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Bachelor Thesis  
Effectiveness of Central bank interventions

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## **Declaration**

I declare that I have worked on my bachelor thesis titled “Effectiveness of central bank interventions” by myself and I have used only the sources mentioned at the end of the thesis.

In Prague on

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signature

## **Acknowledgement**

I would like to thank to Ing. Mansoor Maitah PhD et PhD for his useful advice and support during my work on this Thesis.





**Efektivita intervencí státní banky**

**Effectiveness of central bank interventions**

## **Souhrn**

Tato bakalářská práce popisuje základní monetární politiku státu a nástroje, jež centrální banka využívá při jejím ovlivňování. Dále se zaměřuje na vysvětlení teoretické stránky devizových intervencí centrálních bank na základě výzkumů odborné literatury a také na vysvětlení případných potíží, či problémů, jež mohou souviset s používáním devizových intervencí jakožto nástroje monetární politiky

Praktická část práce se poté zaměřuje na monetární politiku České národní banky a zejména na devizové intervence. Hlavní část praktické části spočívá v analýze devizových intervencí mezi lety 2000-2002 a klade si za cíl nastínit, zda jsou tyto intervence efektivní, či nikoliv a zda existuje pravidlo, jímž by se měly centrální banky řídit při intervencích.

## **Klíčová slova**

Intervence, monetární, politika, centrální, banka, efektivita

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## **Summary**

This bachelor thesis describes monetary policy and tools, which a central bank might use when trying to navigate the monetary policy in certain direction. The theoretical part of the work is focused on explaining theory of central bank interventions based on research of literature on this topic. One of the parts is explaining the possible risks or problems, which might occur when implementing interventions as a tool of monetary policy.

The practical part focuses on the Czech national bank monetary policy and mainly on its interventions. Main part of the practical part consists of analyzing Czech national bank interventions within years 2000-2002 and tries to come up with a discussion and decision, whether interventions are rather effective or not and if there is any rule, that a central bank might use when intervening.

## **Key words**

Intervention, monetary, policy, central, bank, effectiveness



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# 1. Introduction

Foreign exchange rates have a strong impact on our lives, especially in today's globalised world. A political misbalance in one part of the world can destabilize its currency, and possibly effect prices of goods even in far away countries. Therefore it is important for central banks to know, which tools they should use, in case they want to influence domestic or foreign exchange rates, and create a balance in the balance of trade, or target inflation etc. Central bank is a public institution, which has several tools at its disposal in order to regulate monetary supply, or issue a currency. Central bank also usually sets requirements for commercial banks operating within the borders of a certain country. Interventions are one of the tools central banks have at their disposal and the aim of this work is to asses how effectively do central banks employ them, taking Czech national bank interventions in years 2000-2002 as a framework for our research and for a summary of arguments existing in literature regarding theoretical debate and empirical proof of interventions. Interventions are generally a rather controversial tool, and their effectiveness has not yet been fully proved or disproved due to other circumstances and conditions that affect the exchange rates at the same time. This work also gives a brief overview of monetary policy and its instruments for better understanding of the context. In Chapter 2, we will look at goals of this work, and used methodology. In Chapter 3 we will have a look at theoretical framework of this problematic and overview of literature tackling similar topics. Chapter 4 consists of the practical part – an event study approach of the effectiveness of central bank interventions. Chapter 5 summarizes the work done in previous chapters, giving the results of analytic measurements and the conclusion of the whole work, followed by the list of resources used.

## **2. Objectives of thesis and methodology**

The purpose of this work is to analyze the literature on theoretical approaches and reasons for central bank interventions, the variables that influence them, and mainly to assess the effectiveness of such interventions, while separating them from the usage of different tools that may make them look either more or less effective. Czech Republic, and its central bank - Czech national bank and its interventions between years 2000-2002 will serve as an example and the focus target in the analyses part. Author also summarizes available literature on this topic. Some of the other objectives are:

- Discussing potential problems of interventions
- Tools, which might help increase the effectiveness of interventions
- Overview of CNB monetary policy
- Discussing different paths of monetary policy which central bank may choose

Methodology of this work consists of gathering the required data and researching available literature in the first place. Czech national bank data and previous papers done on this topic had served as main base for the theoretical part of this work. Chapters were chosen in order to not only describe the function of interventions themselves, but also to put together a complete picture of monetary policy and tools that a central bank has at its disposal, and what influences the direction that a central bank might choose.

Practical part uses data from both Czech national bank and previous papers done on this topic. Intervention data were gathered for the time period 2000-2002. There is not enough new data that would be significant for any analyses. However, in the period 2000-2002 the Czech national bank has intervened quite often, so we will use this data. We are going to use the Event study approach for the actual analyses of effectiveness, which will be used for the conclusion of this work.

### **3. Literature overview**

Central bank interventions are a sort of controversial tool a central bank might use to influence exchange rates. According to Farlex Financial Dictionary, central bank intervention is "The practice in which a central bank buys and sells one or more currencies in order to affect the exchange rate of its own currency."<sup>1</sup> Or according to a different, but similar definition, it is "The buying or selling of currency, foreign or domestic, by central banks in order to influence market conditions or exchange rate movements."<sup>2</sup> Arguments about the effectiveness of interventions emerged mainly after the collapse of Bretton-Wood system in year 1971, when most countries decided to drop the fixed exchange rate and switch to floating exchange rate. Even though interventions were used before, their usage spread with the spread of floating exchange rates in years 1971-1973.

#### **3.1 Monetary policy**

Before looking further at one of the tools a financial authorities have at their disposal – interventions, let us have a look at an overview of monetary policy and different tools a central bank might use. A country can have different goals to which should a monetary policy lead. Usually they are supposed to promote stability and economic growth, tackle unemployment, or inflation. However, the relationship between real economy and monetary policy is not certain.

