CZECH UNIVERSITY OF LIFE SCIENCES

Faculty of Economics and Management

Department of Economics

Bachelor Thesis

Economic analysis of Czech National Bank interventions in foreign exchange market

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BACHELOR THESIS ASSIGNMENT

Josephine Králová

Economics and Management

Thesis title

Economic analysis of Czech National Bank interventions in foreign exchange market

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Objectives of thesis

To determine and evaluate the impact of foreign exchange intervention of the Czech National Bank on households and other parts of economy.

Methodology

Literature review will be conducted using methods of deduction, induction and analysis.

Analytical section will be done using quantitative and also qualitative approach.

The proposed extent of the thesis

30-35

Keywords

foreign exchange market, intervention, monetary policy

Recommended information sources

Jílek, J. (1997) Finanční trhy, Praha: Grada Publishing, 143 p. ISBN 80-7169-453-3

Kritzer, A. (2012) Forex for Beginners: A Comprehensive Guide to Profiting from the Global Currency Markets, Apress, 1-130 p. ISBN-13: 978-1-4302-4050-1

Singer, M. et al. (2011) Czech currency, the pantheon of Czech banknotes 1993-2011, Praha: Dny české státnosti, 110-114 p. ISBN: 978-80-904980-0-6

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Declaration

I declare that I have worked on my bachelor thesis "Economic analysis of Czech National Bank interventions in foreign exchange market" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any third person.

In Prague ……………………………

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Josephine Králová

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I would like to express my gratitude to my supervisor, Ing. Petr Procházka, MSc, Ph.D., for his valuable comments, supervision and assistance during the assessment of my bachelor thesis.

Author: Josephine Králová

PREFACE

This Bachelor Thesis was submitted and presented at the Euroleague for Life Sciences

Scientific Student Conference in November 2014 in Warsaw.

Economic analysis of Czech National Bank interventions in foreign exchange market

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Ekonomická analýza devizových intervencí České národní banky

Abstrakt

Tato bakalářská práce se zaměřuje na ekonomickou analýzu devizových intervencí, které provedla Česká národní banka v listopadu 2013. Analyzuje tuto problematiku zejména z pohledu deskriptivní a ekonomické analýzy, ale nepovažuje ji jako jedinou část práce. Aby byl tento projekt plně analyzován, autor přistupuje k problematice z různých pohledů. První kapitola je věnována literární rešerši, která pomáhá pochopit problematiku a mapuje vývoj od důvodů zákroku až po výsledky intervence. Druhá kapitola se věnuje analýze, která je rozdělena na několik podkapitol. První část analyzuje důvody zásahu ČNB, zhodnocuje různé názory a kritiku zásahu. Druhá podkapitola je věnována ekonomické analýze, kterou autor považuje jako stěžejní a hlavní část této práce. Analyzuje průběh české ekonomiky do budoucna z pohledu agrárního sektoru a dále podává detailní obrázek současného stavu cen potravin. Poslední část zkoumá existující vztah mezi vývojem hrubého domácího produktu a životním prostředím. Zabývá se především otázkou, jak se hrubý domácí produkt vyvíjí po zásahu a jak tím ovlivňuje životní prostředí České republiky. Výsledkem této bakalářské práce je zhodnocení, zda byly devizové intervence správným krokem, a jak se bude česká ekonomika po zásahu vyvíjet.

Klíčová slova: devizové intervence, Česká národní banka, směnný kurz, česká koruna, monetární politika

Abstract

This bachelor thesis is focused on economic analysis of foreign exchange intervention, that CNB's decided to use it as a monetary policy tool. It assesses this issue mainly from the descriptive and analytical point of view but it is not considered as the only part of this thesis. In order to fully understand this subject, the author approached the issue from different perspectives. For better understanding of the subject, the first chapter is dedicated to the literature review. It maps the theme from the beginning start to development and results of intervention. There will be described and explained the CNB´s decisions. The second chapter contains the analytical part, which is divided to several subcapitols parts. First part of the second chapter analyses opinions and criticism of foreign exchange intervention. The second part provides economical analysis, which the author considers as the main part of the analytical chapter. Furthermore, the part thoroughly analyses the development of Czech agri-sector to the future. Further on, it also gives the most recent picture of the prices in the food sector. The last part of the work is dedicated to the relationship between real GDP and the environment. The author deals with the question of how gross domestic product develops after the intervention and how it will affect the environment of the Czech Republic. The result of this work is to prove whether the foreign exchange intervention was the right step, as there is still no clear-cut conclusion about this impact. Also the problem how the Czech economy will develop after the intervention, if taking into account the analysis used in this work.

Keywords: Foreign Exchange Intervention, Czech National Bank, Exchange Rate, Czech Crown, Monetary Policy

TABLE OF CONTENTS

List of Abbreviations

CR	Czech Republic
CZK	Czech Crown
e.g.	exempli gratia, for example
etc.	et cetera, and so one
FX, Forex	Foreign exchange
CNB	Czech National Bank
CTK	Czech News office
BIS	Bank for International Settlements
CZSO	Czech Statistical office

1. INTRODUCTION

The economic development in the Czech Republic in last years becomes very questionable, because the level of GDP and inflation was very low. The Bank Board of the Czech National Bank (CNB, 2013) decided to launch foreign exchange interventions, for the first time since 2002, to weaken the Czech crown and ease monetary policy. The CNB´s decision from November 2013 influenced Czech economy as well as Czech business and households. The Bachelor thesis is focused on foreign exchange intervention, its reasons, criticism, opinions and the consequences of market reactions. The CNB had been warning Czech society for a year that it may weaken the Czech crown while interest rate was close to zero (Carney, 2013). The brief theoretical introduction to foreign exchange intervention and its general aspects are explained. Reasons of this intervention are discussed and the overview of different results is provided as well. While this decision is now generally perceived more as a supportive step of the Czech economy, impacts upon individual sectors are not known (CNB, 2013). Specifically upon agricultural business. Empirical data and analytical tools are employed to capture the results of analyzes e.g. forecasted net effect of exchange rate differential upon trade balance or study that tries to find commodities for which there were unusual changes of prices. In the last part, author will evaluate the relationship between real GDP and environment and its consequences. This chapter estimates the impact upon GDP and secondly evaluated the impact upon environment using already constructed Kuznets curve.

2. THESIS OBJECTIVES AND METHODOLOGY

2.1 OBJECTIVES

The main goal of this bachelor thesis is to evaluate the impact of CNB´s foreign exchange interventions from November 2013. Foreign exchange interventions are generally introduced in the theoretical part of this thesis, where the term "foreign exchange interventions" is defined by using definitions, what are the impacts, tools, methods or division of foreign exchange interventions.

The wide scope of the topic of this thesis in the practical part is divided in four parts. The first chapter is dedicated to reasons and opinions of CNB´s decision and analytical results contain three analysis. The first analysis of the bachelor thesis tries to evaluate the impact of exchange rate upon Czech agri-food sector firstly by studying impact upon trade balance in the sector and secondly by studying impact upon consumer food prices. The second analysis of the bachelor thesis discusses the impact of intervention upon Czech foreign trade, particularly upon agri-food sector. The third part assesses the impact of intervention upon GDP and environment firstly by estimating impact upon GDP and secondly by evaluating impact upon environment using Kuznets curve.

Another goal of this thesis is to provide readers with the theme who are not familiar with topic. The author tries to describe and explain the reasons, opinions and evaluate the criticism of foreign exchange intervention. Also the bachelor thesis tries to find out if the intervention was successful or not.

2.2 METHODOLOGY

Thesis is divided into theoretical and empirical part. The data and information are collected from books, scientific articles and internet sources focused on the topic.

Firstly, in the theoretical part, the author works with the professional literature on the bases of printed and electronic media, which is listed at the end of the thesis. All relevant data are gathered in order to clarify the terms and definitions of foreign exchange intervention. For creating an inductive thesis specific statistics and data has been used and processed from the initial research.

Secondly, the empirical part of this thesis, methodology is focused on the impact of foreign exchange intervention. Mainly with the use of trend analysis that tries to predict the future movement of a specific sector based on the past data. Trend analysis gives traders and economists an idea of future behaviour. The author uses it for prediction of the behaviour and the impact in specific sectors of the Czech economy. The third part of analysis used Gretl tool specifically Arima model. Data were collected and compiled from many different sources in a specific period. The thesis used quantitative data analysis and processing for real prices transformation, second differences of prices, etc. All calculations and data used in analysis are attached in the annex of the thesis.

2.3 LITERATURE REVIEW

The literature on the effects of foreign exchange intervention is very extensive. This section reviews contains some of the main works. For comprehensive surveys, refer to Butcher (2011), Mohanty and Turner (2005), Kritzer (2012), Jílek (1997) and Genberg (1981).

Study of Geršl (2004) presents that foreign exchange intervention of the CNB also give varied evidences of effectiveness of interventions. However, other papers do not support the conclusion that intervention is effective Humpage (1988).

In the most influential paper, Disyatat and Galati (2005) also argue that there is no impact of foreign exchange intervention even in case of CR. The authors did not find any evidence that intervention had an influence on the short-term exchange rate volatility. To study this impact during 2001 and 2002 authors used official statistics by the Czech National Bank in conjunction with options market data. The paper found out that central bank intervention had a weak statistical significant impact on the spot rate and very small impact of the risk reversal. The results of effectiveness of foreign exchange intervention are unclear and mixed. It depends which exchange rate is analysed, which period is in a sample and which strategy is used. Many available studies find that foreign exchange interventions were effective in the short term and also in the long term (Disyatat and Galati, 2005).

During several years, a big amount of studies were dedicated to the effects of intervention on exchange rate volatility. Most of the studies found a significant effect upon exchange rate volatility Geršl (2004). Also Holub (2004) confirms that there is a significant impact upon increased volatility. Dominguez (2003), however, argues that the influence on exchange rate volatility depends on how intervention is managed by central banks. Dominguez (2003) also writes that getting the timing of interventions is very critical to measure in the short-term impact of interventions.

According to Carney (2013) the Czech National Bank decided for an aggressive foreign exchange intervention strategy in 2013. The society was warned for a year that it may happen. Opinions were very mixed. In Klaus (2013), he wrote that reaction of public sector was very clear and he is against this decision as well as many economists and specialists. In the contrary Tůma (2013) wrote that Prime Minister Rusnok agreed with it. He added

that in the economic impact, interventions were a good choice for Czech Republic. Sides of positive and negative opinions were balanced.

Many authors deal with these issues. Unfortunately, this data are not very often publicly available. According to analyze literature it can be argued that analysis results that foreign exchange intervention depends on timing, the sample of time period, exchange rate and which strategy is used. While this decision is now generally perceived to be supportive, impact upon individual sectors is not known (CNB, 2013). Final results of Czech National Bank decisions are also still unclear. It is the question of the time if foreign exchange intervention was a successful decision.

