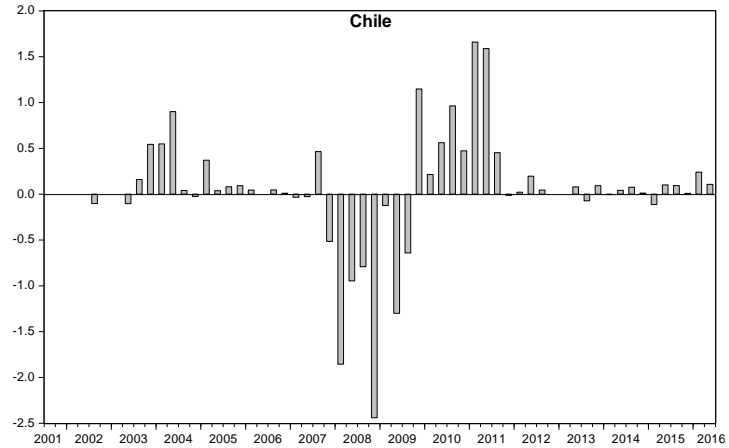
**ME = -0.041 MAE = 0.375 Accuracy: No bias = 31.243\*\*\* No corr = 13.287\*\*\***



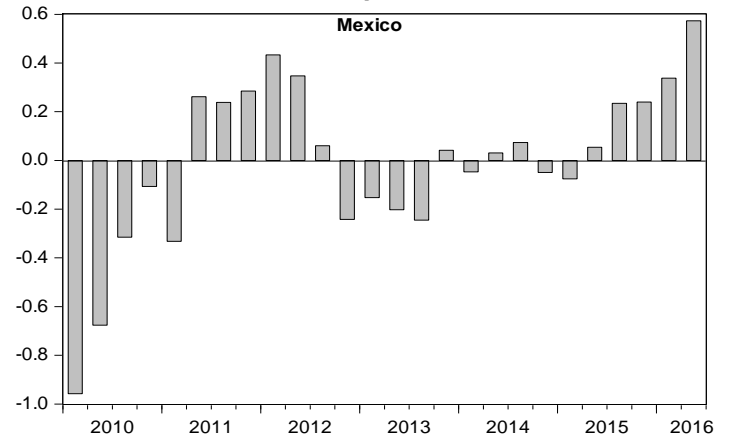
**ME = 0.241 MAE = 0.570 Accuracy: No bias = 5.267\* No corr = 5.313\*\***



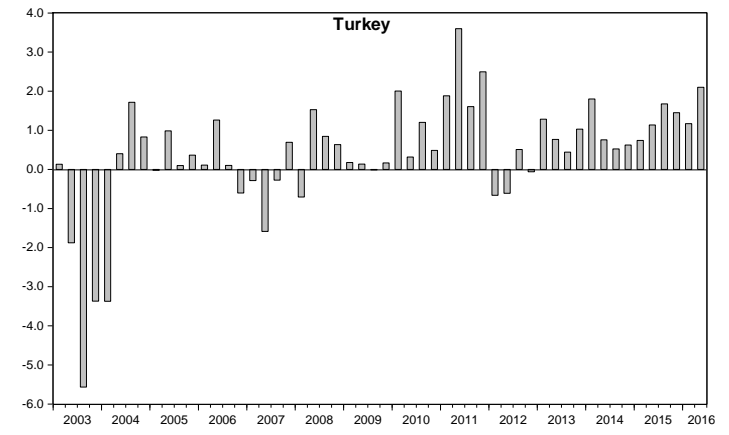
**ME = 0.258 MAE = 0.997 Accuracy: No bias = 314.986\*\*\* No corr = 7.004\*\***