##### **3.1.1 Types of monetary policy**

A central bank uses one of the types of monetary policies they have available in order to fulfill it's goals. Monetary policy types include:

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<sup>1</sup> Farlex Financial Dictionary, Central bank intervention, < <http://financial-dictionary.thefreedictionary.com/Central+Bank+Intervention>>

<sup>2</sup> The same as 1

- Price level targeting – According to Investopedia.com, price level targeting can be defined as „A monetary policy goal of keeping overall price levels stable, or meeting a pre-determined price level target. The price level used as a barometer is the Consumer Price Index (CPI), or some similarly broad measure of cost inputs. A central bank or monetary authority operating under a price level targeting system raises or lowers interest rates in order to keep the index level consistent from year to year.“<sup>3</sup>
- Monetarism – A monetary policy which tries to control the inflation rate. And tries to control it mainly through regulating the amount of money in circulation. This policy was represented and described by Milton Friedman, who was of an opinion, that „inflation is always and everywhere a monetary phenomenon“ and that central bank should keep supply and demand for money at equilibrium.
- Fixed exchange rate – A policy when domestic currency is pegged to foreign currency so that the exchange rate is not volatile.
- Floating exchange rate – In this regime, the exchange rate is not anchored by another currency and floats freely
- Other policies include Gold standard, Inflation targeting, A mix of types

Some of the types of policies are more or less not used anymore. The gold standard has lost its importance with the collapse of Bretton-Wood system in 1971. Fixed exchange rates were, and are, used mainly in small economies, which needed to stabilize their economies. Some of the types have to be mixed with another type in order to be more effective. For example, inflation targeting regime (which will be discussed in more detail later in this work) has to be supported with floating exchange rate regime in order to be effective.

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<sup>3</sup> INVESTOPEDIA.COM, Investopedia news and articles -  
<[http://www.investopedia.com/terms/p/price\\_level\\_targeting.asp](http://www.investopedia.com/terms/p/price_level_targeting.asp)>

### **3.1.2 Monetary policy tools**

A central bank has several options on how to reach the goals it is aiming for with a chosen monetary policy type.

- Monetary base – Central bank can use open market operations in order to adjust a size of monetary base. By selling or buying of assets in exchange for money on deposits, it can exchange such a deposit on currency.
- Currency board – An arrangement when country's monetary base is pegged to one of another country, this can be done for several reasons, including smaller exchange rate volatility, or to be anchored to more stable country and thus improving credibility.
- Reserve requirements – Central bank sets limits of how much reserve a commercial bank has to have. Commercial banks usually keep only a small percentage of cash for a possible withdrawal, a rest is in different form which is not available immediately.
- Interest rate – A widely used tool, when a central bank changes interest rates in order to influence the exchange rate

### **3.1.3 Expansionary vs. Contractionary monetary policy**

We can split a monetary policy in two categories – expansionary, or contractionary. When a central bank uses expansionary monetary policy, it will try to increase the supply of money more and faster than usual. This is usually done in order to tackle unemployment and allow businesses to expand through lowering interest rates. On the other hand, contractionary monetary policy, as one could guess from its name, works the opposite way. A central bank would increase the supply of money slower, or even reduce it. Main aim of a central bank in this case is tackling inflation. Let us have a look at the two in more detail.

### **3.1.3.1 Expansionary monetary policy**

As mentioned in previous paragraph, central bank would conduct an expansionary monetary policy in case it wants to increase the supply of money. Increasing monetary base is just one of the tools a central bank may use when conducting an expansionary monetary policy. Other tools include:

- Reserve requirements – central bank may implement expansionary monetary policy by allowing commercial banks to hold smaller part of their assets in reserve. This increases the amount of loan able funds.
- Interest rate – works rather indirectly on the monetary supply. By decreasing of the interest rate, central bank tries to discourage from savings and tries to encourage loans. This also increases the monetary supply.

### **3.1.3.2 Contractionary monetary policy**

As we have already mentioned, a contractionary monetary policy aims at decreasing the supply of money, or increasing it in a slower rate than usual.

- Monetary base can be decreased by central bank by selling bonds in exchange for currency, which is then taken away from the economy and thus contracting the monetary base.
- Reserve requirements - a central bank has a regulatory power over commercial banks, which usually have only a small portion of their assets in cash available for immediate withdrawal. If a central bank increases the reserve requirements, it will force banks to hold a bigger portion for potential withdrawal, thus reducing availability of loanable funds, which again reduces monetary supply.
- Interest rate changes could also be a tool for conducting contractionary monetary policy, but rather in an indirect way – when a central bank increases interest rates, people should tend to put more of their money into savings, and on the other hand, it should discourage lending.

## 3.2 Reasons for implementing of interventions

“Empirical studies and statements by central banks suggest that central banks intervene in foreign exchange markets mainly to slow or correct excessive trends in the exchange rate and to calm disorderly markets”<sup>4</sup>. Another literature gives another reason for intervention – supporting currency operations of other central banks.<sup>5</sup>

Calming a disorderly market is usually viewed as legitimate reason for intervention, however pointing out the right moment is rather tough, since the criteria for market to be disorderly are very loose. Some central bank intervene in order to prevent such a situation, some countries wait until they think that the market is already disorderly. Why is a disorderly market a threat?

It is important to keep exchange rate volatility and risks down in order to attract investors. But what causes volatility in the first place? It can be argued, that exchange rate volatility is a more of a problem of emerging economies due to their usually shorter history of institutional and policy credibility. In general, a central bank would try to intervene on the foreign exchange market, if it feels that there is instability of the domestic currency - meaning strong fluctuation and thus unpredictability, harming exporters, importers, or investors not trusting the currency because of its volatility. Investors may then push government and central banks to intervene in order to calm the volatility of the currency, because volatility usually drives investors out of the country, since it is much harder to make investment decisions.

More important and debated potential reason for interventions is, however, the attempt of central bank to intervene in order to affect the trends in the exchange rates. Dominguez and Frenkel present a question why would a country choose a floating

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<sup>4</sup> LEWIS, K.K., *Are Foreign Exchange Intervention and Monetary Policy Related, and Does It Really Matter?*

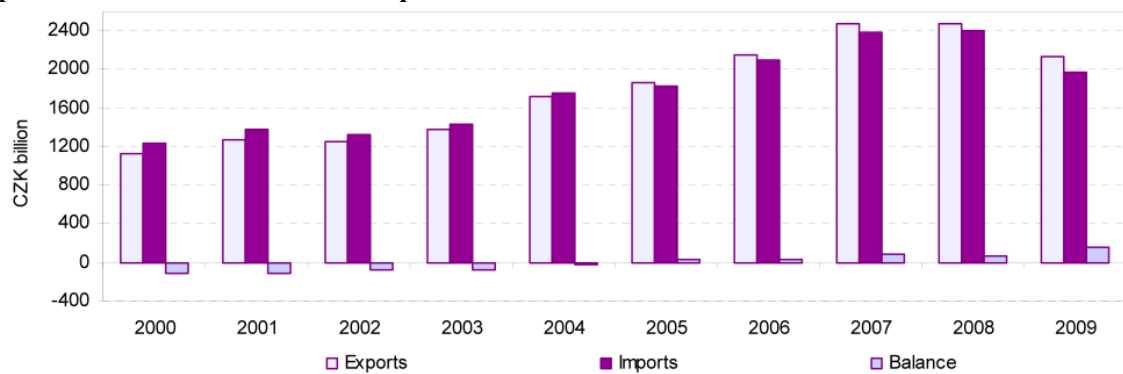
<sup>5</sup> EDISON, H., *The Effectiveness of Central Bank Intervention: A Survey of the Post-1982 Literature.*



exchange rate and than try to influence its path?<sup>6</sup> One of possible answers might be affecting the balance of trade.

