

# Inflation Targeting and the Role of the Exchange Rate: The Case of the Czech Republic

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Received: January 8, 2012

Accepted: January 19, 2012

Published: March 1, 2012

doi:10.5539/ibr.v5n3p33

URL: <http://dx.doi.org/10.5539/ibr.v5n3p33>

*I gratefully acknowledge the valuable comments and suggestions of an anonymous referee on this paper.*

*This study is supported by Japanese KAKEN (Ministry of Education, Culture, Sports, Science & Technology).*

## Abstract

This article analyzes the recent conduct of monetary and exchange rate policies in the Czech Republic. The Czech Republic entered 1993 as a newly independent country. It has introduced inflation targeting and floating exchange rate regime. The multidimensional nature of the inflation targeting definition explains why there is no consensus about whether or not it should be employed. However, the Czech Republic experience with inflation targeting seems to have been satisfactory. The authority has succeeded in maintaining a stable and moderate rate of inflation while enjoying economic growth. The exchange rate also has been stable. Using the Taylor rule, this article shows that the monetary authority has managed financial policy adequately and that the central bank looks forward rather than backward when it formulates monetary policy. Moreover, the exchange rate system, regardless of free-floating rhetoric, does not heavily influence the conduct of monetary policy in the Czech Republic because the central bank need not manipulate the exchange rate strongly and knows that exchange rate policy does not have a strong effect on the exchange rate itself under the global economy and financial deregulation.

**Keywords:** Czech Republic, Exchange rate, Inflation targeting, Monetary policy, Taylor rule

## 1. Introduction

Inflation targeting entails an institutional commitment to price stability as the prime goal of monetary policy, which gives the central bank accountability relative to the attainment of monetary policy goals, public announcement of targets for inflation, and a policy of communicating to the markets the rationale for the decisions made by the central banks. The independence of central banks is needed to give the monetary authorities the leeway necessary to commit to price stability. On the other hand, central banks are responsible for the conduct of monetary policy and its outcomes. Also, sound, stable fiscal policy and a stable banking system is needed to avoid problems that may prevent the central bank from subordinating other goals to the objective of price stability or undermining the independence of the central banks (Kurihara, 2010). Central banks sometimes need to avoid government intervention.

Although the effectiveness of inflation targets in lowering inflation levels and volatility remains controversial, this framework has been durable (Mihov & Rose, 2008). However, the multidimensional nature of inflation targeting explains why there is no consensus about whether or not it should be used.

In the past, the move to the inflation targeting and the emphasis on reducing inflation was accompanied by a weak economic performance in reality (Hayo & Neuenkirch, 2011). Many obstacles to inflation targeting have raised questions regarding its use in emerging markets. The difficulty of forecasting inflation is an obstacle to inflation targeting. It is not realistic to hope to forecast inflation with the requisite reliability if the country is still in the process of bringing down inflation from high levels, reforming taxation and public spending systems, and restructuring the private or banking sector. Credibility problems sometimes make inflation targeting less attractive. They mean more volatility and less flexible policy conduct.

Moreover, changes in import prices due to movements in the exchange rate are quickly passed to domestic market prices in emerging markets (Calvo & Reinhart, 2000). With this type of high pass-through, a change in the exchange rate has a large short-run impact on inflation and a small short-run impact on output in both emerging and developed markets. The exchange rate should be adjusted to offset the effects so as not to harm domestic markets. Recent deflation in many developed countries will also induce inflation targeting central banks to expand the money supply and allow the currency to depreciate, whereas an inflationary shock will induce the opposite reaction. (Note 1)

This article focuses on the Czech Republic, which introduced inflation targeting in 1998, just after the world financial crisis in 1997. Early in the 1990s, the Czech Republic had experienced bad economic conditions and high inflation until the flexible exchange rate regime replaced the fixed one in 1997. Such economic circumstance is one reason for the introduction of inflation targeting.

Kotán & Navrátil (2003) suggested that although inflation targets have been missed more often than met with actual inflation rates, the conduct of inflation targeting has contributed to the stabilization of the Czech economy. Hurník, Kameník, & Vlcek (2008) showed that monetary policy of the Czech Republic was more restrictive than implied by the observed ones (1998Q2-1999Q1, 2001Q3-2003Q2, and 2004Q3-2005Q4), on the contrary, the period from 2003Q3 to 2004Q2 had a relatively loose monetary policy.

