INTERVENTION INTO THE DEVELOPMENT OF CURRENCY EXCHANGE RATES AND PROSPERITY OF ECONOMY

Jiří Kraft

Abstract: *The stagnation in economic growth is a problem of developed market economies. Its cause may be a lack of demand caused by the phenomenon of deflation. In addressing these issues monetary policy instruments are offered to use. The prosperity of a small open economy, however, in today's globalizing world, is strongly influenced by the development of relevant foreign economies. Reducing the exchange rate of the national currency may lead to an increase in the price level, and thus solve the problem. Such a step was taken CNB (Czech National Bank) in November 2013. The aim of this article is to assess whether the CNB intervention to the detriment of the exchange rate of the CZK has contributed to increasing prosperity of the Czech economy. The evolution of the exchange rate CZK/EUR is being analysed on the one hand, and on the other the developments in the GDP, exports and imports, and their relationships, using the sensitivity rate, regression analysis and comparison of standardized values within 20 quarterly periods in 2010-2014. The results show that after CNB intervention, there has been a noticeable growth in GDP, while exports grew with a higher dynamics than imports.*

Introduction

Since the collapse of the gold standard exchange rates have been the subjects of interest not only to economists. This was the case even before the First World War, i. e. during the period of the gold standard, but now it is also the subject of their regulation. This is usually implemented directly on non-convertible currencies, or, more frequently, indirectly on convertible currencies. Central bank interventions refer not only to developed countries such as Japan [16], but also to developing countries, for example, Zambia and Pakistan [4], [14]. Monetary policy and its instruments have a significant impact on the real economy, which is also reflected in a different way in the European Economic Area. [2], [11], [15] It is usually assumed that the decline of the domestic currency will increase exports and also to dampen import, which will not only improve the trade balance in terms of actions against its eventual deficit, but since the decline of the domestic currency is expected to boost a growth in the gross domestic product (GDP). This situation is typical for the reality of today's Czech Republic, and with this in mind; the Czech National Bank creates downward pressure on the exchange rate of CZK against EUR and USD.

The logic is more or less clear in the situation with a minimum rate of inflation, which tends to transform into deflation. In connection with deflation, an interest drop of local residents in shopping at present, as well as an interest to postpone purchases can be expected. This would lead to a drop in demand, which is critical for the change in GDP, especially in view of the Keynesian economic theory. [3] Insufficient demand could indeed dampen the GDP growth, which is why the Czech National Bank intervened to create

downward pressures on the CZK exchange rate to raise inflation, discourage home residents from postponing purchases and ensure a level of domestic demand, which would create conditions for the growth of GDP.

However, for this consideration many contentious moments arise, among which plays a major role the philosophical category "rate of things". There is the question now, if the expected positive moments of GDP growth, which especially in the Czech Republic depend on a number of other factors besides causing inflation, are adequate in relation to the negative consequences that the artificial reduction of the CZK exchange rate leading to an inflation increase causes? In this context, it is possible to ask other questions: How high will be the percentual increase in the domestic demand in case of a possible increase in the price level of 1%? Or vice versa, how big will be the reduction in the market demand in case of a possible reduction in the price level of 1%? Do the residents postpone their home purchases due to a reduction in the price level in the above mentioned case? Therefore, is it possible to describe GDP growth stimulation by reducing the exchange rate of the domestic currency? All these questions cannot be answered in this article because of its scope; it will be focused on one of the crucial issue, particularly whether it is possible to quantify the link between the decline in the CZK exchange rate and the GDP growth in the Czech Republic.

It is necessary to perceive the Czech economy in its position of a small and open economy as part of the relevant neighbourhood. In the parable by R. B. Reich, who describes the globalizing world economy as a magnificent fleet of the national economies sailing on the same vast ocean, the speed and safety of a particular ship depends to a certain extent on the speed and safety of the others. [12] Important in this context is the fact that in the period 2010-2014, the already high share of exports in the GDP of the Czech Republic increased - derived from the CZSO data - from 62 to 84.5%. [8]

1 Initial theoretical aspects influencing exchange rates by the central bank

The current situation whereby the central bank influences the domestic currency is not newsworthy in the Czech Republic. At the time when the market economy had been recovered in the territory of the current Czech state after 1989, it was understandable that with regard to a problematic competitiveness of the domestic production on Western markets, while leaving some Eastern markets by Czechoslovak enterprises, it was necessary to underestimate the domestic currency, then the Czechoslovak crown, and thus act to minimize the deficit of the foreign trade balance. The effect was also reflected upside down; basically it was a protectionist measure, when the decline of the domestic currency raised the prices of the foreign production.