Balance of trade is the difference between monetary value of exports and imports in an economy over a certain period. Trade surplus is a term used for a situation, when country earns more from exporting than it does from importing goods or services. Trade deficit is the opposite, meaning that country earns more from import than it does from export of goods and services.

**Graph 1 - Balance of trade in Czech Rep. 1**



Source: Czech Statistical Office, External Trade of the Czech Republic in 2009

When the exchange rate of domestic currency gets higher, it creates a better situation for importers, who can buy foreign products or services at (in local currency) a lower costs and the total import is stimulated; and on the other hand it does not create an optimal conditions for exporters, who receive less money for their products or services. Thus the import starts to overcome the exports and therefore a trade deficit, sometimes called a trade gap, is made. If the deficit grows too large, the central bank might decide to intervene. By selling the domestic currency in the market tries to weaken the domestic currency, thus shifting the conditions toward the benefits of exporters and potentially creating a trade surplus when earnings from export overcome the import.

<sup>6</sup> DOMINGUEZ, K. M. and FRANKEL, J. A., *Does Foreign Exchange Intervention Work?*

Another reason for intervening is the inflation targeting. The inflation is a result of in a long run increased supply of money, and in short and medium run is usually thought to be dependent on supply and demand pressures in the economy. Deflation is quite the opposite – it is caused by the decreasing supply of money.

### 3.3 Sterilized and nonsterilized interventions

We can distinguish two types of interventions, sterilized and nonsterilized. Sterilized interventions are made when the central bank tries to neutralize the effects of interventions on the monetary supply through market operations. On the other hand – during nonsterilized interventions central bank lets interventions affect the supply of money.

Sterilized interventions are thought not to be so effective, since most economists think, that it is the influence on supply of money what creates an effective tool out of the interventions. Main reasons why would central bank try to sterilize the interventions is the fear of a need of growth of the exchange rate and increase of unemployment.

#### 3.3.1 Sterilization cost

One thing that has to be taken in consideration are the sterilization costs.

**Table 1 - Sterilization costs 1**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Net foreign assets	24	112	248	342	359	378	439	488	510	633
Domestic int. rate (in %)	11.1	8.6	10.9	12.0	14.0	13.8	6.6	5.3	5.1	3.5
Foreign int. rate (in %)	5.9	4.9	5.0	4.0	4.0	4.1	3.5	5.1	5.5	4.3
ER gains/losses	-0.3	0.0	0.2	-8.6	44.7	-35.6	31.8	-3.5	-40.1	-26.2
Estimated costs of FXR	-1.6	-4.1	-14.5	-36.1	8.6	-72.1	18.5	-4.4	-38.1	-20.9

Source: Holub, 2003

### 3.4 Channels through which interventions take place

We can distinguish channels through whom might central bank intervene. Some of the channels are usable when central bank does not wish to impact the domestic money supply, meaning that the interventions are sterilized. In this case, the academic literature usually distinguished two channels through which may the sterilized interventions be effective – portfolio balance channel and signaling channel.<sup>7</sup> Other channels and both portfolio balance and signaling channels can be used in case the central bank does not mind the impact of interventions on the domestic money supply.<sup>8</sup>

#### 3.4.1 Portfolio Balance Channel

According to Edison, portfolio and signaling channels are the ones that the literature mainly focuses on.<sup>9</sup> In order to understand this channel, we must use a definition as used by Edison, where he used a basic portfolio model, which might be used to explain how the portfolio channel works. It assumes that net financial wealth of domestic private sector in domestic currency ( $W$ ) can be split into three items – domestic bonds ( $B_d$ ), foreign bonds ( $B_f$ ), and money ( $M$ ). We then add the domestic interest rate ( $i_d$ ), and foreign interest rate ( $i_f$ ). “ $S$ ” in the function will stand for the spot price, “ $S_d$ ” for the expected domestic currency depreciation and  $X_k$  a partial derivation of  $X$  in regard to  $k$  for  $X=M, B_d$  and  $B_f$ . We also assume, that monetary supply ( $M_s$ ), domestic bonds ( $B_d$ ) and foreign bonds ( $B_f$ ), are given<sup>10</sup>. With this data we can assess a demand function:

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<sup>7</sup> SAMO, L., TAYLOR, M. P. *Official intervention in the foreign exchange market: Is it effective and, if so, how does it work?*

<sup>8</sup> GERŠL, A., *Foreign Exchange Intervention: The Theoretical Debate and the Czech Koruna Episode.*

<sup>9</sup> EDISON, H. J., *The Effectiveness of Central Bank Intervention: A Survey of the Literature after 1982*

<sup>10</sup> EDISON, H. J., *The Effectiveness of Central Bank Intervention: A Survey of the Literature after 1982*

$$MD = M (id, if + Sd, W), Mif < 0, Mid + Sd < 0, MW = 0 \quad (1)$$

$$BdD = B (if, id + Sde, W), Bif > 0, Bid + Sde < 0, BW > 0 \quad (2)$$

$$BfD = 1/SfBf (if, id + Sde, W), Bfid < 0, B if + Sde > 0, BfW > 0 \quad (3)$$

$$W = M + B + SBf \quad (4)$$

If the central bank buys foreign bonds, and sells bonds in domestic currency, than it tries to depreciate domestic currency through sterilized interventions. The foreign exchange rate will change if the interest rates do not change. Growth of W is caused by the growth of Sd, which causes the depreciation (4).