3. THEORETICAL PART

3.1 Essentials of Foreign Exchange Market

3.1.1 The Foreign Exchange Market

Nordhaus (1992) explains that the foreign exchange market is the place, where all currencies of different countries are traded. The foreign exchange rate of a currency determines the balance of supply and demand for foreign exchange. Moreover, supply and demand for foreign exchange exists for every currency.

The key factor, which affects the Czech foreign exchange market (currency market) is the exchange rate of the Czech crown against the major world currencies, which sets CNB every single day. According to this exchange rate, business is conducted in the foreign exchange fixing of CNB and this exchange rate is also the official rate in the following day for accounting purposes (Jílek, 1997).

Foreign exchange trading began to growth since currencies start to free float in 1978. Automated forex dealing system was established in 1980´s and electronic matching systems in the 1990´s. These two systems supported the safety and speed of foreign exchange transactions (Butcher, 2011).

3.1.2 What Does it Mean "Forex"

Forex is a short for foreign exchange and refers to the context of one currency into another. Currency exchange is essential function of the global economy. Goods and services are produced in one country and sold in another country and need currency change. Forex market is massive, according to Kritzer (2012) average daily turnover in the forex markets exceed 4 trillion dollars. The most traded financial asset in the world is USD/EUR.

However, the retail penetration of forex is minimal. As Kritzer (2012) says, "many stock brokers, bond brokers, and options brokers are all now household names, retail forex brokers tend to be small and specialized and have very little brand recognition outside of the forex niche." In fact, forex trading has moved from a nondemanded sphere into the highly used stream. The majority of individual investors have ignored the opportunity to profit from it for a long time. Nevertheless central banks are most active and the biggest

participants in the forex markets and they are also one of the largest long-term players in the forex markets.

Figure 1: Average Size of Daily Foreign Exchange Interventions

	In USD millions				As a percentage of daily FX market turnover				As a percentage of average monthly FX reserves			
	2007	2010	2011	2012	2007	2010	2011	2012	2007	2010	2011	2012
Latin America[1]	109.2	185.1	194.6	166.6	8.3	5.1	6.0	11.0	0.5	0.5	1.0	0.7
Asia[2]	2.6	...	...	9.7	1.0	...	0.1	0.2	0.2	...	...	0.2
Emerging Europe[3]	50.6	41.3	55.8	81.8	95.0	65.0	70.0	105.0	13.0	4.0	5.5	10.0
Other emerging economies[4]	222.5	230.0	438.0	40.0	0.1	1.4	0.6	0.2	0.1	0.1	0.1	0.1
Total	99.7	133.5	179.6	99.6	21.2	14.4	14.8	26.6	2.7	1.0	1.4	2.2

[1] Based on the responses of six central banks. [2] Based on the responses of two central banks. [3] Based on the responses of two central banks. [4] Based on the responses of two central banks.

Source: (BIS questionnaire, 2013)

Also as Kritzer (2012) explains that central banks buy or sell their domestic currency to appreciate or depreciate the currency. These actions of intervention inevitably fail over the long-term, but they can be very effective over the short-term. He point it out that it is maybe because central bank has whole control over the money printing presses and almost unlimited budget.

As he states "The typical average size of daily intervention in EMEs increased from less than $100 million per day in 2007 to about $133 million and $180 million, respectively, in 2010 and 2011. In 2012, the average size of intervention fell to close to the 2007 level."

3.1.3 The Exchange Rate

Nonfiction literature contents various definitions in terms of the exchange rate which reflects the essence of the problem. The definition of Nordhaus - the rate, or price, at which one country´s currency is exchanged for another country´s currency. When a nation´s exchange rate rises, the prices of imported goods and services fall and exports become more expensive for foreigners. As a result the country becomes less competitive in world market and net exports decrease. Exchange rate significantly affects many parts of economy such as output, inflation or employment also revenues of exporters, expenses of

importers, income of foreign capital. Through the above factors lead to influence prices on the domestic market. These influences in economy lead to the fact that the exchange rate is not always determined by market factors, but it is often decided by central banks in the foreign exchange market. Each country has different rules and different institutions governing the operation mechanism of the exchange rate and its own methods of use for payments abroad or receipts from abroad. Each country chooses such an exchange rate system that best and relatively fits the needs of a political and economic and social development in a given period (Nordhaus, 1992).

3.1.4 The Exchange Rate of the Czech Crown

After the devaluation in 1990 it was set a fixed exchange rate as a stabilizing element of the Czech economy. Czech crown was fixed on a basket of currencies, the initial composition in 1990 was 65% DEM and 35% USD (Jílek, 1997). With the CNB's reference on article about history, since May 1997 CNB left fixed exchange rate regime and floating exchange rate regime became the main element of the Czech economy. In the period between 2001 and 2008, the Czech crown gradually (with variations) appreciated. The exchange rate in late 2008 and 2009 weakened sharply due to the global financial crisis. In the following years, due to the deepening debt crisis and other problems in the Euro zone the exchange rate of the Czech crown was fluctuate very much.

In November 2013 the CNB has used the exchange rate as an instrument of monetary policy in a situation where traditional tool – cutting the interest rate – was on to what is called a "technical zero" of 0.05 percent. The exchange rate of the Czech crown against the euro after the announcement of this commitment stabilized slightly above the level of the exchange rate commitment (CNB, 2013).

3.1.5 Exchange Rate Regimes

Following Šmach the current exchange rate and calculations of each individual currency are relatively a new thing. Everything started with the gold standard, where each single unit of a currency had always been connected with a fixed value or certain amount of gold. The change was possible only in a situation of disposing of coins, called seignorage. However, it was not a common phenomenon. Changes of exchange rate were very rare occurrence. In comparison with today´s system it is a big difference. Nowadays, exchange rate is changed continually and very often.

It is interesting note Ka Fu (2000) that in general, we distinguish between three exchange rate regimes. Flexile, intermediate and fixed regime.

Fixed exchange rate denotes nominal fixed exchange rate with respect to one foreign currency or a basket of foreign currencies. On the other hand a floating exchange rate is determined more or less by the force of market demand and supply. Floating exchange rate permits enough flexibility and fluctuates continually (CNB, 2013).

3.2 Foreign Exchange Intervention

The Legal Status of Intervention

One of the theory suggests Ka Fu (2000) that forex transactions, which are coordinated by monetary authorities. Their goal is to influence exchange rate and market conditions. Mainly the value of domestic currency on the foreign exchange market.

Evidence in Kritzer (2012) states "When central banks intervene, they inadvertently provide support for opposing currencies. In other worlds, a central bank cannot simply sell its home currency, it must simultaneously buy an opposing currency."

LeBaron (1999) claims that intervention days are the source of unusual profit for traders. He finds that moving average trading rule profits are significant in daily foreign exchange data if interventions days are excluded in the sample, profit go to zero.

Getting the timing of interventions is very critical to measure in the short-term impact of interventions on the forex markets. Even if interventions are just informative and give information that is considered price relevant, exchange rates might not react right away, traders learn about interventions at different times. Also, interventions are often non-informative, foreign exchange interventions might have still impact on prices and volatility in short-run or long-run. Anyway, interventions are common knowledge and traders should be able to distinguish the difference between non-informative interventions and informative interventions (Dominguez, 2003).

Central Bank

Central bank is the financial institution that oversees many operations of the country´s banking and monetary system such as regulating the money supply, issuing the national

currency, implementing monetary policy and controlling interest rate or price stability, managing forex reserves etc. Central bank has many tools of monetary policy, the interest rate is the most visible one. Raising interest rate influence households through mortgages, loans and consumer debts. In turn this reduce consumer spending, because consumer has less money to spend. Higher interest rate slows down spending and also the economy. On the other hand, lower interest rate gives more money to consumer so they borrow money and it has positive impact on economic growth. Lower interest rate means a decrease in the value of currency (Butcher, 2011).

Why Central Banks Intervene in the Foreign Exchange Market?
As Genberg (1981) explained, intervention in the foreign exchange market has an important role of the conduct of economic policy in the present system. Central banks sell or buy foreign currency for many reasons, which are also written in paragraph called "Types of forex intervention".

We distinguish between several motives of intervention such as central bank´s financial stability, to control inflation, maintain competitiveness and build foreign exchange reserves. These motives depend not only on bank´s choice, but also on their balance sheet position etc. Successful intervention depends mainly on the right choice of instruments, markets and timing to maximize the impact on the exchange rate (BIS, 2013).

In general we consider two main issues: (1) the consistency of intervention (monetary policy stance) this means appreciation or depreciation the exchange rate to stabilize inflation (or recession) at the same time when monetary authority may depreciate or appreciate the currency. In addition, intervention may send some wrong signals about monetary policy.

On the other hand there are (2) implications for domestic monetary suggested that domestic implications depend on the extent to which it is sterilised and also on the instrument of sterilization (Mohanty and Turner, 2005).

Figure 2: Motives of Intervention

Motives of intervention	Importance[1] in 2005-2006			Importance[1] in 2011-2012		
	High[2]	Moderate[3]	Low[4]	High[2]	Moderate[3]	Low[4]
To curb excessive exchange market speculation	8	4	0	11	4	0
To maintain monetary stability	7	2	2	10	2	2
To discourage sharp capital inflows or outflows	4	3	1	5	5	1
To build or reduce foreign exchange reserves	4	3	1	6	2	2
To smooth the impact of commodity price fluctuations	3	1	3	4	1	3
To maintain or enhance competitiveness	2	2	3	4	1	3
To alleviate FX fundings of banks and corporations	4	2	0	5	2	0
[1] On a scale of 1 to7, where 1 is most important and 7 is least important. [2]1 or 2. [3]3 or 5. [4]6 or 7.						

Source: (BIS questionnaire,2013)

One of the most thorough surveys was made by BIS (2013) where they employ motives of intervention compares to other motives in specific periods. In 2011-2012, 15 out of 19 central banks responded highly or moderate (79%). The monetary stability became one of the dominant motives of intervention. Building and reducing foreign reserves continues to be one of top motives. To achieve it, the central bank manages the level or the volatility of exchange rate, or in other case both. As it was said before these three main tactics are very important: monitoring of markets, timing of intervention, and instruments of intervention.

3.2.1 Intervening Strategies

Wong Ka Fu (2000) states in his work several strategies of intervening and types of foreign exchange interventions, which are written below.

"Lean against the wind"

Central bank wants to support to either domestic or foreign currency by selling or buying foreign exchange when domestic currency is appreciating or depreciating to resist short run fluctuations in exchange rates (Ka Fu, 2000).