Geršl & Holub (2008) showed that the intervention in the foreign exchange market in the Czech has a statistically significant but short-lived and economically not very important impact on the koruna's exchange rate. Holub & Hurník (2008) indicated that dealing with exchange rate volatility had been a key challenge for inflation targeting, and despite the missed inflation targeting, the regime was successful in stabilizing the inflation expectations. In general, the evaluation of the world inflation targeting has been high; however, it is necessary to analyze this country's inflation targeting and monetary policy. I employ the Taylor rule to examine empirically whether or not the monetary authority has adequately conducted financial policy.

This article is structured as follows. Section 2 reviews the monetary policy of the Czech Republic. Section 3 presents one theoretical model for empirical analysis. Section 4 shows the results and analyzes them. Section 5 analyzes the role of exchange rate in the conduct of monetary policy in this country. Finally, this paper ends with a summary.

## **2. Inflation Targeting in the Czech Republic**

The Czech Republic is one of two successor states of Czechoslovakia, the other being Slovakia. The Czech Republic entered 1993 as a newly independent country that still shared a monetary union with Slovakia. This arrangement rapidly proved to be unsustainable, and the union was dissolved in 1993. Since then, the Czech Republic has conducted its own independent economic and monetary policies.

Table 1 shows the development of basic macroeconomic variables in the Czech Republic, and Table 2 shows the conducted inflation targeting.

Insert Table 1 Here

Insert Table 2 Here

The heritage of Czechoslovakia was overall macroeconomic stability. The country had been a bulwark of monetary and fiscal prudence during communism and the early transition policies confirmed this trend (Drabek, Janacek & Tuma, 1994). Restrictive monetary and fiscal policies accompanied the start of reforms in January 1991, ensuring that inflation fell after the initial jump caused by price liberalization. After falling to approximately 10 % in 1992, inflation rose to about 20 % in 1993 as a result of the introduction of the value-added tax (VAT) in the Czech Republic in January 1993.

The years 1993 to 1997 are generally regarded as a period of prosperity. The economy recovered greatly and growth rates were quite high. Growth was accompanied by high employment rates without parallel in other countries. Inflation stabilized at around 10 %. In the second half of 1995, the Czech Republic liberalized the current account of the balance of payments. As a result of relatively high interest rates, a stable nominal exchange rate, and low perceived political risk, the economy of the Czech Republic began to attract large amounts of capital from foreign countries in 1994 and 1995. However, reflecting sluggish export growth and strong increases in imports, economic growth began to slow in 1995 to 1996. Prompted by a combination of a major currency crisis in Asia and some European countries and a recession, in 1997, the government passed an austerity package that contained expenditure cuts, other measures to dampen domestic demand, and medium-term institutional and structural measures to stimulate the supply side of the Czech economy.

From 1998 to early 2000, the economy emerged from the recession. Along with the central bank, the new government conducted a massive clean-up and privatization of major banks, which led to a revival in lending activity. Fiscal policy was largely relaxed to pay the costs of bank restructuring and to stimulate demand by investment in infrastructure and significant increases in pay for public employees. Unemployment was stabilized and inflation remained low and stable (Beblavy, 2007).

The monetary policy irrelevance of inflation targeting in the environment of high and unstable capital inflows was one of the reasons that the Czech central bank switched to direct inflation targeting after the exchange rate crisis of 1997. The central bank had argued that inflation targeting had a problem caused by a lack of predictable relationship between monetary aggregates and inflation. However, at the beginning of 1998, the Czech National Bank (CNB) finally set a target for net inflation as the final target.

At the beginning of this transition, Czech Republic policymakers had to institute a monetary policy framework that would take advantage of sound economic fundamentals along with the inflation targeting. The policy response was a fixed exchange rate as the intermediate target of monetary policy complemented by inflation targeting. The central bank announced inflation targeting in terms of the so-called headline consumer price index; however, the exchange rate peg remained the nominal anchor.

A partial improvement in economic growth was followed by a repeated slow-down, with an excessive appreciation of the koruna with low foreign direct investment. However, since 2003, foreign direct investment and accession to the European Union accelerated economic growth (Antal, Hlaváček & Holub, 2008).

Considering these past situations, it seems important to analyze the Czech Republic's monetary policy. The Czech government has succeeded in stabilizing inflation and has experienced economic growth while some countries, especially European countries, have suffered much economic damage.