Usage of this channel is however rather controversial. First, when central bank buys foreign bonds, the price is again negotiated between two sides and therefore it can basically act as a market channel – meaning that it also carries its negative attributes. Central bank would again have to intervene largely in order to influence the exchange rates, because a small intervention would not do much when the total overturn is much larger. And again, the interventions would have to be frequent. Therefore it is thought that the portfolio channel might not be sufficient in order to asses the effectiveness of interventions on exchange rates.<sup>11</sup>

### 3.4.2 Signaling channel

There are some conditions that central bank has to meet in order to make the interventions effective through signaling channel. First of all, the central bank has to be credible enough in order to make an impact on the market participants. Central bank also has to have information about future fundamentals, which are not available to the rest of the market. The central bank than provides such information to the market in order to affect the exchange rate. But of course, market participants have to believe the central bank's signals. If they do, their expectations regarding future fundamentals would change. And when the

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<sup>11</sup> HEIKENSTEN, L., BORG. A., *The Riksbank's Foreign Exchange Interventions –Preparations, Decision and Communication.*

future fundamentals are expected to be different, the market would revise its expectations regarding the future exchange rate which might also change the current rate. For example, if a central bank in support of the domestic currency signals future contractionary domestic monetary policy, the domestic currency will appreciate relative to the foreign currency<sup>12</sup>. There is some empirical evidence to support the hypothesis that intervention serves to signal information regarding future monetary policy. Tests were made whether intervention helps forecast future monetary policy. These studies find evidence that knowledge of intervention policy does improve predictions of future monetary policy, although they also find that subsequent monetary policy changes are frequently in the opposite direction to what was signaled. Interventions may signal information regarding monetary policy, or, more generally, intervention might usefully convey information whenever, 'government officials have access to information that cannot readily be made available, for security or similar reasons, to private speculators'. Kenen suggests that intervention signals may effectively “change the market's confidence in its own projections...when expectations are heterogeneous and especially when a bubble appears to be building”<sup>13</sup>. There are arguments that suggest that interventions may convey (ambiguous) signals about the central bank's short-term exchange rate target, which in itself may reflect the central bank's assessment of the possible future paths of fundamentals<sup>14</sup>. Questions we must however ask, is why should market participants that the signal a central bank sends are based on truth? And why should monetary institutions have better information than market participants? In case of the second question an answer might be, that even though central bank does not necessarily have to have better information of the current situation, it however probably has better information regarding future monetary policy. And as for the first question – if the signal is solely a verbal intervention, or announcement of future monetary policy, the signal will probably not be completely trusted by all. However, if the signal is strengthened by interventions, than the signal itself might seem more credible, since a central bank must

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<sup>12</sup> DOMINGUEZ, K. M., FRANKEL, J. A., *Does Foreign Exchange Intervention Matter? The portfolio effect.*

<sup>13</sup> KENEN, P., *Exchange rate management: What role for intervention?*

<sup>14</sup> DOMINGUEZ, K., *Central Bank Intervention and Exchange rate volatility, Journal of international money and finance*

invest in order to make this signal, thus making market participants more convinced of its truth<sup>15</sup>. Why are than interventions usually made without any publicity? In general, literature gives more credit to Signaling channel than Portfolio balance channel regarding the effectiveness of interventions.

### **3.4.3 Market channel**

Interventions through market channel are the easiest method of interventions out of all mentioned channels. When central bank enters the foreign exchange market, than it also influences the demand and supply for currency and therefore the exchange rate. Since the central bank does not enter the market in order to make profit, but in order to try to move the exchange rate one way or another, than it has to sell or buy at a different price than is the official one. And since the official exchange rate is calculated as the balance of all operations done through day, than every transactions of central bank would result in an influence on the exchange rate. For example if central bank would try to depreciate the domestic currency, it would buy foreign currency above the market price. However, the obstacles of this channel are for once the fact that central bank would have to intervene with massive amount of money in order to shift the exchange rate, and secondly such interventions, if successful, would have to be supported by frequent daily intervening.

### **3.4.4 Microstructural channel**

This channel is quite similar to the market channel, since the intervention is done again through foreign exchange market. According to Peiers, the basic determination of foreign exchange levels do not include factors such as different motives of market participants or different and better information of some market participants. He also states, that central bank intervenes rather without publicity and secretly through a private bank. Such a bank gets better information from a central bank and has a short term opportunity to create a

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<sup>15</sup> MUSSA, M., *The Role of Official interventions*, New York: Group of Thirty

profit. Therefore it changes its market strategy. Other market participants would suspect, that one of the agents is better informed and knows something they do not, and thus they would adapt their position in order to minimize their losses. This is however temporary, because once the market realizes that the better informed participant got his information from a central bank, they will return to their original position before the intervention. The point of intervening through this channel is the need for lower quantity of investment compared to the market channel, because one of the participants will convince the others to change their behavior as well. However, as he states, effectiveness of this channel is only temporary until the time that the others realize that central bank is behind the information<sup>16</sup>.

### **3.4.5 Monetary channel**

Monetary channel presumes the usage of nonsterilized interventions, because with use of this channel, the interventions would have an impact on monetary base and interest rate. If central bank tries to depreciate domestic currency, than it buys a foreign currency. With the drop of an interest rate, investors would try to get rid of their assets in local currency in a change for foreign assets. This would cause the depreciation of domestic currency.

### **3.4.6 Other channels**

There are some new channels being introduced in recent literature, such as coordination channel or noise-trading channel. However, their effectiveness has yet been fully theoretically described or tested, so only time will prove if they will become a possibility for central banks in order for the effectiveness to be longer-termed than it is today.

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<sup>16</sup> PEIERS, B. (1997): *Informed Traders, Intervention, and Price Leadership: A Deeper View of the microstructure of the Foreign Exchange Market.*

### **3.5 Empirical research**

There has been a lot of debate in last three decades about the effectiveness of intervention. Usually, nonsterilized interventions are thought to be a rather effective tool. The main controversy in the community is a debate regarding the effectiveness on sterilized interventions through above mentioned channels. First empirical study made by Jurgensen in 1983, did not find any conclusive evidence if sterilized interventions are, or are not effective. One thing that it was able to conclude, was the fact, that nonsterilized interventions affect the long-term exchange rates more than sterilized interventions; sterilized interventions last only for a very short period of time. The general perception of the effectiveness has been changing over time, in the 1980's the general conclusion was that interventions are not a very effective tool. More recent studies have however showed that interventions might in fact be effective. Perhaps this was also changed by availability of more data than before. Some studies have shown that both portfolio balance channel and signaling channel were effective<sup>17</sup>. But according to for example Edison who has made an overview of the literature studying the effectiveness in years 1982 – 1992, signaling channel can be rather effective, while portfolio balance channel does not provide much of an evidence for its effectiveness<sup>18</sup>.