**ME = 0.043 MAE = 0.368 Accuracy: No bias = 81.371\*\*\* No corr = 12.814\*\*\***



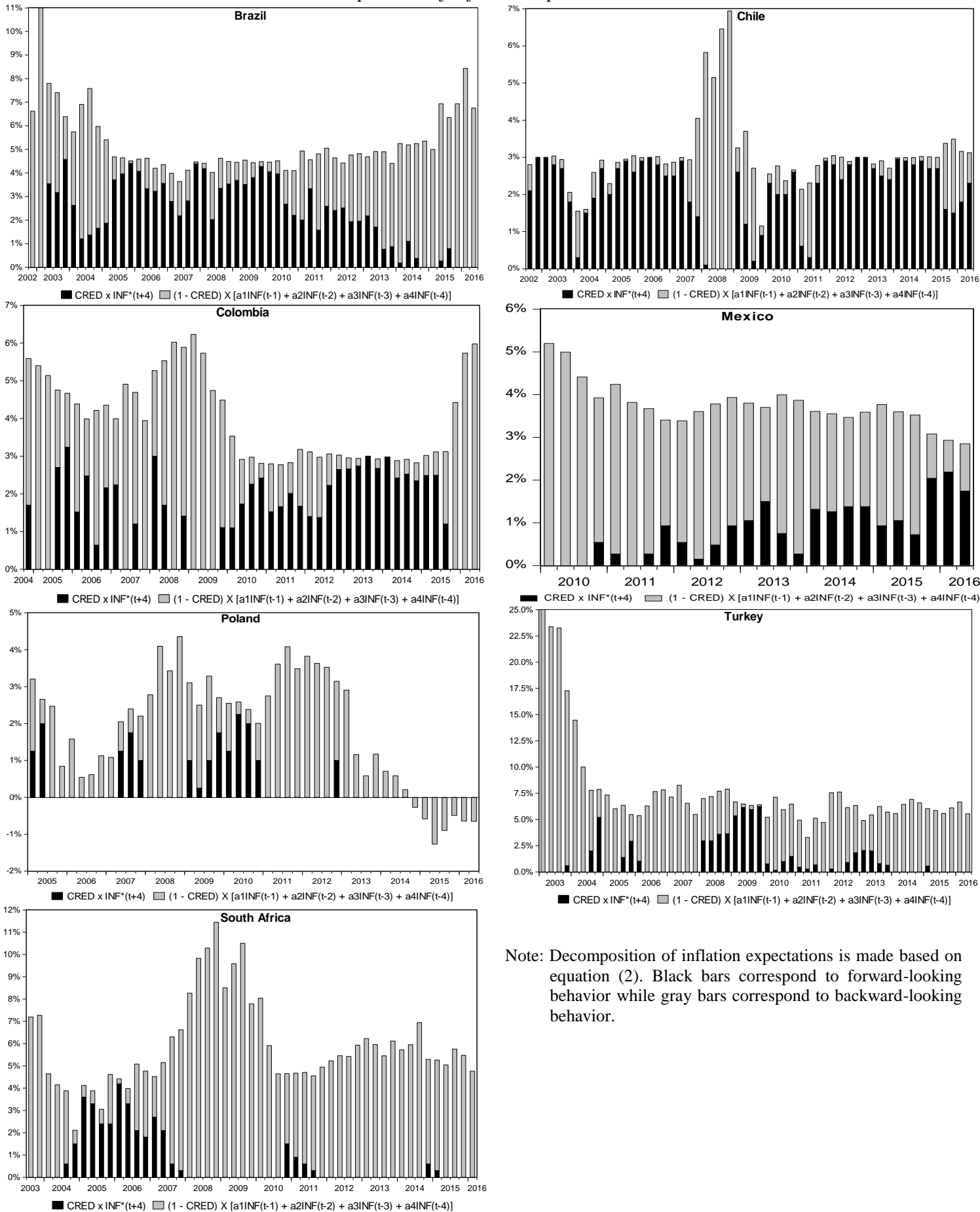
**ME = -0.007 MAE = 0.254 Accuracy: No bias = 151.240\*\*\* No corr = 5.879\*\***



**ME = 0.385 MAE = 1088 Accuracy: No bias = 25.643\*\*\* No corr = 3.503\*\***

Note: Accuracy is the test based on Holden and Peel (1990) where “No bias” reports the Chi-square in Wald test for null hypothesis  $\alpha=0$  and  $\beta=1$  (equation 6), and “No Corr” reports F-statistic for LM Test. (\*), (\*\*), and (\*\*\*) denotes rejection of the null hypothesis at the 10%, 5%, and 1% levels, respectively.

**Figure 5**  
*Decomposition of inflation expectations*



Note: Decomposition of inflation expectations is made based on equation (2). Black bars correspond to forward-looking behavior while gray bars correspond to backward-looking behavior.

The observation of figure 5 is impressive. With the exception of Chile, which presents a very good performance in anchoring inflation expectations, the other countries present a frustrating performance. The cases of Poland, Turkey, and South Africa, show that only in very few periods did inflation targets associated with credibility have the ability to contribute to the formation of inflation expectations. Colombia and Brazil did not present a very bad performance over time. However, the problem, especially in the Brazilian case, is that the central banks reduced the attention on inflation and the result is a deterioration in expectations in the last period. In contrast, Mexico seems to be improving the central bank's commitment with inflation target and the result is an increasing ability to anchor expectations.

#### 4. Impact of credibility on inflation expectations

Until the previous section, this analysis assumed a rule presented in equation (2) for inflation expectations. However, it is possible that credibility does not have a significant role in the determination of expectations. In order to observe if the monetary policy credibility is, in fact, relevant to inflation expectations, this section presents OLS estimations for inflation expectations based on two variations of equation (2). One model which considers the inflation target four quarters ahead ( $E_t(INF_{t+4})$ ) and the average of past inflation in the last four quarters ( $\overline{INF}_{t-1}$ ), that is:

$$(7) \quad E_t(INF_{t+4}) = \rho_0 INF_{t+4}^* + \rho_1 \overline{INF}_{t-1} + \zeta,$$

and other model which takes into account the credibility effect on inflation expectations through an interactive term with inflation target ( $INF_{t+4}^* \times CRED_t$ ) which corresponds to:

$$(8) \quad E_t(INF_{t+4}) = \gamma_0 INF_{t+4}^* + \gamma_1 INF_{t+4}^* \times CRED_t + \gamma_2 \overline{INF}_{t-1} + \xi.$$