"Minimizing Overshooting Effect"

Foreign exchange intervention is an instrument used in short-term to transits in the exchange rate by minimizing overshooting when economy is changing (Ka Fu, 2000).

"Reducing Exchange Rate Volatility"

Central bank reduces volatility because it may prevent international investment flows. Company does not want purchase a foreign company if exchange rate uncertainty reduces the expected profit. Other reason of reducing volatility is negative affect on international trade. When currency is stable, the investment risk is lower. Higher price means lower demand for traded good (Ka Fu, 2000).

Correct Misalignment of Exchange Rate

The correct "misalignment" moves the inflation rate outside of a target range. Stabilization could move the exchange rate back towards equilibrium (Ka Fu, 2000).

Profitability of Intervention

Profitability of forex intervention is not a necessary order for intervention, sometimes intervention brings a big profit (Ka Fu, 2000).

Technical Trading Rule Profitability

Technical analysis uses past price and determine trading decisions. It can produce constant profit in exchange rate markets. The trading rules use several types of statistical data. For example moving average or double moving average, which describes relationship between long and short moving averages. If short moving average is less than the long moving average, trader should sell the asset (Ka Fu, 2000).

3.2.2 Types of Foreign Exchange interventions

Entrustment Intervention

"Entrustment Intervention" is conducted in overseas markets with funds of local monetary authorities. It is different from the intervention that is conducted in overseas markets with funds of respective foreign monetary authorities (Ka Fu, 2000).

Reverse-Entrustment Intervention

It is used when authorities need to intervene in a country's foreign exchange market, e.g Beijing market, the central bank of China can conduct interventions on their behalf upon request (Ka Fu, 2000).

Concerted or Coordinated Intervention

It is type of forex intervention where two or more monetary authorities implement intervention jointly by using their own funds at the same time or in succession (Ka Fu, 2000).

Non-sterilization and Sterilization

Studies generally distinguish between intervention that does or does not change the monetary base. When monetary authorities buy or sell foreign exchange, then monetary base increases or decreases by the amount of the purchase/sale. Money stock should be prevent from increasing/decreasing, they can sterilize the effect forex intervention by selling or buying short-term domestic assets to or from the bank leaving the monetary base unchanged. Sterilization does not change the money supply and exchange rate (Ka Fu, 2000).

Spot and Forward Markets for Intervention

A spot transaction, traders agree to sell or buy currency at the current exchange rate and it is settled two days later. A forward transaction, traders buy and sell currency at predetermined exchange rate at least three days later to reduce their exchange rate risk (Ka Fu, 2000).

The Options Market

The options market is also used for intervention. In Europe it is called (put) option, which presents the right, not the obligation to buy or sell specified quantity of the underlying

asset on a specific date. Standardly, the option contract defines the price for which the asset may be sold or bought, and this is called the strike (exercise price). Monetary authorities want to prevent depreciation or devaluation of currency. They may sell put options on the domestic currency or they may call options on the foreign currency (Ka Fu, 2000).

Indirect Intervention

In one case monetary authorities want to influence exchange rates, on the other hand it can also refer to other indirect policies for that motive. There is an infinite number of methods how you may indirectly influence the exchange. Capital controls such as taxes or restrictions on international transactions in stocks or bonds or exchange controls such as the restriction of business with currencies (Ka Fu, 2000).

3.3 Volatility

The influence of interventions on volatility has also brought a lot of thinking in the literature on intervention. Most of studies found a significant effect upon exchange rate volatility (Geršl, 2004). In some studies there is no significant impact on the exchange rate. Based on studies of Holub (2004) there is a significant impact upon increased volatility. Furthermore, the foreign exchange markets can be as volatile as mainstream financial markets (Kritzer, 2012).

Following Ka Fu (2000) there are many causes of exchange rate volatility e.g. money supply, income or interest rates. These are market fundamentals, which affects it, because the level of exchange rate is function of these fundamentals. Large changes in money supply leads to changes in exchange rate and that leads to changes in exchange rate volatility. Another cause of volatility is expectations about future market fundamentals or economic policies. With new information, they alter their forecasts of future conditions. For example the growth or decline of interest rate. For volatility is also very important the degree of confidence. Volatility tends to rise with increases market uncertainty about future economic conditions. Exchange rate movements are another example of cause. For example many speculators buy Czech crown, because they believe it will appreciate, then it could appreciate regardless on fundamentals. In case speculators start to sell Czech crown, it could depreciate.

3.4 Effectiveness of Forex Interventions

Available studies from (Geršl, 2004) on the forex intervention of the CNB also give varied evidences of effectiveness of interventions. Some of studies found a little or no impact on the exchange rate level, more positive studies give results with a regard to the effect on the exchange rate.

Most of economists believe that changes in the supply of money in the long term will mainly increase the level of price with a small or no influence upon real output. Monetary changes will affect definitely aggregate demand and will tend to change real GNP in the short run. In the long run, as prices and wages are more flexible, more and more of the effect of the money supply change turns up in prices and less and less shows up in real output (Nordhaus, 1992).

Evidence in Ka Fu (2000) presents that intervention can increase and also decrease volatility. However, there is still much evidence that foreign exchange intervention is effective in a positive way. It can stabilize the market. He claims, the bigger the amount of interventions, the higher the possibility of positive result.

As author mentioned before, successful intervention depends on the choice of instruments, timing and markets.

3.5 The Historical background of the Czech Currency

While the history of tender is almost as long as civilization itself, we need only go back far to 1993 to unearth the foundation of the establishing the Czech crown.

Czech Statehood Day (2011) published on 28 September 2011, the project of these celebrations - The Pantheon of Czech Banknotes. This part is called "The birth of Czech banknotes" wrote by an employee of the Central Bank JUDr. L. Surga.

Everything started in year 1990. Same year in September, the State Bank of Czechoslovakia resorted to an anonymous public competition, where everyone could participate. The participation had several conditions such as sending of proposals of nine denominations: 10 Czechoslovak crowns, 20 Czechoslovak crowns, 50 Czechoslovak crowns, 100 Czechoslovak crowns, 200 Czechoslovak crowns, 500 Czechoslovak crowns, 1,000 Czechoslovak crowns, 2,000 Czechoslovak crowns and finally 5,000 Czechoslovak

crowns, as well as observance of anonymity (personal information had to be in sealed envelopes).

The themes for the new Czech banknotes had been received in 1992, in the autumn after the decision to split the federation into two independent states. A big number of banknotes were changed instead of Slovak themes to portraits of famous Czech women who appeared most frequently: Božena Němcová, Saint Agnes of Bohemia and finally Emmy Destinn. With this decision also another proposal was accepted, all final personalities were arranged in chronological order, i.e. from the oldest on the lowest value banknote to the youngest on the highest value banknote. Finally, individuals were chosen "verified" by history: Charles IV – Father of the Country, František Palacký – Father of the Nation, Jan Amos Comenius – Teacher of Nations and Tomáš Garrigue Masaryk, where it was stated that he rendered meritorious service to the state.

The themes for banknotes were resolved very quickly, but the selection of visual design lasted for period of one year. Finally, it was selected design of Czech art designer Oldřich Kulhánek.

3.6 The Role of Foreign Exchange Interventions in the Czech Republic

It is very similar to other transition economies in Eastern and Central Europe, that monetary policy in Czech Republic after split up in 1993 was relying at the early stages of the transition process. It means achieve price stability through the exchange rate. After several devaluations against the currency basket in 1990, the Czech crown's system remained unchanged until the float regime which was introduced in 1997, because of the currency crisis. This new regime was orientated against the German mark and after that against the euro in 1998 (Komárek and Égert, 2005).

Figure 3: Exchange Rate in the Czech Republic, 1999-2014
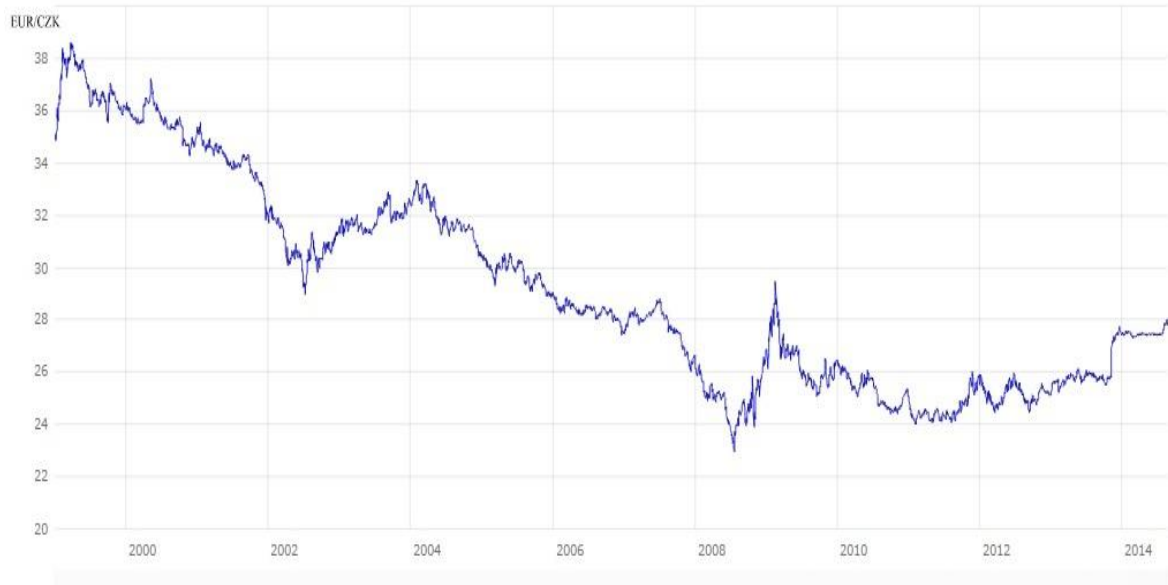
<div align="right">Source: (ECB, 2014)</div>

The figure above shows data from January 4, 1999 to August 21, 2014. Minimum (21 July 2008): 22.968 - maximum (24 March 1999): 38.583 and average: 29.218. It is known that the Czech crown was appreciating from 1998 till the end of 2002, because of the massive privatization of a corporate sector and many greenfield investments. From 1998 to 2002, the CNB intervened on the foreign exchange markets to moderate the appreciation caused by the foreign capital inflow, more detailed it was the appreciation of the Czech crown against the German mark and the euro to weaken the Czech currency. In year 2002 the Czech currency continued to appreciate so the Bank Board also approved intervention in the foreign exchange market. The CNB did not intervene in year 2003, but it started to buy the crown from April 2004 as sales of foreign reserves by elimination of losses of the CNB, because the CZK appreciated. In late year 2008 to year 2009 the exchange rate depreciates due to the global financial crisis which occurred (Komárek and Égert, 2005).