### **3.6 Inflation targeting and Interventions in inflation targeting regime, monetary policy of CNB**

Since in the analytic part we will focus on the Czech Republic and effectiveness of its interventions in an inflation targeting regime, we will now look at a basic theory of what inflation targeting is, and how can interventions help central banks to achieve their targets.

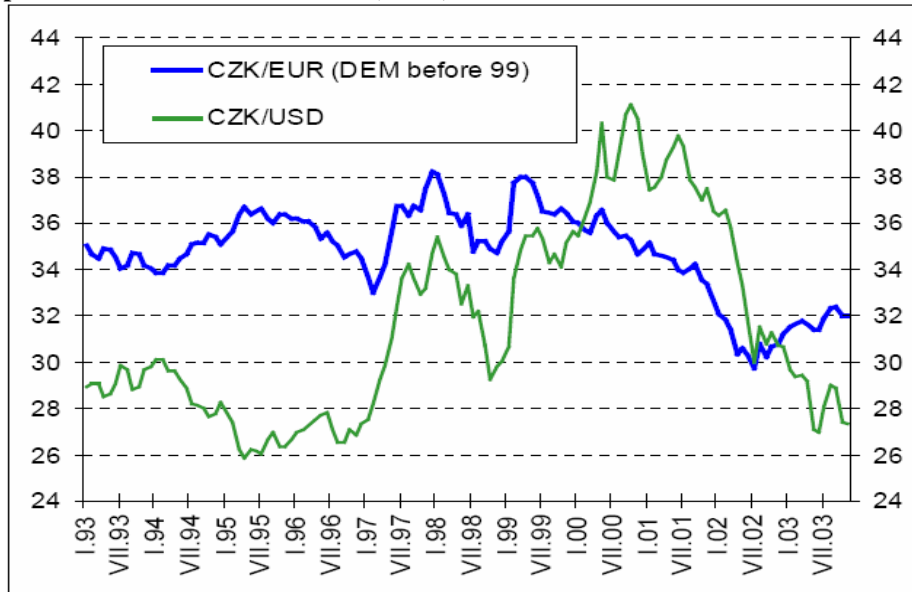
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<sup>17</sup> DOMINGUEZ, K. M., FRANKEL, J. A., *Does Foreign Exchange Intervention Matter? The portfolio effect.*

<sup>18</sup> EDISON, H. J., *The Effectiveness of Central Bank Intervention: A Survey of the Literature after 1982.*



**Graph 1 - CZK/USD and CZK/EUR(DEM) rates 1**



Source: Czech national bank, [www.cnb.cz](http://www.cnb.cz) 1

### **3.6.1 History of inflation targeting regime**

First attempts to target an inflation level instead of exchange rate levels emerged after the crisis of gold standard after World War I. The basic concept how we know it today was introduced by John Maynard Keynes in 1923 in his “Tract on monetary reform”. Inflation targeting regime basically presumes a floating exchange rate, which was not the case during the Bretton-Wood system, so it was after it’s collapse when the regime was even optional for usage. A pioneer in inflation targeting regime was New Zealand, which introduced this regime in 1990, and was later followed by many countries, among others by the Czech Republic.

### **3.6.2 Basic concepts of inflation targeting**

As we mentioned above, the basic presumption for country in order to use this policy are floating exchange rates. When is a central bank targeting inflation, it sets an inflation level, which it will try to keep and will change interest rate accordingly. This makes it easier to predict interest change moves, because if the inflation is higher than the targeted level, central bank is likely to raise interest levels in order to bring inflation down, or the other way around. This of course does not have to necessarily work perfectly, and sometimes does not affect the inflation rate. Such a policy (inflation targeting) is viewed positively by investors who than might more easily predict interest rate moves creating a better economic stability.

### **3.6.3 Monetary policy and inflation targeting regime in the Czech Republic**

Looking at the table below, we can some progress that has been made since the introduction of a floating exchange rate at 1997. The GDP recovered from a decline in years 1997 and 1998 which were caused by fiscal and monetary restraints and floating exchange rate and inflation targeting regime helped along with reduction of prices of food and energy to lower the inflation rate from 10.7% in 1998 to 1.8% in 2002. Inflation growth in years 2000-2001 was caused by growth of GDP<sup>19</sup>.

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<sup>19</sup> CREEL, J. and LEVASSEUR, S., *How would a fixed-exchange-rate regime fit the transition economies?*

**Table 2 - Czech macroeconomic indicators 1**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
GDP real growth rate	- 0.9	2.6	5.9	4.3	- 0.8	- 1.0	0.5	3.3	3.3	2.0
CPI rate of inflation*	20.8	10.1	9.1	8.8	8.5	10.7	2.1	3.9	4.8	1.8
Broad money (nominal increase)**	n.a.	21.4	19.9	17.0	6.8	6.2	8.9	6.5	10.9	7.0
Nominal interest rate***	8.0	8.5	9.5	10.5	13.0	7.5	5.0	5.0	3.8	1.8
<i>In % of GDP:</i>										
Current account balance	0.3	- 0.1	- 2.7	- 7.4	- 6.1	- 2.4	- 3.0	- 4.8	- 4.4	- 6.5
General government balance	n.a.	- 1.9	- 1.6	- 1.9	- 2.0	- 2.4	- 2.0	- 4.2	- 5.2	- 6.5
Public debt	n.a.	17.6	15.3	13.2	12.9	13.0	14.5	16.7	18.7	n.a.

Note: Following Coricelli and Ercolani (2002), fiscal data were taken from the EBRD. General government balance excludes privatisation revenues. Government public debt is a consolidated outstanding debt excluding the indirect debt of Konsolidacni Agency and publicly guaranteed debt.

\* Year-on-year, in per cent.

\*\* M2.

\*\*\* Official discount rate.