### 3. Theoretical Analysis

One way to infer the importance of inflation, the real economy, and the exchange rate in the policy decisions of the CNB is to estimate an extended Taylor rule, a formula created by John Taylor to provide guidance for central banks to set short-term interest rates to attain both their goals for stabilization of inflation and the economy. The rule states that the short-term interest rate (usually adjusted for inflation) is determined according to three factors: (1) where actual inflation is above or below the targeted level, (2) how far economic activity is above or below the full-employment level, and (3) what the level of the short-term interest rate would be consistent with full employment level. (Note 2) Moreover, Holub (2008), which focused on the Czech economy, indicated that movement of the real exchange rate gap takes over as the most important factor for deviations of inflation from the target. Other studies have followed this approach. Along with the reason explained in the previous section, this article takes into account the exchange rate in the Czech Republic.

Assume that the call rate partially adjusts to the target according to the function:

$$r_t = (1-\rho)r_t^* + \rho r_{t-1} + v_t \quad (1)$$

where,  $r$  is the call rate,  $r_t^*$  is the target rate for it, and  $v$  is a random shock. The coefficient  $\rho$  captures the degree of interest rate smoothing practiced by the central bank.  $t$  means time.

$r_t^*$  is assumed as follows:

$$r_t^* = r_t^{**} + \beta(E[\pi_{t+n}|\Omega_t] - \pi^*) + \gamma E[\text{output gap}_t|\Omega_t] + \zeta[z_t|\Omega_t] \quad (2)$$

where,  $r_t^{**}$  is the long-run equilibrium nominal interest rates,  $\pi_{t+n}$  is inflation between period  $t+n$  and period  $t$ ,  $\pi^*$  is targeting inflation rate, and  $z$  is another variable that may influence the reaction of the central bank. Combining (1) and (2) results in the following:

$$r_t = (1-\rho)[\alpha + \beta\pi_{t+n} + \gamma\text{output gap}_t + \eta z_t] + \rho r_{t-1} + \varepsilon_t \quad (3)$$

where,  $\alpha = (r_t^{**} - \beta\pi^*)$ , and  $\varepsilon_t = (1-\rho)[\beta(\pi_{t+n} - E[\pi_{t+n}|\Omega_t]) + (z_t - E[z_t|\Omega_t]) + v_t$ .

Let  $u_t$  be a vector of variables included in the central bank's information set at the time it sets the interest rate that are orthogonal to  $\varepsilon$ .

$$E[\varepsilon_t | u_t] = 0 \quad (4)$$

Finally,  $z$  is assumed to be a real exchange rate considering this country's monetary policy. Exchange rate may have influenced the central bank's monetary policy. The next section provides an empirical analysis based on this theoretical analysis.

#### 4. Empirical Analysis

Equation (4) entails the orthogonality conditions that we exploit to estimate the unknown parameters via GMM (generalized method of moments). GMM is a robust estimator in that, unlike maximum likelihood estimation, does not require information about the exact distribution of the disturbances. Hansen's J statistics is also performed. This test checks whether the models moment conditions match the data or not. In a GMM context, when there are more moment conditions than parameters to be estimated, this chi-square test can be used to test the over-identifying restrictions.

Dependent variable is overnight call rate. I used a one-time lag of the overnight call rate based on Eichengreen (2008), real GDP growth rate, the inflation rate (Note 3), and the lagged rate of real exchange rate depreciation as the explanation variables of the central bank's information set. Including (a one-time lag of) the interest rate and real exchange rate as explanation variables is a difference from pure Taylor model. The sample period is 1998 to 2010. (Note 4) In 1998, the central bank introduced inflation targeting. The data are quarterly. All of the data have no unit root at least at the 10 % level by the ADF test. All of data are from International Financial Statistics (IMF).

An important step is to estimate the output gap. Various methods may be employed for this purpose. The time series for GDP is transformed into an output gap series in two ways following Eichengreen (2008). One is to use the two-sided linear Hodrick-Prescott filter and the other is to use a linear trend. First, I examine the forward-looking case for the inflation rate. The results of the estimation are shown in Table 3.

Insert Table 3 Here

The results indicate a good fit for actual movements in the call rate in general. The equations show that the call rate rises along with inflation. It also rises as actual output increases relative to capacity. The lagged dependent variable of interest rate  $\rho$  is significant and very large. Although the presence of the lagged dependent variable explains the success of these equations in following trends in the call rate, the other variables, inflation and output gap, still appear to have a role in determining call rate as expected. All of the variables are significant at the 1 % level.