4. ANALYTICAL PART

In the first chapter of analytical part there is described and explained the CNB´s decision. Second part of research is dedicated to economic analysis. There is analyzed mainly consequences of intervention for example agri-food sector prices, which influence mainly consumers. Basically, what author is looking for is the change that occurred after November 2013.

Second part of the analytical part has three subcapitols, each of them with an analysis. Firstly author wanted to determine problems of Czech economy and reasons of the intervention. Secondly, author analysed impacts of CNB´s interventions upon agricultural market, specifically agribusiness was analysed. To evaluate impact of exchange rate upon Czech agri-food sector, author studied the impact upon trade balance in the sector. Another purpose of second analysis is to find out the influence of exchange rate on agri-food prices, mainly through the impact upon consumer food prices. In a last part a methodological approach is proposed to analyze possible impact upon Czech environment through GDP using a concept of Kuznets curves (Hercegova, Strielkowski, 2011). For all these purposes author used Microsoft Excel 2007 and Gretl, Arima tool, as it proves to be a useful tool to analyze these relationships. All data were collected from Czech statistical office database and currency exchange values were collected from the database at bloomberg.com and ecb.europa.eu. Data used for this analysis are collected in the appendix section of the thesis.

4.1 Foreign exchange intervention of CNB in November 2013

The Bank Board of the Czech National Bank decided for an aggressive foreign exchange intervention strategy. The CNB had been warning Czech society for a year that it may weaken the crown as economic growth goes up while interest rate is close to zero (Carney, 2013).

On November, 7 the Bank Board decided for foreign exchange interventions, for the first time since year 2002, in order to ease monetary conditions. In 2002 the Czech National Bank used interventions to stabilise the crown (Geršl, 2004). For this time the Bank Board decided to support economic growth, price stability and take a preventive step instead of waiting until deflation occurs. CNB decided to use it as a monetary policy instrument because interest rate was on the zero level (Český rozhlas, 2013). It was said that interventions could not prevent deflation, but they reduced the risk of long-term deflation. The CNB sold crowns and bought euros for about CZK 200bn by November, 20 and within few minutes changed the Czech currency by one and half crown weaker to approximately CZK 27.00 per Euro (Finanční noviny, 2013). More accurately before the intervention, the Czech crown was CZK 25.80 per Euro and depreciated to CZK 26.63 per Euro in the afternoon and before 4 p.m it was traded by Kc26.95/Euro. Regarding the macroeconomic prediction, the CNB wants to keep the Czech crown close the Kc27/Eur until 2016 (CTK, 2013). According to Czech News Agency "The crown weakened versus the euro to a four-year low after the CNB announced the interventions. The new currency rate is the weakest since June 2009." One day after forex interventions on Czech National Bank vice-governor Vladimir Tomsik said "The main benefits of forex interventions are the preservation and creation of new jobs as well as prevention of losses of gross domestic product that would be much higher if deflation occurred." The Bank Board named many advantages of foreign exchange intervention such as the increase in prices of imported goods and services, can expect to reduce household's purchasing power, their demand may be redirected to domestic goods and services to a greater extent and also they expect lower real interest rates as a result of higher inflation expectations (CTK, 2013).

As CNB (2013) Inflation report states "At the same time, the weaker exchange rate will support Czech exports and the profitability of corporations and their willingness to invest.

The recovery in production will then contribute to a rise in employment and wages, which will increase the purchasing power of households. The above impacts of exchange rate changes on the Czech economy are quite well mapped from the CNB's point of view." According to Czech National Bank governor Miroslav Singer, CNB decided to intervene for such a period of time and in such a volume as it will be required to achieve the necessary value of the exchange rate. "We are not limited by the amount of forex reserves as regards interventions to weaken the crown," Singer added (CTK, 2013).

4.2 Reasons of the decision from November 2013

According to Prouza (2013) the decision of CNB was a big surprise and also very risky. Similar decision was used almost 11 years ago. The decline of Czech economy lasted for one and half year before the CNB´s decision. According to vice-guvernor Tomsik in article of Reuters (2013), domestic economy does not growth since the second half of 2011. Under normal circumstances, the CNB would decrease interest rates, but this possibility was not possible anymore thanks to technical zero level. Deflation is very hard to stop when it occurs and its prevention is better than fight with the deflation.

Another reason of forex intervention was the increase of domestic demand. As reported vice-guvernor Tomsik interventions are the impulse for households to buy products and not procrastinate the consumption. And we understand that this impulse is the impulse for consumers and also for investment demand (Kohout, 2013).

According to Jánský (2013) another goal of CNB was to achieve an increase in prices and increase the inflation more precisely, because inflation expectations were below the target of CNB.

In November 2012 CNB reduced the level of interest rate to "technical zero". And during 2013 conducted verbal intervention aimed at weakening the crown. Reasons were following during 2013. Significantly negative output gap, slower growth than in neighbouring countries, a significant growth of savings, the decline in inflation in the euro area, the lowest wage growth in private companies in history, a steady rise in unemployment, decline in fixed investment over the past two-year, a decline in property prices, the long-term decline in growth rates of monetary aggregates and the velocity of

money in the Czech Republic, historically low levels of inflation expectations (Singer, 2014).

4.3 Advantages and disadvantages

Year 2013 provoked many reactions and there were mostly negative. The attention specifically raises in prices of import and also to already low domestic consumption.

Advantages and disadvantages of forex interventions have an impact on a wide spectrum of different companies and also on households. Generally, one who is dependent on the import is logically uncomfortable with CNB´s decision. According to CTK (2013) import would lose and export will increase its values. Companies which are dependent on import had to reduce their costs, not only number of employees but also in sphere of wages.

According to CNB (2013), advantages have mainly exporters, because it should bring higher profits for them. Also households should spent more money and it should create new job places. The decision of the Bank Board, however, may play a role in underestimating the psychology of consumers, because they may occur in a opposite effect that it was intended, because maybe households are afraid of higher prices and they spend less money. Disadvantages of more expensive imports put pressure on the price level and as well as on the purchasing power of the population and thus on the standard of living.

As Wiesner (2013) claims in the case of long-term maintenance of the exchange rate level of the CNB, it should appear in positive effect, which will support the domestic economy. There is a question, what will happen in the moment, when CNB will stop to intervene against the crown. In the Czech Republic is very quality workforce at a reasonable price, a big amount of products assembled here and it is usually dependent on imported raw materials. It is interesting note that in the long term, the decision of CNB should undoubtedly help the Czech agriculture as well as the Czech economy in general. The decline of the Czech crown is undoubtedly support for exporters, since the Czech economy is an open export orientated economy. The long term it means in years and this could be a problem. It should be noted that the main goal and CNB´s purpose of the intervention is to prevent Czech economy from deflation spiral which is probably a goal for within a year.

Wiesner in opinion of KZPS also writes that it is necessary to be said that other major currencies are also weakened for a long time. The US central bank continues in the so-called "quantitative easing" to help the American economy by a weak dollar. The exchange rate is also weakened in Japan or England. The step of CNB is in the fact a logical step towards the "normal" exchange rate of the Czech crown in proportion to the strength of other foreign currencies. In the article of Kohout (2013) Czech households lost almost 76 bilion of Czech crown.

4.4 Opinions and Criticism of CNB´s decision

Tomsik with the Bank Board very defend CNB´s actions, on the other hand these steps has also been very criticised by many firms, entrepreneurs, economic experts, unions and also by President Milos Zeman and his predecessor Vaclav Klaus (CTK,2013).

Public opinion research centre prepared in February 2014 a survey called "Opinion on Foreign Exchange interventions of the Czech National Bank" by personal interviews with respondents (older than 15). As a result only 12% of Czech people agree with the central bank´s action against the crown. About two thirds of population (64%) disagree and nearly one quarter (24%) of Czechs had no opinion about the issue. An overwhelming majority of Czechs believe that the willingness to save and willingness to purchase goods will remain the same, this state around one half of the population (56%). One third of Czechs said their willingness to save has decreased and 41 percent believe there will be lower willingness to shop. "Overall we can say the Czech public is embarrassed about the crown's weakening to the euro," CVVM stated (Ďurďovič, 2014).

Negative opinions

Reaction of public sector was very clear. "Interventions have very disputable effects but very undisputable costs", according to Klaus. Institute of Václav Klaus (2013) wrote an article as a part of its economic texts that the intervention was a big mistake. From many point of views.

"I realise that it can help our exporters in a short run but the question is for how long," Zeman said. Stated by Zeman, "there is no danger of deflation in the Czech Republic at present." ...."The inflation level stays within the interval between 1 and 2 percent," he noted. Marketa Sichtarova, director of company Next Finance, The CNB can repeat the

interventions, but their effect will be gradually decreasing. "We bet that the crown will now start to strengthen slowly and return to the level at which the intervention was made," Sichtarova added (CTK, 2013).

The CNB's steps have also been criticised by the Confederation of Industry deputy head Zbynek Frolik: "It was a surprise for most industrial companies because the economy started to grow in autumn, and they expected an economic recovery," Frolik said. According to the trade union umbrella organisation CMKOS: "The CNB's decision is very problematic and it is a question whether the expected benefits arrive." Raiffeisenbank analyst Helena Horska said that she disagreed with the CNB's expectation that a weaker rate will start up household consumption. "In a situation when households' real incomes are falling, the willingness to succumb to shopping spree is little," Horska said. "The question is how long the bank will be able to intervene," former Czech prime minister and European commissioner for social affairs Vladimir Spidla said. Similar opinion has a Czech State Secretary for European Affairs Tomáš Prouza and truly wrote, that Czech National Bank says that thanks to intervention, households will be afraid of prices in future, so they spend their money before all prices will raise. While this corresponds to theories from economic books, reality is totally different. It completely ignores the reality of everyday life. Households did not spend their money because low inflation, but because they are scared and afraid of the future. As an example, Prouza stated that society will still be afraid of their job and they can forget to higher wage. And in this situation they will not buy television or vacation in the Egypt, because it will increase its price by a thousand in the spring time.

Positive opinions

In the contrary, many economic experts and politicians have a different opinion. They support this decision and they believe in better future economic development.

Prime Minister Jiri Rusnok expressed support to the CNB´s action. Tůma (2013) wrote that Rusnok agreed with this decision and totally understand reasons, which had CNB for this action. "In the economic impact point of view, I think that the intervention of the Czech National Bank in the short and medium term especially in a few years, were good choice and the Czech economy will benefit" he remarked.