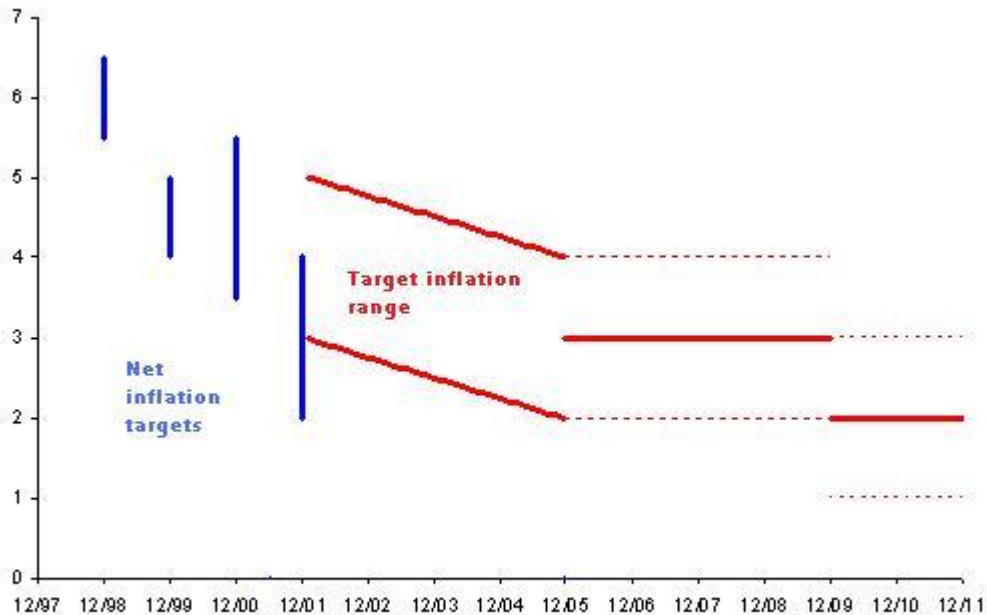
Sources: OECD, IMF, EBRD.

Source: Jérôme Creel et Sandrine Levasseur « How would a fixed-exchange-rate regime fit the transition economies? », *Revue de l'OFCE* 5/2004 (n° 91 bis), p. 83-120.

The Czech Republic has introduced the inflation targeting regime in 1997 after introducing floating exchange rate the same year following the crisis caused mainly by Asian countries. Previously the Czech Republic has used fixed exchange rates following its economic transition. It also became the first transition country to introduce this regime. According to Holub, inflation targeting regime of the Czech Republic was focused on disinflation, rather than setting low inflation which was in contrast to inflation targeting regime in advanced countries. The Czech Republic is also a very open economy, which makes it more vulnerable to exogenous and exchange rate shocks<sup>20</sup>.

<sup>20</sup> HOLUB, T. , *Foreign Exchange Interventions under Inflation targeting: The Czech Experience*.

**Graph 2 - Inflation targets in the Czech Republic**



Source: Czech national bank, [www.cnb.cz](http://www.cnb.cz) 2

Short term target was set for December 1998 at 5.5%-6.7% and medium target was set in December 1997 for December 2000 at 3.5%-5.5%, compared to 7% in 1997. In the first years the target was undershot, thanks to strong disinflation caused by the drop in food and oil prices and exchange rate appreciation in 1998. At the beginning of 2000 has CNB create a special account for government's privatization income. Later in 2002 an agreement between CNB and government has managed to keep the privatization income out of the market and gave government a financing option. Until 2003 CNB has bought more than 4.2 trillion EUR directly from the government. The inflation targeting regime itself has changed significantly in the Czech Republic as a response to the previous experience. In 2001, new targets were no longer set in net inflation, but in terms of headline inflation. The target set for January 2002 at 3-5% declining to 2-4% in December 2005<sup>21</sup>.

<sup>21</sup> HOLUB, T. , *Foreign Exchange Interventions under Inflation targeting: The Czech Experience*.

### 3.6.4 Interventions and inflation targeting

Holub, suggest three criteria for assessing the effectiveness of interventions consistent with an inflation targeting regime:

1. Interventions should always be at least partially nonsterilized.
2. Interventions focused against appreciation should be made only if the exchange rate depreciation is consistent with the inflation target.
3. A movement of exchange rates is considered to be one of direct shocks causing undershooting the goal.

These criteria are important in order for interventions not to send distorted signals along with using of interest rates. We must also take in consideration different factors such as sterilizing costs. These criteria above should be however viewed as compulsory for using the interventions, not optional. There are also different problems a country has to face when implementing an inflation targeting regime. One of them is the question how should a country manage possible large exchange rates fluctuations? This topic is even more important for emerging countries, which are in general more vulnerable to exchange rate shocks than advanced countries and might be subjected to international financial flows volatility<sup>22</sup>. Svensson gives an answer on whether central bank should use interventions according to the theory of inflation targeting. Foreign exchange markets should provide a perfect arbitrage, according to the uncovered interest rate parity. Therefore there should not be any advantage in trying to influence the exchange rates, because all interventions would be countervailed by an equally strong flow in the opposite direction<sup>23</sup>.

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<sup>22</sup> HOLUB, T. , *Foreign Exchange Interventions under Inflation targeting: The Czech Experience*.

<sup>23</sup> SVENSSON, L. E. O., *Open-Economy Inflation Targeting*.