The key finding is that the rate of change in the real exchange rate does not influence the setting of the policy instrument in equations (3) and (4). (Note 5) When the real exchange rate depreciates, there should be a tendency for the CNB to raise the call rate; however,  $\zeta$  are in the opposite direction, counter to expectations; however, they are not significant. The addition of the rate of currency depreciation reduces the magnitude of the other coefficients but does not change the results.

Finally, the method for the calculation of output gap does not produce a large difference in results as shown in the equations for the case of (1) (3) and (2) (4). (Note 6)

In Table 4, it is interesting to note that the substitution of backward-looking for forward-looking behavior produces a negative coefficient for the excess of actual output over capacity output in some cases [equations (5), (7), and (8)]. Estimates of monetary policy reaction functions that are framed in terms of backward-looking price movements can be seriously misleading. (Note 7)

Insert Table 4 Here

Compared to the results of Table 3, the results are not satisfactory. The CNB looks forward rather than backward when it formulates monetary policy.

#### 5. The Role of the Exchange Rate

Introduction of inflation targeting as an economy's monetary policy framework does not guarantee interest rate stability. The literature on the effects of inflation targeting on exchange rate volatility is not conclusive. Edwards (2007) suggested that volatility increases with inflation targeting as a result of the flexible exchange rate regime. Rose (2007) indicated that inflation targeting delivers the best outcomes in terms of lower exchange rate volatility. Some advocates of inflation targeting have taken the position that the exchange rate regime that is fully compatible with an inflationtargeting framework for the conduct of monetary policy is essentially free-floating. At the most basic level, the choice of exchange rate regime, or the weight placed on changes in the exchange rate in the central bank's reaction function, should be a function of a country's economic development strategy.

The Czech Republic has been committed to a strategy of export-led growth, which can keep the exchange rate stable at a competitive level. Czech policymakers may be reluctant to move to greater exchange rate fluctuation because of the worry that exchange rate stability is important for economic growth. A strategy of keeping the exchange rate from appreciating and keeping interest rates low to confer additional resources into the production of exports-or, more generally, into the production of those goods for which the scope for productivity improvement is greatest-does not work as well in the Czech Republic.

However, few studies have analyzed the relationship between inflation targeting and exchange rate. The main reason may be that many emerging countries that had adopted inflation targeting have changed their exchange rate regime from fixed to floating and their nominal anchor from exchange rate to inflation targeting. Since the introduction of the floating exchange rate regime, some emerging countries have had to intervene in the foreign exchange markets more than advanced economies. Domaç & Mendoza (2004) suggested that foreign exchange market interventions reduce exchange rate volatility, whereas Guimarães & Karacadag (2004) found that interventions had a limited effect on volatility. Using panel data for 37 countries, Berganza & Broto (2011) showed that inflation targeting leads to higher exchange rate volatility. As these, it seems that the results are inconclusive.

In this present study, the case of the Czech Republic, the reason why the real exchange rate does not influence interest rates is difficult to understand. It can be understood that (1) the central bank need not manipulate the exchange rate strongly, (2) the central bank knows that exchange rate policy does not have a strong effect on exchange rates themselves under the global economy and financial deregulation, (3) the central bank has tried to manipulate the exchange rate; however, it has not had strong positive effects. The reason for (3) may not be able to be adopted as it would be unnecessary and impossible to manipulate exchange rate strongly by interventions. The CNB does not seem to have taken such stances (3). So (1) and (2) should be the reason that the equations excluding real exchange rate would be adequate.

## 6. Conclusions

The Czech experience with inflation targeting has been satisfactory. The authority has succeeded in maintaining a stable and moderate rate of inflation while enjoying economic growth when it conducts monetary policies. The technical problems suggested by skeptics of the application of inflation targeting have not interfered with the operation of this regime. This article suggested that the CNB did not look backward but forward for inflation rate. Also, The CNB does not care about the real exchange rate when it manipulates interest rates. The reason may be (1) the central bank need not manipulate the exchange rate strongly and (2) the central bank knows that exchange rate policy does not have a strong effect on exchange rates under the global economy and financial deregulation.