Deloitte's chief economist David Marek agreed with CNB rather than with his critics. He added that the primary benefit of intervention was to reduce the risk of deflation. Czech economy would be probably in deflation without the intervention of the bank he said for ČTK. "Higher export from the Czech Republic, supported by a weaker crown and solid foreign demand is probably still the most obvious benefit of the weaker crown," warned chief economist at Raiffeisenbank Helena Horská. "This year, despite the Russian-Ukrainian conflict and higher import prices due to the weaker crown we can look forward to another record-breaking surplus in foreign trade" she said. She added that, without intervention, would be spring inflation negative, below -0.5 percent. CNB´s study from September 2014 stated that without their action in November 2013, the inflation would be significantly negative in the first two quarters, and it would be deeper and longer time than it was indicated in the analysis earlier in November 2013 (Česká televize, 2014).

According to the Czech Statistical Office step of CNB was correct. Compared with December prices rose by 0.1 percent, which is the lowest monthly increase in prices since January 1993. As CSO reported, electricity decreased annually by 10.5 percent and natural gas by 9.1 percent. In addition, declined also prices in health care by 3.8 percent for hospital stays (E15, 2014).

4.5 One Year from Interventions

From interventions has passed almost a year and half. This work brings a simple overview on "One year from interventions". In this section it is found several tables and graphs related to this theme.

**Figure 4: Annual Increase of Real GDP (in %)**
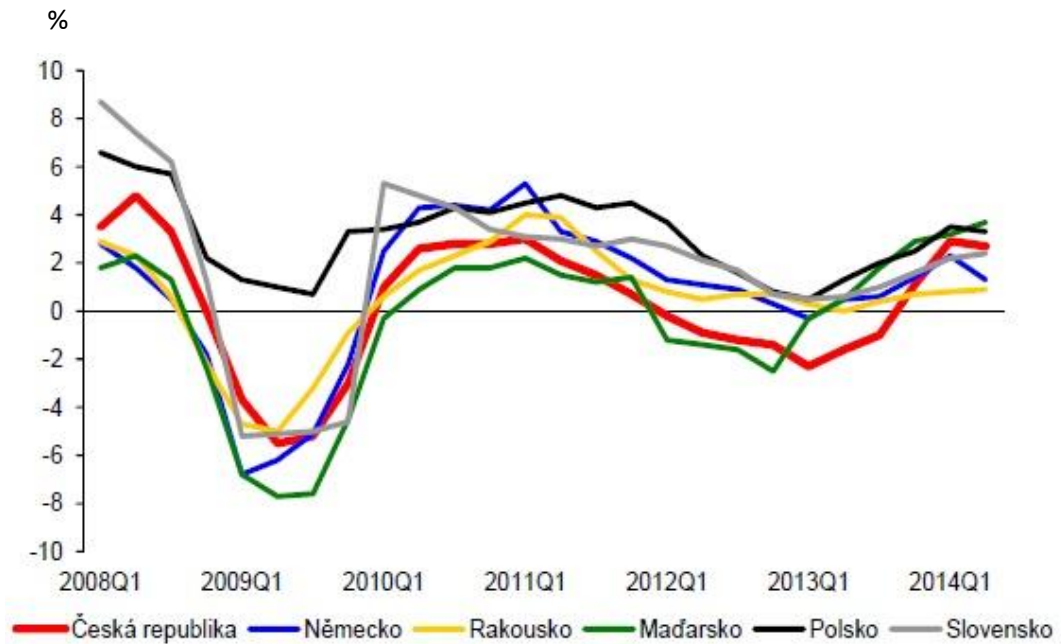
Source: (Král, 2014)

Evidence in Král (2014) suggests that until last year, the Czech Republic had the largest decline in comparison with other countries in the region. The bottom of the cycle was reached in the first half of 2013. In the second half of the year the growth was relatively higher. Number of full-time employees very slightly increased in 2014, also the average salary after a decline at the end of last year in Q1 2014 increased. In 3Q 2014, inflation will increase gradually in the second half of the next year returns to 2% target. This target will be similar in 2016.

Evidence in Rusnok (2014) says that the core inflation was in negative zone 60 months in a row. Price developments clearly signalled a growing risk of deflation. In October 2013 the Czech Republic had a similar price development as Greece, Bulgaria or Cyprus.

Figure 5: Prognosis of GDP Fundamentals (in %)
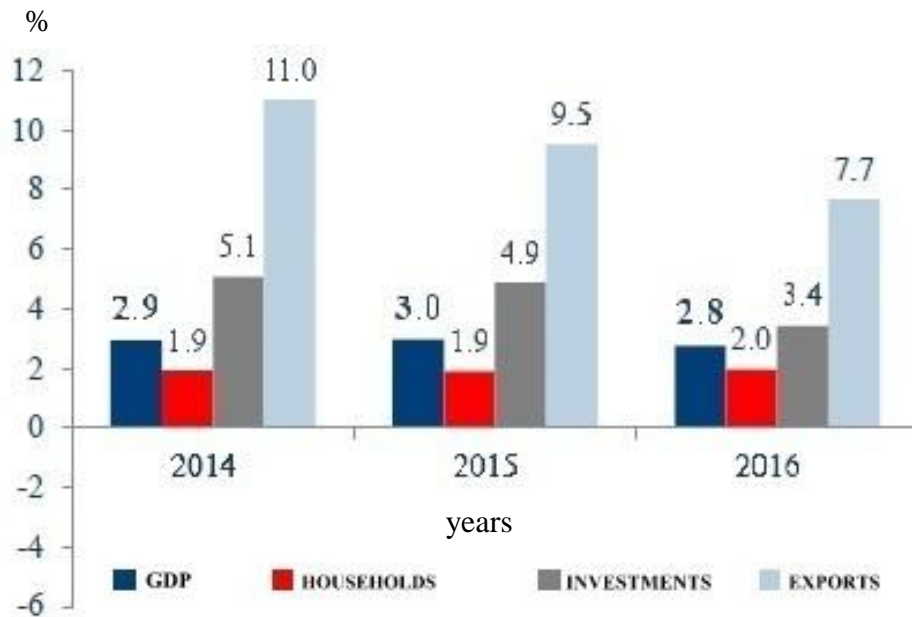

<div align="right">Source: (Rusnok, 2014)</div>

Also Rusnok (2014) noted that the last statement of the Bank Board from September 2014 indicates that the Czech National Bank does not stop using the exchange rate as an instrument of monetary policy earlier than in 2016. There are two major variants to exit from the scheme. The former type is disposable announced exit, followed by rising interest rates the latter A phased exit, the progressive abandonment of the exchange rate commitment with two or more intermediate steps.

According to Urbánek (2014), who used data from CZSO in period from January to July 2014, export was higher by 15.9% and import was higher by 14.2%. According to the final data in the concept for 2013 export rose by 3.3% to 174.7 billion 3. CZK and import by 2.0% to 2 823.5 billion CZK.

Development of Inflation

In the definition of Nordhaus (1992) inflation or inflation rate is the percentage annual increase in a general price level.

Figure 6: Consumer Price Index (in %)
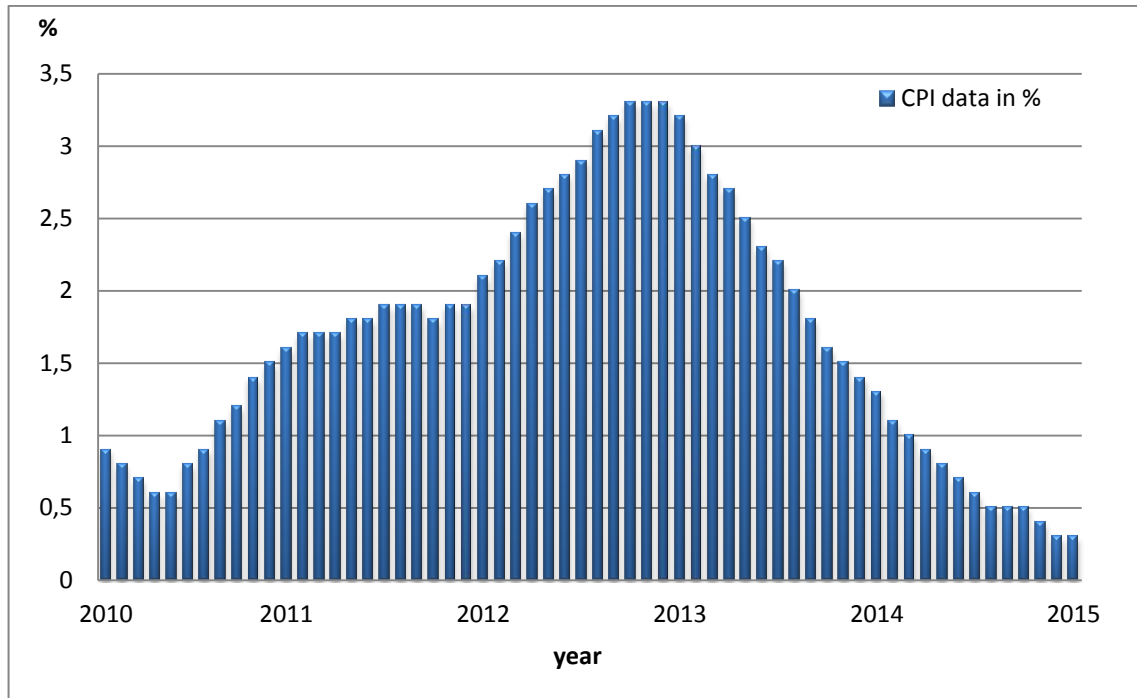
The CPI decreased by 0.1%. Year-on-year strongly decrease on the level of 0.1%. CPI 2014 was 0.4 % and this level was the lowest from 2003. From a macroeconomic perspective growth was increased last year apparently by investments, household consumption and increased industrial production. Artificial depreciation of the Czech crown has helped significantly to growth of sales, especially in sectors strongly oriented to export. Car factories were sold by almost a fifth (+19.5%), producers of computers and electronic equipment by 17.3%. The paper also wrote that employment is increasing and the general unemployment rate is now really low. Also wages increased its values (CZSO, 2015).