This step was also influenced by the market, even though the domestic currency was not convertible at the time, while the growth in the domestic price level was faster than in Western Europe. When the domestic currency was not declining, so actually a process called revalflation [10] spontaneously increased since the purchase of the same quantity of goods in the consumption basket in two consecutive compared periods demanded a greater increase in CZK in the former Czechoslovakia than it was necessary e.g. in Germany in the German currency (DEM). In simple terms, for the same purchase in the subsequent period in the Czech Republic (Czechoslovakia) it was necessary to have a larger amount of DEM exchanged into CZK and because the original amount of CZK in view of the higher price level growth in the Czech Republic has already mediated the trade. So at an unchanged CZK/DEM exchange rate the CZK actually appreciated. The stimulation

of the GDP growth by the Central Bank was de facto a subsequent effect then, the inflation in the Czech Republic was not necessary to rise by exchange rate changes directed elsewhere.

The current situation is completely different. From a theoretical point of view, in favour of the intervention of the Czech National Bank with the intent to decline the CZK exchange rate speaks the fact that the Czech economy is dependent on sales abroad, especially in Germany, and the decreased CZK rate may reduce the cost of Czech production at this dominant customer, and thereby increase the sales, or respectively the demand for it. In addition, as in the aforementioned past, a problematic effect occurs (replacing duty imposed), in particular an price increase of foreign production resulting from a lower exchange rate, and thus reducing the level of competition on the domestic market. That bond of elasticities of imports and exports are relevant to the effectiveness of the decline of the domestic currency in relation to the resulting change in the trade balance, as is clear from Marshall-Lerner condition. [9]

On the other hand, it is known from the theory that the demand for domestic production abroad is mainly given by the amount of incomes in importing countries, and the income growth provokes induced imports. But this is not contradictory, since the effect of income growth and the effect of a price drop of imported production is somewhat analogous. It can also cause selectively, thus being in favour of purchasing products from a country which decreased its prices declining the exchange rate of its currency.

The CZK exchange rate decrease is equally positively justifiable also in terms of stimulating the domestic demand. Postponing consumption is – in a situation when the price level rises at an interest rate from deposits converging to zero - certainly irrational, while the economics assumed rational behaviour of economic subjects.

On the other hand, it is necessary to take into account the phenomenon of elasticity. The sensitivity of the percentage change of the quantity exported to foreign countries to the percentage price changes of exported products caused by the lower exchange rate is important for deciding whether it is advantageous to "subsidize" exports by declining the exchange rates. If the elasticity is high and a low percentage change (decrease) in price leads to a high percentage increase in imported quantities into the importing country, then actually no above mentioned "subsidy" occurs because the exporter reports the effect of raised incomes resulting from the increase in imports from abroad. Otherwise it does not apply. The above stated elasticities are very „national" issues, that is why estimates from internal experts are generally more accurate than those from external ones. [1] After ČNB's intervention that led to a decrease of the CZK/EUR exchange rate, there have been repeated attempts by the market to improve the CZK/EUR rate. So far, the last intervention on the part of ČNB, aimed to prevent new rises in currency value, took place in 2015.

In terms of understanding the developments in foreign exchange markets, especially for subjects not versed in these matters, it becomes necessary to draw one's attention to a particular paradox, namely that growth in the nominal sum of domestic currency necessary to purchase units of foreign currency (it's mathematical growth) is mirrored by a simultaneous decrease in the domestic exchange rate value, as more units for purchases of foreign currency are now required.

This article aims to assess whether the step taken by CNB on 7th November 2013, when its intervention has achieved a reduction of the exchange rate from 25.788 to 26.852

CZK/EUR, was the right or not in terms of the impact on the GDP and foreign trade as two important indicators of prosperity of the Czech economy.

2 Methodology

Apart from the development of the CZK/EUR exchange rate, both GDP and exports and imports of goods and services must be included in the evaluation. CZSO and CNB data have been analysed for the years 2010 - 2014 in quarterly periods, i.e. for 20 periods in total.