The Czech Republic has conducted an overall package of reforms that has promoted and sustained economic growth and modernization. Inflation targeting seems to be a useful strategy for the conduct of monetary policy; however, there is no relationship between the real exchange rate and interest rates under inflation targeting. On this point, further research is needed.

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## Notes

- Note 1. Empirical evidence suggests that this is the case for Brazil and Mexico. See Mishkin&Savastano (2000).
- Note 2. There are many opinions about this rule. See, for example, Taylor & Davradakis (2006), which suggested that the very predictability of this policy rule, set out in a nonlinear framework, may be one reason that the United Kingdom has enjoyed price stability combined with strong growth. I followed the approach of Clarida, Gali, & Gertler (1998).
- Note 3. Fackler & McMillin (2011) suggested a dynamic stochastic simulation of the average inflation rate using the moving average representation of a vector autoregressive (VAR) model.
- Note 4. Another reason why the sample period is short is a result of the lack of data.
- Note 5. The result is similar to de Gregorio et al. (2005).

Note 6. Horváth (2008) suggested that the sign of exchange rate was significantly opposite and the sign of output gap was minus; however, it is not significant. Erdem & Kayhan (2011) indicated that the Czech central bank did not take into account output gap and exchange rate when considering the short-term interest rate.

Note 7. Eichengreen (2008) showed similar results.

Table 1. Macro-Economic Variables in the Czech Republic (%)

	97	98	99	00	01	02	03	04	05	06	07	08	09	10
CPI	10.0	6.8	2.5	4.0	4.1	0.6	1.0	2.6	2.2	1.7	5.4	2.9	1.0	1.6
Growth rate	-0.7	-0.8	1.3	3.6	2.5	1.9	3.6	4.5	6.4	6.4	6.5	3.2	-3.5	0.1
Unemployment rate	5.4	7.3	9.0	8.3	7.8	7.3	8.1	8.2	7.8	6.5	4.8	4.2	5.5	5.7

Table 2. Inflation Targets

Year	Target Level	Set in
1998	5.5-6.5	December 1997
1999	4.0-5.0	November 1998
2000	3.5-5.5	December 1997
2001	2.0-4.0	April 2000
2005	1.0-3.0	April 1999

Table 3. GMM Estimates: Forward-Looking Inflation

Eq.	$\alpha$	$\beta$	$\gamma$	$\rho$	$\zeta$	Adj.R <sup>2</sup>	D.W.	J-test	Output gap
(1)	3.49*** (4.73)	216.41*** (5.15)	24.86** (2.58)	0.93*** (20.82)		0.58	1.80	4.12	Hodrick=Prescott
(2)	3.14*** (4.41)	229.63*** (5.71)	26.52*** (2.89)	0.91*** (21.15)		0.63	1.92	4.34	Linear trend
(3)	3.60*** (4.82)	212.72*** (4.25)	23.29** (2.42)	0.92*** (20.56)	-20.28 (-0.99)	0.61	1.60	4.40	Hodrick=Prescott
(4)	3.25*** (4.50)	217.25*** (4.79)	26.14*** (2.80)	0.94*** (21.06)	-18.85 (-0.96)	0.66	1.62	4.45	Linear trend

Note: Data in parentheses are t value. \*\*\* means significant at 1 %; \*\* means significant at 5 % level respectively.

Table 4. GMM Estimates: Backward-Looking Inflation

Eq.	$\alpha$	$\beta$	$\gamma$	$\rho$	$\zeta$	Adj.R <sup>2</sup>	D.W.	J-test	Output gap
(5)	3.13*** (4.41)	223.10*** (24.39)	-24.39** (-2.64)	0.94*** (25.43)		0.62	0.91	4.52	Hodrick=Prescott
(6)	2.83*** (4.41)	131.38*** (2.98)	11.23** (2.29)	0.93*** (24.18)		0.38	0.40	3.98	Linear trend
(7)	3.26*** (4.54)	231.85*** (5.66)	-25.18*** (-2.72)	0.910*** (18.89)	-17.56 (-0.90)	0.62	0.92	4.55	Hodrick=Prescott
(8)	3.29*** (4.50)	128.86*** (5.51)	-24.70** (-2.65)	0.908*** (18.72)	-20.14 (-1.02)	0.64	0.45	4.03	Linear trend

Note: Data in parentheses are t value. \*\*\* means significant at 1 %; \*\* means significant at 5 % level respectively.