Figure 7: Forecasted Annual Level of Inflation
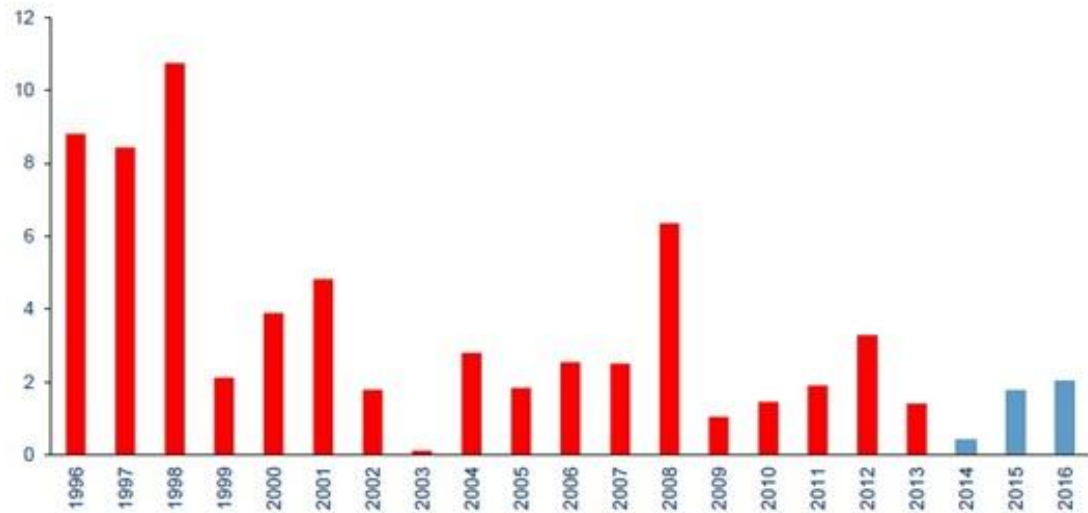
<div align="right">Source: (CNB, 2014)</div>

In 2015 - 2016 the level of inflation will be close to 2%. These effects on mark-ups and macroeconomic growth are identified comprehensively in CNB forecasts. The November and December 2013 inflation figures suggest that the effect of the weakened exchange rate on most price categories is broadly in line with the assumptions. Inflation will gradually increase and 2% target returns in the second half of 2015 (CNB, 2014).

The confidence of people in the Czech National Bank is lower and lower. The figure 8 shows that it is lower mainly from November 2013, when CNB used interventions as a monetary policy. CVVM did a very interesting research, which is displayed below.
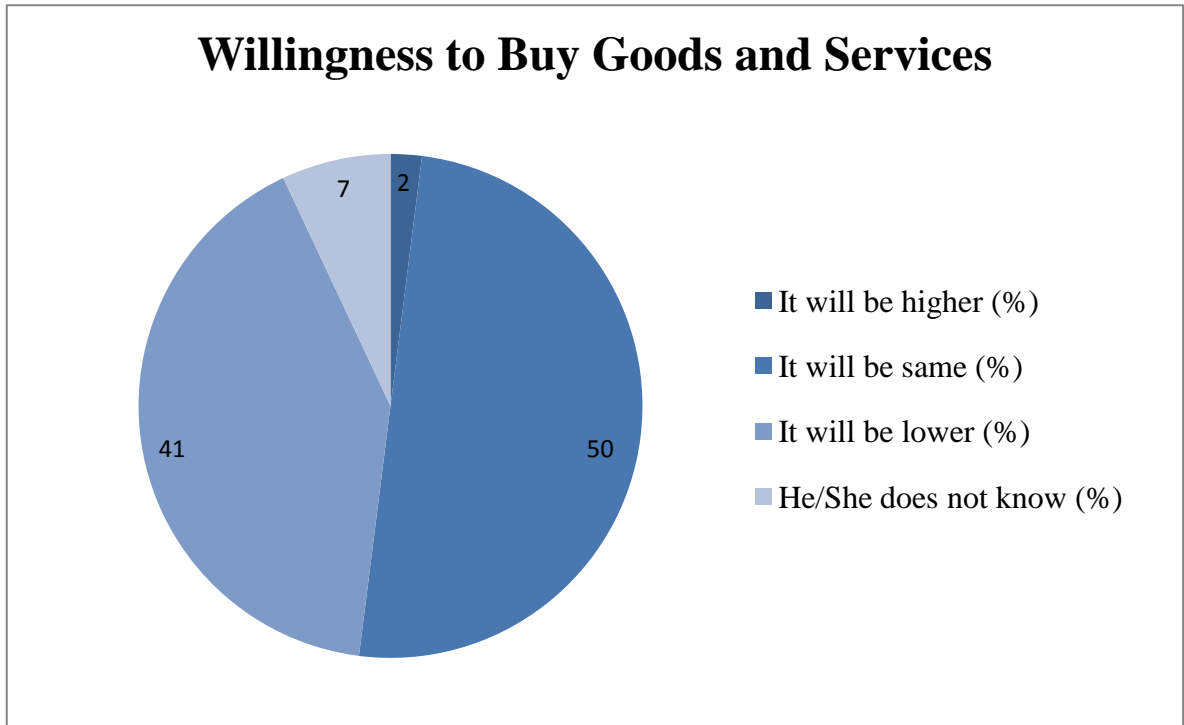
Figure 8: Confidence in CNB (in %)

	IV/06	IV/07	II/08	II/09	XII/09	II/10	IV/11	XII/13	I/14
CNB (%)	66	61	59	60	60	66	66	38	31

<div align="right">Source: (CVVM SOÚ AV ČR, 2014)</div>

The figure above is dedicated to Czech confidence in the Czech National Bank which decline very rapidly. These values are the sum of answers "Definitely trusts" and "tend to trust". Confidence in the central bank decreased to 31 percent in January with more than 50 percent of Czechs expressing lack of confidence.

Willingness to Buy Goods and Services

Legend:
- ■ It will be higher (%)
- ■ It will be same (%)
- ■ It will be lower (%)
- ■ He/She does not know (%)

Source: (CVVM SOÚ AV ČR, 2014)

For the purpose to determine if households are willing to pay, Public opinion research centre collected data in 2014 from 1105 respondents who were older than 15 years old by oral personal interview. The majority of Czechs believe that the weakening of the Czech crown will not increase their willingness to save money or even their willingness to purchase goods or services.

It is most often presented opinion that the willingness to purchase goods and services remain the same (50%). In addition, large part of respondents considers that the CNB´s decision willingness to buy goods and services will decrease (41%). From these views can be seen the high disbelief. In the case of willingness to buy goods and services four-fifths of Czechs (41%) expect a reduction. Only 2% thinks that it will increase the willingness to buy goods and services.

5. EVALUATION OF RESULTS

5.1 The Impact of the Czech National Bank interventions on agri-food sector in the Czech Republic

Czech National Bank intervened in the foreign exchange market to depreciate EUR/CZK exchange rate. While this decision is now generally perceived to be supportive of the Czech economy, impact upon individual sectors is not known (CNB, 2013). Specifically upon agricultural sector, particularly agricultural business. Agrarian foreign trade is an important sector in terms of its impact on environment, while it also maintains employment in rural areas by creating jobs and secures sufficient supply of food, energy and biomaterials. Hence, macroeconomic decisions concerning, e.g. fx market intervention have an ultimate impact upon services provided by agricultural sector. The Czech National Bank latest decision on November 2013 to intervene in the foreign exchange market had a certain impact upon prices including inputs for agriculture.

Forecasted Net Effect of Exchange Rate Differential upon Agri-sector Trade Balance in the Czech Republic

Firstly, data of agri-sector foreign trade specifically import and export in mil. CZK were collected in period from 2005 to 2014. For this research there were chosen 6 sectors of agri-sector. Food and live animals, beverages and tobacco, animal and vegetable oils, fats and waxes, chemicals and related products nowhere else stated, manufactured goods classified chiefly by material and agri-food sector in general. Next step was calculation of trade balance of these 6 sectors. Data from year 2014 had to be estimated by a trend function. Afterwards, prognosis up to year 2020 was predicted by linear trend function. Forecasted trade balance was multiply by predicted numbers of the Czech crown without intervention and fixed exchange rate from October 2014, specifically 27,705CZK/EUR. For results of the research is certainly obvious that without intervention the exchange rate of the Czech crown would raise its value.

Figure 10: Forecasted Net Effect of Exchange Rate Differential upon Trade Balance in the Czech Republic
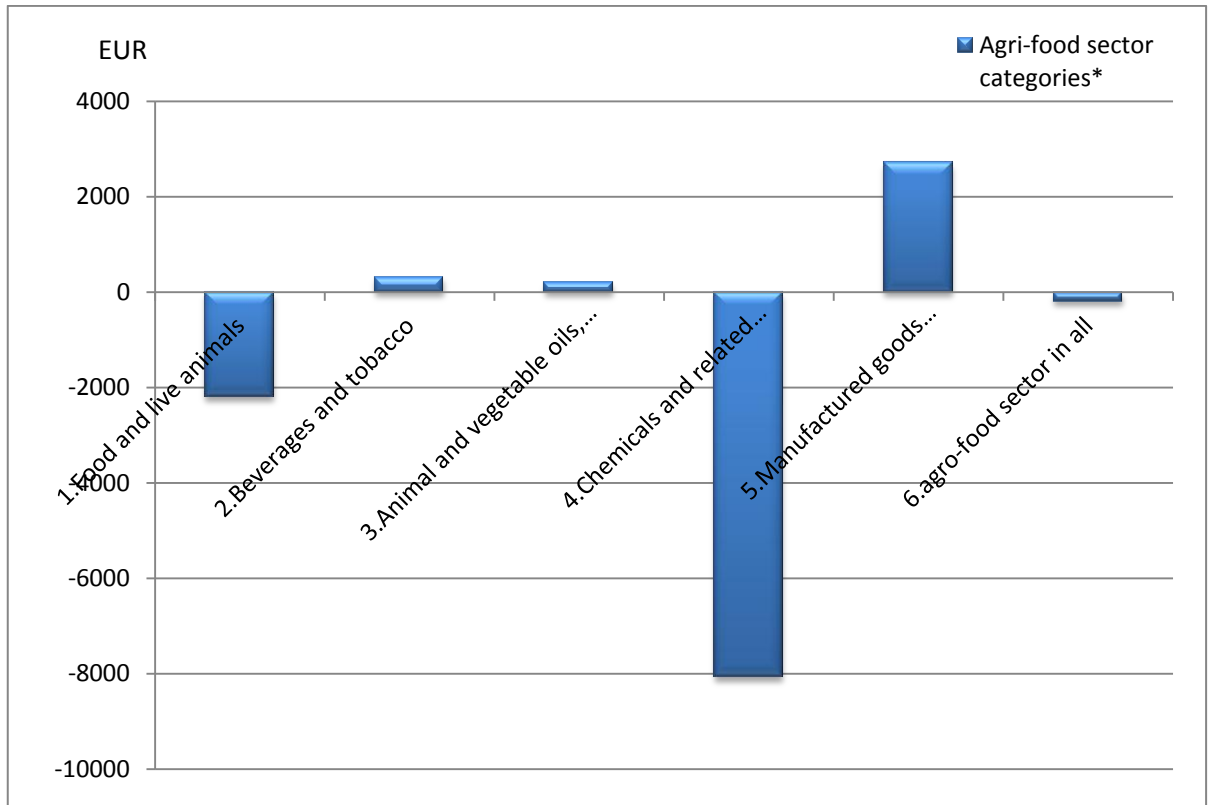
Source: (CZSO, 2014), own calculations

*Sector 4. and 5. are not directly and entirely related to agribusiness.
However subcategories of them are e.g. fertilizers etc.