## **4. The effectiveness of central bank interventions**

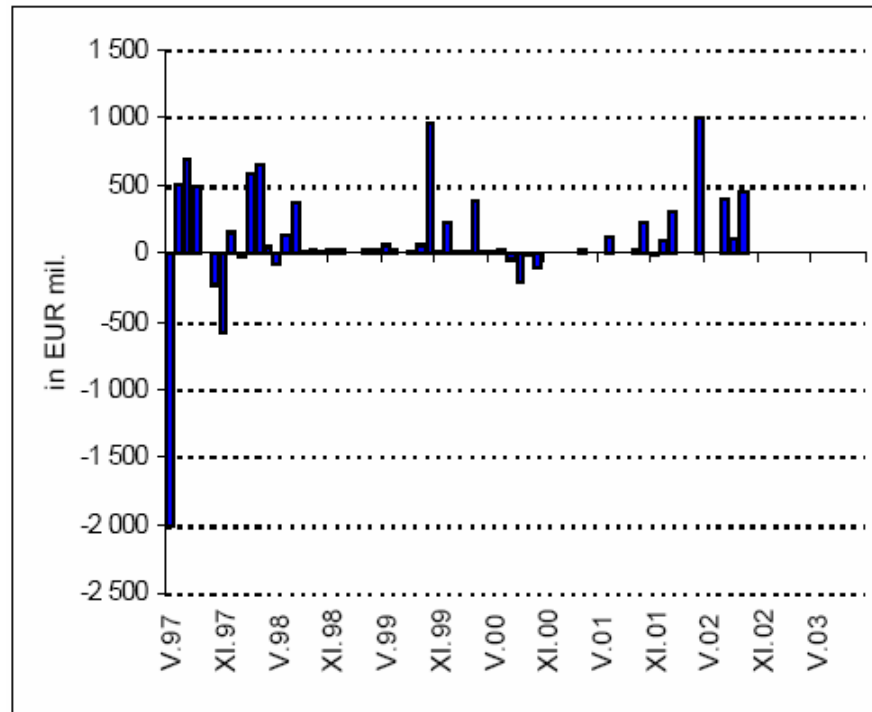
### **4.1 The Event study approach**

As a main approach for our analysis we will use the event study approach. This approach has many advantages; one of them is the fact that using this approach we are able to filter out interventions which would only distract the complete picture of their effectiveness. Therefore we have to assess a criteria in a way, that we will then be able to get some idea of the effectiveness of interventions. Similar framework to the one of Égert and Komárek is used<sup>24</sup>. Our focus will be the relationship between the Czech Koruna and Euro. Prior to Euro it is the relationship between Czech Koruna and Deutsche Mark. When making criteria for a definition of event for our purposes, we must define what classifies an event. In the event study approach we will focus on the intervention events in years 2000-2002, since it was in this time period, where Czech national bank intervened most frequently. Graph 1 shows the amount of interventions made.

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<sup>24</sup> ÉGERT and KOMÁREK, *Foreign Exchange Interventions and Interest Rate Policy in the Czech Republic: Hand in glove?*

Graph 3 - CNB interventions 5/97-12/02 1



Source: Czech national bank, [www.cnb.cz](http://www.cnb.cz) 3

The amounts are in million of Euros, and we can see that in some periods CNB intervened massively, and in some periods were nearly no interventions.

1. When we look at intervention data of CNB, we need to assess criteria on how single interventions can create an event. Égert and Komárek pose a crucial question of how many days must separate two individual interventions in one direction so that they can be considered two different intervention events. The timeframe is mainly a matter of choice, for our purposes we will consider 5 options. 2, 5, 10, 20, or 30 days have to separate two single events so we could consider them as two intervention events. This means that if we are looking for example at the 2 days timeframe, and 2 days go by without any intervention, the intervention event is concluded. If however another intervention was made on the third day, it could still

be included as an intervention event in the 5 day timeframe<sup>25</sup>.

2. Since we now have an intervention event defined, we also need a time window before the intervention event and after it as well. For our purposes we will again take 2, 5, 10, 20, 30 days before and after the intervention. We will always compare the same size of the pre-event window with the same post-event window, meaning that if we choose a 2 day pre-event window, we will compare it again to a 2 day post-event window.

3. How do we decide whether an intervention event is effective or not? We have to compare the exchange rate trend in the pre-event window with the trend in post-event window. Either we find out that the intervention was not effective if the trend in a post-event window does not change or it is even strengthened (presuming that the central bank intervenes with an intention to reverse the trend, or at least lower it). In case that the trend was lowered, meaning that for example if the exchange rate is appreciating in the pre-event windows, and a central bank sells domestic currency, it will cause the exchange rate to appreciate less in post-event window, than we are talking about smoothing of the exchange rate movement. In case the trend is reversed, meaning that if currency is appreciating in the pre-event window, central bank intervenes by selling domestic currency and the exchange rate depreciates in a post-event window, we are talking about leaning against the wind.

4. Trying to decide whether the interventions were effective solely on the situations described in paragraph 3. would be tricky. We must take into consideration if a central bank did not use other monetary tools during the time of intervention events as well, because what might be seen as an effective and successful intervention might not have been so effective, if a different tool was not used as well. A very important tool for influencing the exchange rates is interest rate. We therefore have to look, if any interest rate changes took place during

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<sup>25</sup> ÉGERT and KOMÁREK, *Foreign Exchange Interventions and Interest Rate Policy in the Czech Republic: Hand in glove?*



intervention events, and both pre-event and post-event windows. If there were any changes during intervention, than interventions might have only strengthen the effect of interest rate moves, or not be effective at all. If interest rate changes took place in the pre-event or post-event windows, than would not be able to predict what would have happened with the exchange rate if the interest rate changes did not take place. Especially interest rate moves in the same direction as interventions might distort the whole picture regarding effectiveness. For example if central bank was to intervene by selling domestic currency, and such an intervention would be supported by lowering the domestic interest rate or increasing foreign interest rate, both action would suggest depreciation of the domestic currency. Therefore we have to filter out intervention events when this took place.

When we summarize all the data by the criteria above, we find out, that only 6 intervention events have occurred in years 2000-2002. However this is a number without filtering out intervention events that overlap with interest rate movement. When we include this, the total number of intervention events in years 2000-2002 is only 4<sup>26</sup>.

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<sup>26</sup> ÉGERT and KOMÁREK, *Foreign Exchange Interventions and Interest Rate Policy in the Czech Republic: Hand in glove?*

**Table 3. Intervention events with maximum of 30 days with no intervention**

No.	Year	Days of intervention	Total days	Days to next episode	Type of intervention	Pre-event and Post-event Windows						
						2	5	10	20	30	40	60
1	2000	3	4	164	SALE		W	W	W	W	S	S
2	2000	1	1	225	SALE		W	W	W	W	W	W
3	2001	2	2	38	SALE	W	W	W	S	S		
4	2001	5	25	45	SALE	W	W	S	S	S	S	S
5	2002	5	5	61	SALE		S	S	W	W	W	S
6	2002	28	53	50	SALE	W	W	W	W	W	W	W

**Table 4. Intervention events with maximum of 30 days with no interventions and no overlap with interest rate moves**

No.	Year	Days of intervention	Total days	Days to next episode	Type of intervention	Pre-event and Post-event Windows						
						2	5	10	20	30	40	60
1	2000	3	4	164	SALE	W		W	W	W	S	S
2	2000	1	1	225	SALE		W	W	W	W	W	W
3	2001	2	2	38	SALE	W	W	W	S	S		
5	2002	5	5	61	SALE		S	S	W	W	W	S