For a more thorough assessment of the phenomenon, there are applied following three methods: sensitivity analysis, which is recommended in this context and applied in certain modifications [13], regression analysis and comparison based on standardized values. The sensitivity rate is calculated to reflect changes in the exchange rate CZK/EUR corresponding to changes in GDP, exports and imports by formula (1). Within the regression analysis a linear regression function is evaluated both for the whole period 2010-2014, both for symmetric long periods after the CNB intervention and before it. For a comprehensive look at the development of all four parameters, allowing the comparison, their transfer to standardized values using the formula (2) has been used.

$$s = \frac{Y_{t+1}-Y_t}{Y_t} \Big/ \frac{C_{t+1}-C_t}{C_t}, \text{ resp. } s = \frac{E_{t+1}-E_t}{E_t} \Big/ \frac{C_{t+1}-C_t}{C_t}, \text{ resp. } s = \frac{I_{t+1}-I_t}{I_t} \Big/ \frac{C_{t+1}-C_t}{C_t} \qquad (1)$$

$$h_{ti} = \frac{x_{ti}-min_i}{max_i-min_i} \qquad (2)$$

Expanatory notes:

Y	GDP gross domestic product	I	imports	index t	time period
E	exports	C	exchange rate	index i	assessed indicator

3 The development of the CZK/EUR exchange rate, GDP and foreign trade - analysis results

The exchange rate CZK/EUR appeared in the period from 2010 until November 2013 as relatively stable (variation range at the level of 1.547 CZK/EUR) with signs of appreciation, with the exception of the last quarter of 2011, as shown in Fig. 1. To the date of 6th November 2013, when the exchange rate was 25.788 CZK/EUR, CNB decided to intervene against the CZK, and the exchange rate fell to 26.852 CZK/EUR on 7th November 2013.

Fig. 1: Development of quarterly average exchange rate CZK/EUR in 2010-2014
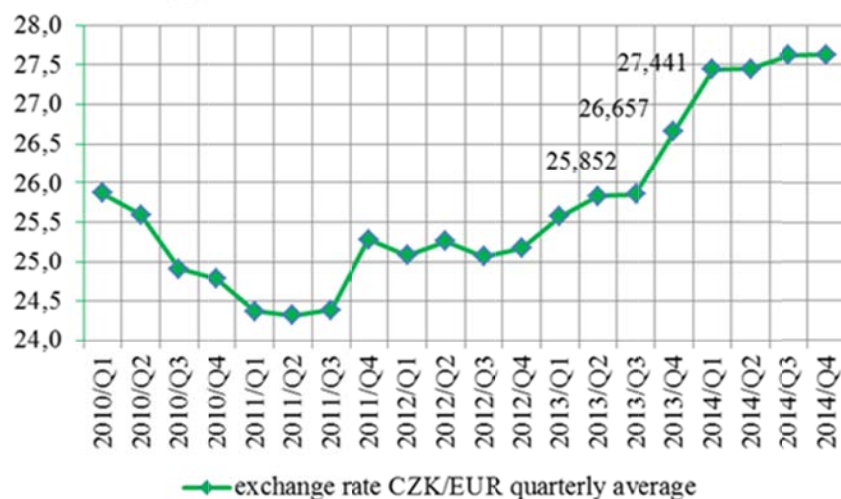
The CNB Bank Board with reference to the recommendations of the evaluation mission of the International Monetary Fund has decided as early as in autumn 2012 to use the exchange rate as an instrument of its monetary policy, especially to apply foreign exchange interventions against deflation risks, with the justification that "This tool is for the Czech Republic, which is a small open economy with a long-term excess liquidity in the banking sector, more effective for releasing monetary conditions than other tools."[4] As a result, the variation range for the entire time period 2010-2014 roughly doubled and reached the level of 3.303 CZK/EUR.

3.1 A sensitivity analysis of the GDP response to changes in the CZK/EUR exchange rate

For the evaluation of the sensitivity of the GDP development and the exchange rate are relevant the values of relative increments in both variables. The data in Tab. 1 show that the relative increase in GDP was negative in only 4 of the 20 evaluated quarters, while the relative increase of the CZK/EUR exchange rate was up to 2012/Q3 mostly negative. A positive sensitivity rate thus points to the direction of a harmonious development of both indicators. With a few exceptions (namely: 2011/Q3, 2011/Q4 and 2012/Q4) the GDP reacts with its growth to the CZK/EUR exchange rate growth over the period from 2010/Q2 to 2013/Q1. It is interesting to compare the significant proportional response of the GDP in 2011/Q3 and 2013/Q3 (CNB intervention period). After the CNB intervention there is a considerable oscillation of the sensitivity parameter, but it is accompanied by the reduction of the CZK/EUR exchange rate by the GDP growth.