*n.e.s: nowhere else stated

Results of the forecasted net effect are presented in the table above. According to the forecast, the sum of all chosen agri-food sector categories is -7,195, 1851 mil. Eur.

Export has higher values than import. Dynamics of the growth leads to reduction of values of trade balance. Results clearly showed that in agricultural sphere of import and export Czech Republic is a small import agri-orientated country. According to IAEI (2014) the share of agricultural products in total Czech foreign trade on the export side still slightly decreases. The overall progress of agrarian foreign trade of the Czech Republic is slowly increasing. Czech agricultural trade with the EU 28 was balanced active, its assets reached 543.0 mil. CZK in the first quarter of 2014.

5.2 Effects of the weakened exchange rate on consumer prices

This study tries to find commodities for which there were unusual changes of prices following the decision to use the exchange rate as a monetary policy instrument. This part was done through analyzing and calculating second differences of prices in 2013 and 2014. These two graphs enable us to analyse unusual changes among chosen food items in agri-food sector.

In this part author choose approximately 30 food items. Meat, vegetable, fruit and cereal included. In case that prices will raise it may discourage willingness of consumer to spend money for goods and services. Increasing prices of food and other commodities will lead to consumption of goods of detrimental quality. In order to understand the impacts on firms and households, it is necessary to build a model that includes effects on both sides of the market. While it is clear that economic growth is related to improving environment in the Czech Republic, the adverse is also reality. Therefore, interventions must necessarily aim at improving of the Czech economy not vice versa.
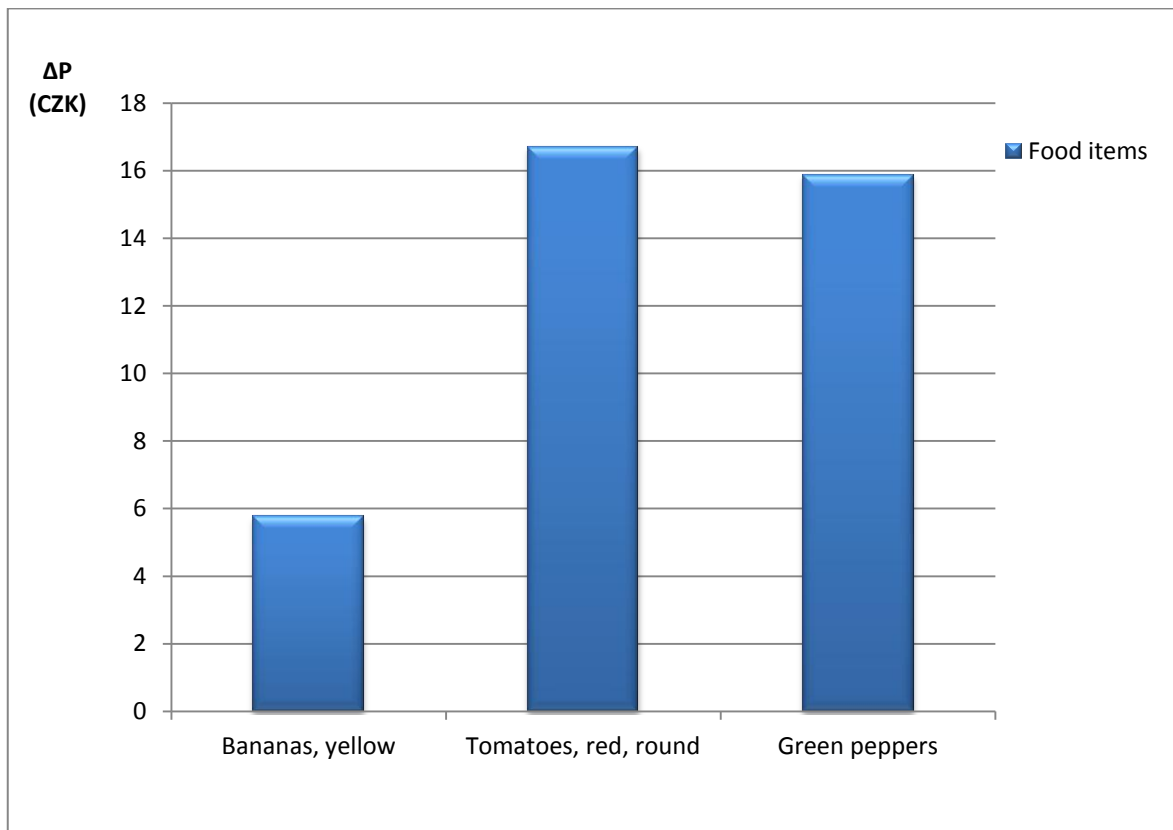
Figure 11: Effect on Consumers, Changes in Prices Annually
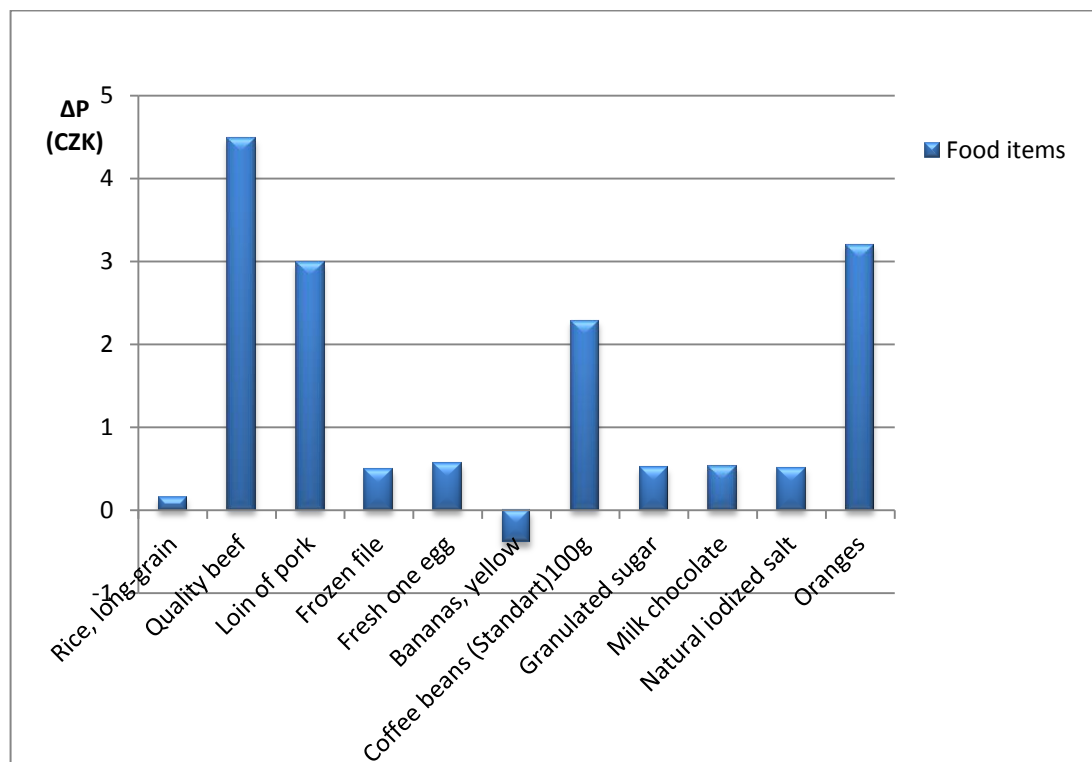
Source: (CZSO, 2014), own calculations

On the first graph, 27 food items were analyzed on an annual basis from 2005 to 2014. The amount of 10 out of 27 food items has a positive change and increased its price. Dominant changes can be traced in beef, loin of pork, coffee and oranges. However, other determinants of prices must be also taken into consideration such as harvest level, etc.

Figure 12: Effect on Consumers, Changes in Prices Monthly

On the second graph, 26 food items were analyzed on a monthly basis. The amount of 7 food items out of 26 has a positive chase and increased its price. Among the 27 items for example quality beef, pork, chicken, cheese, fresh eggs, unsalted butter, wheat flour, white wheat bread, oranges, carrot etc. Three highest differences are presented. There are yellow bananas, red and round tomatoes and green peppers. Prices are in CZK per one unit, it means 1kg or 1l. However, other determinants of prices must be also taken into consideration such as harvest level, etc.

An interesting article of Zlámalová (2015) says that increasing of prices after CNB´s decision was not confirmed. Growth of prices was almost stopped and the country falls

into deflation. In December, the goods and services were more expensive in comparison to the previous year by 0.1%. Everyday things like food, electricity, gas and part of consumer goods get cheaper and cheaper. Electronics, which is registered in the consumer basket, is cheaper by approximately 2-11%.

5.3 Environmental Kuznets Curve

This part of thesis is dedicated to assess impact of intervention upon GDP and environment by estimating impact upon GDP and evaluating impact upon environment using Kuznets curves. First, the effect of exchange rate upon GDP must be determined and based on already constructed Kuznets curve by Hercegova and Strielkowski (2011) a relationship between environment and exchange rate has to be investigated. A study, which examines GDP per capita and S02 production per capita, is chosen for this research. This is just a methodological framework that will be used in future research using time series predictions and regression framework for GDP and pollution.

Kuznets Curve

Kuznets hypothesized that economical inequality increases over time and after a certain level of income is reached, environmental improvement will occur. This model is shown as an inverted U-shaped curve, it is relationship between per capita income and pollution (Gallagher, 2010).

The environment is usually an income-elastic commodity. In the first stage of industrialisation, in the environmental Kuznets curve grows rapidly mainly pollution and environmental degradation. It is because people are more focused on job and income than clear environment, air and water. In other words, in the first stage of environmental Kuznets curve, environment is more perceived as an obstacle for economic growth. The growth in this stage has a negative effect on environmental quality. However, the situation changes with next stages, where income rises. Main industries become cleaner due to new technologies and environmental investment. The paper stated that with some specific level of income per capita economic growth leads to improvement of environment. But it is very unclear why the quality increases when income exceeds a certain threshold level. In this stage economic growth leads to environmental degradation (Hercegova and Strielkovski, 2011).