Source: Egert and Komárek, 2005

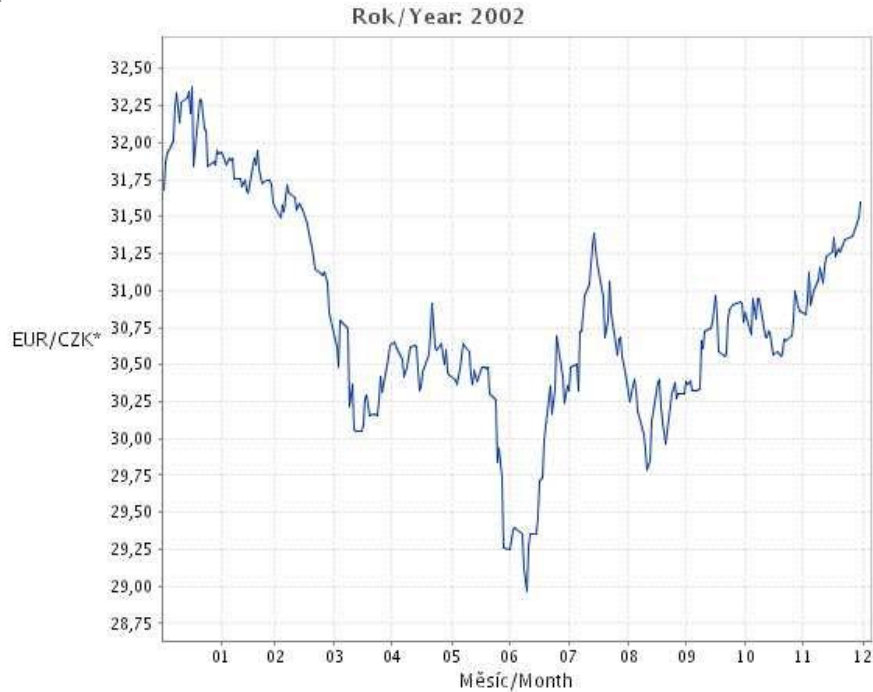
The explanation of Table 3 and Table 4 is following: Table 3 shows 6 intervention events in years 2000-2002, including the ones that had an overlap with an interest rate movement. In this case are used a maximum of 30 days without intervention events. Pre-event and post-event windows are on the right side of the table, and are set up for lengths of 2, 5, 10, 20, 30, 40, 60 days, in order to observe both short-term and long-term effectiveness. Each field has either “S”, “W”, or blank inside. “S” stands for smoothing, meaning that the intervention effect had a smoothing effect on the exchange rate in the corresponding pre and post event time windows. “W” stands for leaning against the wind, pre and post event windows with “W” suggest, that the intervention event was effective in reversing the trend for corresponding pre and post event windows. Blank cells suggest that there was no significant effect on the exchange rate in specific pre-event and post-event window. Grey cells are for the pre-event and post-event windows which did not overlap with another intervention event. All of the intervention events were in the same direction – domestic currency sale. Table 4 shows intervention events with maximum of 30 days with no intervention. The difference from Table 3 is that in Table 4, the intervention events which were overlapping with an interest rate move were filtered out.

## **4.2 Outcome of the Event study approach**

From Tables 2 and 3 is obvious, that interventions are rather effective when combined with interest rate moves. In most cases were the changes in post-event windows successful in either reversing the trend or at least decreasing the trend. Especially leaning against the wind seems to have been working quite well. However as we have already discussed, it is hard to asses whether interventions themselves have an impact on that, and if so, how strong such an impact is. When adjusted for the interest rate moves, meaning that grey cells are the once where was no overlap with interest rate moves or different intervention events, successful intervention events no.4 and 6 are filtered out. This could be partially due also to the fact, that those two were the two events, than lasted the longest

number of days, so the chance for them to overlap was higher.

**Graph 4 - Interventions in 2002 1**



Source: Czech national bank, [www.cnb.cz](http://www.cnb.cz) 4

This could be partially due also to the fact, that those two were the two events, than lasted the longest number of days, so the chance for them to overlap was higher. When assessing the effectiveness of intervention events adjusted for interest rate moves, we can clearly see that their effectiveness is not all that positive as it was in Table 2. Effectiveness can be assessed only in short term (except of the intervention event no.2, which has been basically only a single intervention event with no other intervention within next 30 days). In case of intervention event no.1, it seemed to be effective only in the pre and post event windows of 2 days. No.3 was effective in windows of 2, 5, and 10 days and no.5 only in windows of 5 and 10 days.

### 4.3 Problems of interventions

As we saw in the event study approach in previous paragraph and tables, intervention events can have an effect on the exchange rate in an effective manner. However, according to Holub, even though we can say about some of the intervention events that they were successful in influencing the trend, there is not any pattern or rule that could be useful for future interventions. Simply put, what worked once would not have to work again, and some interventions that did not seem to have any effect might have been more effective next time<sup>27</sup>.

This brings around second problem of interventions: If we were to be a hundred percent sure, that it was the intervention what has caused the changing trend in post-event window compared to pre-event window, we would have to take into consideration what would have happened if a central bank would not have intervened and what would be the trend in the post-event window without such intervention. This would however require a very complicated statistical model, which would not be comprehensible enough and would not fit into this work.

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<sup>27</sup> Holub, T., *Foreign Exchange Interventions under Inflation targeting: The Czech Experience*.

## 5. Conclusion

We have set up a goal of examining the effectiveness of central bank interventions. After providing a basic theoretical framework in the theoretical part we were able to understand the principles of interventions, and central bank motivations for using them. A few obstacles came out when starting the practical part. First of all, the rather scarce data of CNB has not made things any easier. We were expecting to find a conclusion, which would correspond to findings found in different papers done on this topic.

We have conducted an event study approach and empirical research in order to assess the effectiveness of central bank interventions. Even though interventions according to our findings may be sometimes effective, we have also found out, that there is however not a specific step-by-step guideline for central banks on how to make an effective intervention, what we can do and what we did is look back in time and see, if the interventions already conducted were effective, or not. We also have to consider, that it is difficult to make assumptions on whether they are or are not effective on the example of just one central bank, maybe other central bank could have been intervening in more effective manner, or on the other hand, maybe interventions of a different central bank might have been much less effective. It is usually believed, that interventions are a better working tool for emerging countries and smaller countries, thanks to their smaller turnover, so a smaller change by either sales or purchases of local currency might cause bigger changes in the exchange rates<sup>28</sup>. However, from what we have found out, interventions can sometimes be effective, especially when accompanied by a supportive change in interest rate. Still, one question stands out: Should a central bank be even using interventions as a stand alone tool of monetary policy? Answer to this question has not yet been fully answered, neither by literature, neither by experience from exchange markets. Interventions are usually done secretly, thus providing worse conditions for studies that examine them. The fact is, that recently CNB has been using interventions much less than in past, and its 'primary tool,

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<sup>28</sup> DYSIATA, GALATI, *The effectiveness of foreign exchange intervention in emerging market countries: evidence from the Czech koruna.*

since it runs a inflation targeting regime, is an interest rate, which has been found effective in influencing exchange rates.

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