The models above permit checking if the introduction of the credibility in the model improves the forecast of the inflation expectations. This can be observed through a measure of accuracy (root-mean-square error – *RMSE*) and the coefficient of determination (adjusted  $R^2$ ) – see table 2. In the case where the model with the presence of the credibility (equation 8) implies a lower *RMSE* and a greater adjusted  $R^2$ , there is an indication that the introduction of credibility improves the forecast. Furthermore, taking into consideration the usual case where inflation expectations are greater than inflation target, a  $\gamma_1 < 0$  means that credibility contributes to decrease inflation expectations and thus helps to the convergence to the target.

**Table 2**  
*Inflation expectations – estimations*

<i>Countries</i>	<i>Model without credibility</i>				<i>Model with credibility</i>				
	$\rho_0$	$\rho_1$	<i>Adj. R<sup>2</sup></i>	<i>RMSE</i>	$\gamma_0$	$\gamma_1$	$\gamma_2$	<i>Adj. R<sup>2</sup></i>	<i>RMSE</i>
Brazil	0.895*** (0.154)	0.204* (0.106)	0.465	1.091	1.120*** (0.184)	-0.425*** (0.116)	0.182** (0.088)	0.660	0.862
Chile	0.831*** (0.067)	0.186*** (0.061)	0.385	0.432	0.944*** (0.135)	-0.126 (0.124)	0.163*** (0.051)	0.414	0.418
Colombia	0.723*** (0.061)	0.331*** (0.046)	0.877	0.283	0.764*** (0.083)	-0.035 (0.034)	0.308*** (0.057)	0.875	0.281
Mexico	0.750*** (0.144)	0.411*** (0.125)	0.452	0.254	1.157*** (0.152)	-0.372*** (0.045)	0.166 (0.127)	0.740	0.171
Poland	0.153* (0.091)	0.787*** (0.080)	0.706	0.824	0.162 (0.099)	-0.197 (0.191)	0.812*** (0.086)	0.707	0.815
Turkey	0.636*** (0.146)	0.385*** (0.076)	0.898	1.322	0.790*** (0.293)	-0.193 (0.192)	0.320** (0.135)	0.900	1.296
South Africa	0.998*** (0.042)	0.299*** (0.031)	0.647	0.513	1.135*** (0.088)	-0.325*** (0.072)	0.228*** (0.062)	0.787	0.394

Note: Marginal significance levels: (\*\*\*) denotes 0.01, (\*\*) denotes 0.05, and (\*) denotes 0.10. Robust standard errors (Newey-West) are in parentheses.

The results in table 2 indicate that for all countries, the model with credibility presents better results (greater adjusted  $R^2$  and lower  $RMSE$ ). In addition,  $\gamma_1$  is negative and has statistical significance in all cases. Therefore, there exists evidence that credibility represents a good thing when the objective is to anchor inflation expectations.

## 5. Conclusion

This study presents an analysis of the effect of the monetary policy credibility on inflation expectations based on information gathered from seven inflation targeting emerging economies. Through the use of a simple rule for determination of inflation expectations it was possible to identify which part of expectations is associated with the interaction of the credibility with the inflation target and the part that is associated with the interaction of the lack of credibility with past inflation. Furthermore, it was observed if monetary policy credibility is relevant to improve forecasts regarding inflation expectations.

The findings in this study present a direct practical implication for the conduct of the monetary policy in emerging economies that makes use of inflation targeting. The main observation is that only adopting inflation targeting is insufficient to anchor inflation expectations. Although all countries in this study announce inflation targets, the lack of commitment of the central banks to the targets is unacceptable. With the exception of Chile, the emerging economies in this study are not able to maintain regularity in guiding inflation expectations to the inflation targets. The result is that the countries present low monetary credibility and, as a consequence, inflation expectations are determined in large measure by past inflation.

What should be done to reduce the lack of capacity to anchor inflation expectations? Credibility is imperative for countries with inflation targeting. This is not magic but a result of the commitment of the central banks to the targets. The main mistake of central banks in emerging economies is that they try to achieve unreal inflation targets and to respond to shocks on the economy at the same time. Credibility is intrinsic to time, thus only one government or one central banker tenure, which is really committed to the inflation target, is insufficient to establish credibility. Inflation (or deflation) is an incurable disease. Therefore, it demands continuous care. It is necessary to create mechanisms that increase the commitment of the central bank to the targets and to avoid governments using the benefits of a burgeoning credibility, as appears to have happened in Brazil. At last, of course inflation expectations can be influenced by several other variables that were not considered in this study and thus deserve attention in future research on this subject. However, the results presented show an unquestionable relevance of the monetary policy credibility on inflation expectations in emergent economies.

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