Tab. 1: Sensitivity rates of GDP and the CZK/EUR exchange rate in the period 2010-2014

Time period	Relative GDP increment	Relative exchange rate increment	Sensi-tivity rate	Time period	Relative GDP increment	Relative exchange rate increment	Sensi-tivity rate
2010/Q1	.	.	.	2012/Q3	-0.003713	-0.007759	0.3539
2010/Q2	0.009999	-0.010786	-8.0942	2012/Q4	0.001400	0.004069	-4.7035
2010/Q3	0.003085	-0.026418	-2.8137	2013/Q1	-0.000241	0.015934	-1.2365
2010/Q4	-0.001271	-0.005098	1.6367	2013/Q2	0.003293	0.010286	2.6866
2011/Q1	0.006818	-0.016582	-1.4502	2013/Q3	0.006506	0.000813	31.8064
2011/Q2	0.005718	-0.002215	-0.8845	2013/Q4	0.022662	0.031139	1.3939
2011/Q3	0.004411	0.002755	11.1205	2014/Q1	0.013341	0.029411	1.2250
2011/Q4	0.003993	0.036534	-0.1468	2014/Q2	0.005345	0.000219	121.4796
2012/Q1	0.004760	-0.007753	-8.1975	2014/Q3	0.007259	0.006230	0.4732
2012/Q2	-0.003728	0.007096	-0.5383	2014/Q4	0.005900	0.000217	142.2162

Source: author´s own calculations based on CNB data [7] and CZSO [8]

3.2 Character of the linear regression functions and their reliability

The equation parameters of the linear regression function, in which the exchange rate CZK/EUR acts as the independent variable, are shown in Tab. 2. The analysis is carried out in three versions: one for the entire examined period, i.e. for the 20 quarters; another one - in the interest of time symmetry - for five consecutive quarters before and after the CNB intervention, in particular for three dependent variables: GDP, exports and imports.

Parameter "a" notes for which value the y axis is intersected by the line. The positive parameter "b" indicates the increasing linear function, the higher the value, the greater the positive response of the dependent variable to changes of the independent variable. It is evident that the reliability of the linear functions is high for all indicators in the period after the intervention, while in terms of foreign trade it is low in the period before the CNB intervention. However, the regression function showing the relationship between the CZK/EUR exchange rate and GDP has in terms of assessing the overall period of the highest reliability, while in the case of evaluating the period after the CNB intervention, the reliability of the relationship CZK/EUR and Czech exports is "the leader".

*Tab. 2: Parameters of the linear regression functions*

Dependent variable	Time period	Parameter a	Parameter b	Reliability R^2
GDP	2010/IQ-2014/IVQ	449 887	22 122.0	0.7347
	2012/Q3-2013/Q3	772 658	9 406.2	0.5913
	2013/IVQ-2014/IVQ	256 340	29 447.0	0.8340
exports	2010/IQ-2014/IVQ	- 740 313	58 572.0	0.5833
	2012/Q3-2013/Q3	356 840	16 354.0	0.1718
	2013/IVQ-2014/IVQ	- 1 000 000	75 928.0	0.9583
imports	2010/IQ-2014/IVQ	- 476 636	46 354.0	0.5194
	2012/Q3-2013/Q3	565 248	5 989.1	0.0236
	2013/IVQ-2014/IVQ	- 907 142	62 721.0	0.7719

Source: author´s own calculations based on CNB data[7] and CZSO [8]

3.3 Comparison of the development of selected indicators using standardized values

Standardized values allow elegantly compare the development of various indicators in terms of their scope. They range in the interval from 0 (minimum) to 1 (maximum). Application of this method to GDP, export, import, and CZK/EUR exchange rate during the 20 quarters in the period 2010-2014 shows a very similar development of exports and imports, and an analogous - albeit with a certain detachment between the 9th and 15th periods, i.e. between 2012/Q1 and 2013/Q3 - development of the GDP growth. However, a significantly different development of the standardized values, as shown in Fig. 2, can be observed in the development of the exchange rates, and this until 2013/Q3. After the CNB intervention - simply said - all standardized values converge, since the 16th period (2013/Q4), i.e. in the CNB intervention period, and the standardized values of the CZK/EUR exchange rate exceed the other evaluated indicators.

Fig. 2 Development of the standardized values of GDP, exports, imports and exchange rate CZK/EUR
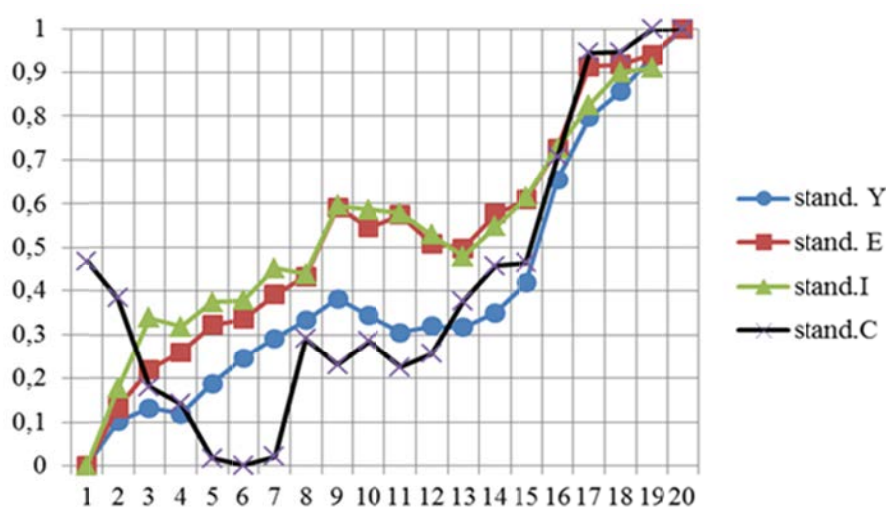
Source: author´s own calculations based on CNB data[7] and CZSO [8]

Note: the symbols have the same meaning as in formula (1)

The above shown analysis indicates the links between the decline of CZK/EUR exchange rate and the GDP growth. It is not yet possible to ignore that in the same time

period there has been a strong growth in the German economy which is the most important foreign trade partner of the Czech Republic. In the first quarter of 2014, GDP grew by 0.7%, with the forecast for the German GDP growth with predicted values 1.4 - 1.8% for 2014, respectively 1.8 - 1.9% for 2015. [5] And exactly in the spirit of the economic theory, the largest increase in the volume of foreign trade between the Czech Republic and Germany can be observed in the same period when the Czech GDP (2014) was growing. In 2014 the foreign trade reached an overall record volume of 70.39 billion euros. While the Czech Republic continues to show positive trade balance in the amount of EUR 3.37 billion for 2014, i.e a year on year increase of about three quarters (2013 = 1.94 billion EUR). [5] It follows that an important moment of the Czech economy growth has been the growing foreign demand. Its development is given by the GDP growth just in the relevant foreign countries, i.e. in demanding countries, rather than in the Czech Republic itself.

Therefore, it cannot be said with certainty whether the country's GDP would grow even if the CZK/EUR exchange rate remained unchanged. At the same time it is not possible not to accept that the growth of Czech exports to Germany in the period after the CNB intervention could be partly stimulated by the price drops of the Czech production induced by reducing the CZK/EUR exchange rate.

Conclusions

The Czech economy is an open economy, whose largest trading partner is Germany. Demand for Czech production and its change from Germany is dependent on Germany´s GDP and its GDP growth. Therefore, if the German GDP grows, the foreign demand for Czech production, i.e. approx. two thirds of the country's GDP, will grow up even without any reduction in the CZK / EUR exchange rate. The decline in the CZK/EUR exchange rate in order to boost a growth of the Czech GDP may not have been necessary.

The fact is that in 2014 the decline of the CZK exchange rate against EUR was accompanied by an increase of the consumer prices in the Czech Republic what was the objective of the CNB to prevent deflation. This goal was only to help not to postpone the domestic demand and thus to act positively to the GDP growth.

From the above mentioned statements it can be concluded that the CNB step, which was did in November 2013, cannot be regarded as proven wrong, because at the beginning of 2014 there has been a growth in the country's GDP. However, the question still remains whether this growth is not related more to the GDP growth in Germany, which is the largest importer of the Czech production. In this context, understatement of the Czech crown could help to increase the foreign demand due to cheaper Czech production for foreign customers.

As mentioned above, even after ČNB's involvement and a decrease in the CZK/EUR rate, market incentives repeatedly tended to increase it. This may be interpreted as evidence to the claim that the CZK rate falls short of its natural value. On the other hand, this does not disguise the fact, that devaluation of the CZK/EUR exchange rate may be instrumental to economic growth.

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Contact address

Prof. Ing. Jiří Kraft, CSc.
Technical University in Liberec, Faculty of Economics, Department of Economics
Studentská 2, 461 17 Liberec, Czech Republic
E-mail: Jiri.Kraft@tul.cz
Tel. číslo: +420 485 353 157