Figure 13: Environmental Kuznets Curve
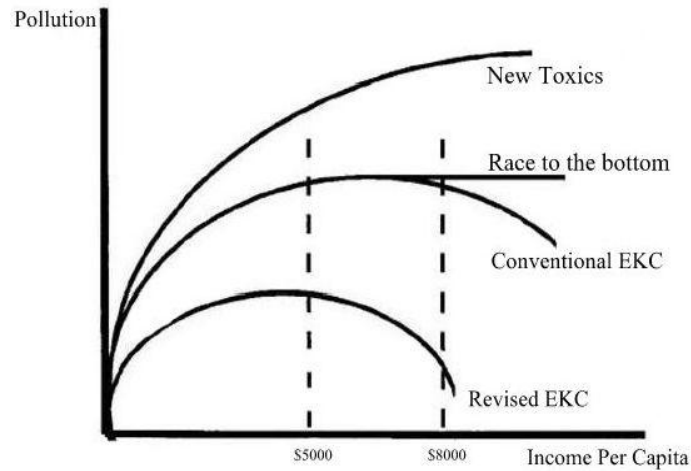
Source: (Hercegova, Strielkovski, 2011)

In paper of Hercegova and Strielkovski (2011) the model of interdependence between pollutants and economic development is explained. There was tested a relationship between the environmental pollution expressed by CO_2, SO_2 emissions per capita and the GDP per capita for the Czech Republic on the other side. According to paper the EKC hypothesis for the CR results the interdependence between GDP per capita and SO_2. With basic explanation of Kuznets curve above, paper explained that at higher levels of development, environmental protection occurred. Expenditures of society start to rise because their preferences shift away into the sphere of public goods. General regression suggests that air and pollution increase until income per capita reaches a range between $5000 and $ 8000. In case that this level is exceeded, pollution starts to decline. This decline is seen in the Figure 12.
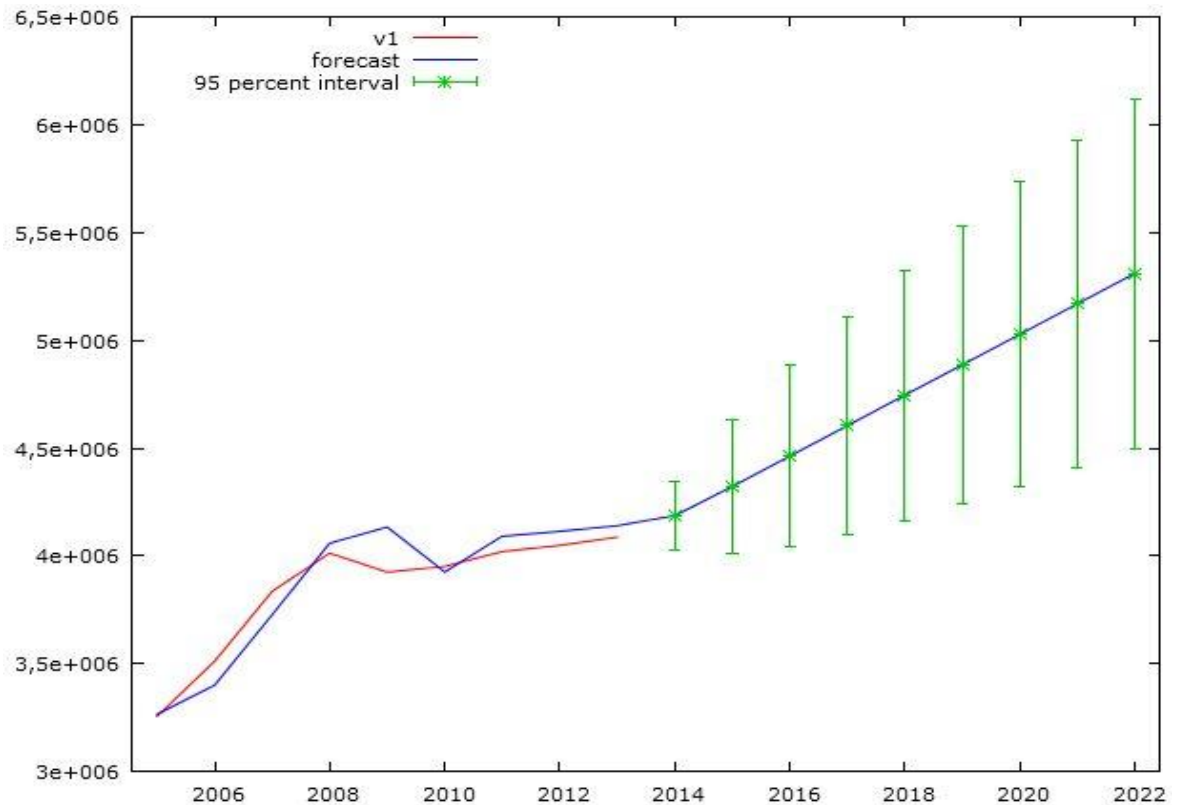
Figure 14: OLS Estimation Results: EKC Model (SO2)

Variables	SO₂ emissions
GDP per capita ^2	-0.139***
Constant	3.694***
Adj. R-squared	0,43
Obs.	20
***Significant on the 1% level	

Source: (Hercegova and Strielkowski, 2011)

The outcome of the Figure 13 in period 1990-2009 shows that only SO_2 emissions have significant influence.

Figure 15: Forecasted GDP in mil.

This figure above represents data of gross domestic product by type of expenditure in current prices and the data are seasonally adjusted. Figure 15 displays forecast to 2020 with plot confidence interval 95% using error bars. There is 9 pre-forecast observations to graph. This is an automatic forecast and dynamic out of sample, in specific period from 2014 to 2022. The relatiohship between p-value and level of significance is 0.04883. This relationship indicates that parameter is significant with 5% level of significance. Gross domestic product is total output produced within a country during a given period, usually it is a year (Nordhaus, 1992). The process was done using Arima model by Gretl tool.

As a result GDP will grow significantly mainly due to acceleration of foreign demand, which is tied to CNB interventions. In the future research this relationhship will be more investigated. However, other determinants must be also taken into consideration.

Forecast of CNB states that level of GDP decrease by 0.2%, to 2.8 percent in 2016 according to documents made public by the central bank. GDP growth will be positive in next years. Household consumption will grow more significantly and wages will also growth. CNB expect a low inflation. As a result of a recovery in external demand and the weaker exchange rate, net exports will contribute positively to GDP growth (CTK, 2013).

Summary of Results

Firstly the impact of CNB interventions upon agri-food sector will increase in the future. The sum of all chosen agri-food sector categories is negative, which means that Czech agri-food sector is primarily import orientated. It seems that intervention has a positive impact in this sector. According to CZSO (2015) results of trade with foreign countries is also according to data in the national concept very favourable, exporters exported about 157.1 billion CZK more goods than imported importing firms.

Secondly, conclusion from the conducted study shows that mainly imported vegetable and fruit have become more expensive due to CNB interventions in November 2013. Price of meat shows inconsistency since price of meat was growing in the months of July 2013 to November 2013. It means that prices of meat grew even before CNB interventions.

Most prices of imported goods increased its price even before November 2013. In general, prices of many products in consumer basket also fall for a long time and even before foreign exchange interventions as Zlámalová (2015) and this analysis confirmed.

The overall import intensity of food is thus higher than one-third (35%). The most import-intensive items are computers, metals, machinery and equipment, and medicines, but their aggregate weight in the consumer basket is small (CNB, 2014).

The Czech Republic is a small, export orientated economy. When CZK depreciates, total GDP rises due increased level of export. From results of third research due to exchange rate change, GDP increases, S02 emissions will decrease and hence, environmental quality in the Czech Republic will improve its conditions. As the study and CNB confirms, GDP will increase its values.

According to Singer (2014) Czech economy avoided a deflation and emerged from the recession and it is growing significantly faster than most developed EU countries. Inflation is low, but non-negative. Also Czech economy registered the decline in regulated prices and a slowdown in food prices. The CNB wants to keep interventions until 2016. Singer also stated tha the Czech economy is on the path to a balanced and faster growth.

6. CONCLUSION AND RECOMMENDATION

This paper identifies circumstances in which the central bank interventions influence the exchange rate of EUR/CZK. The main conclusions from the theoretical part are as follows. Firstly, central banks buy or sell their domestic currency to appreciate or depreciate the currency. These actions of intervention inevitably fail over the long-term, but they can be very effective over the short-term. It is the question of time if central bank´s decision will be successful or not. Secondly, successful intervention depends on the choice of instruments, timing and markets. Another point is that the survey highlights a number of facts about central bank foreign exchange intervention. The survey results many positive and negative reasons and opinions in this field. Against this background, this paper evaluates the effectiveness of intervention.

In the second part the forecasted net effect of exchange rate differential upon trade balance in the Czech Republic was modelled by using standard trend analysis. Also analyzes of effect on consumers were modelled specifically changes in prices annually and monthly. This analyzes were modelled in order to compare them and see if changes were higher even before foreign exchange intervention in November 2013. This study yielded the following main results. The expected increase in food prices did not occurred, according to the statistics and to the bachelor´s analyzes. According to our expectations, mainly imported vegetable and fruit have become more expensive due to CNB interventions. Furthermore, price of meat shows inconsistency. Author agreed with many Czech economists who predicted stability of prices.

The confidence in the Czech National Bank declined very rapidly. On the other hand Czech economy is on the path to a balanced and faster growth. GDP will grow and inflation is non-negative. Progress or result cannot be seen in months, but in years sometimes decades. It is suggested that intervention sometimes works and sometimes it does not.

The main conclusion shows that there is still no clear-cut conclusion about this impact. Intentions and assumptions of the thesis are consistent with the results of the work. The further research could be extended to the examination of this effect.

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8. APPENDIX

Appendices 1: Selected Forecasted Agri-sectors (2015-2020)

|	1.Food and live animals	2.Beverages and tobacco	3.Animal and vegetable oils, fats and waxes	4.Chemicals and related products, n.e.s.	5.Manufactured goods classified chiefly by material	8.agro-food sector in all
2015	-33472,1	4616,5	2750,8	-123944,4	46777,8	-8539,8
2016	-35787,1	5063,13	3230,35	-132141,6	47259,45	-6276,2
2017	-38102,1	5509,76	3709,9	-140338,8	47741,1	-4012,6
2018	-40417,1	5956,39	4189,45	-148536	48222,75	-1749
2019	-42732,1	6403,02	4669	-156733,2	48704,4	514,6
2020	-45047,1	6849,65	5148,55	-164930,4	49186,05	2778,2

Appendices 2: Difference between "With Intervention" (CZK/EUR: 27.705) and "Without Intervention" (see figure 4)

	1.Food and live animals	2.Beverages and tobacco	3.Animal and vegetable oils, fats and waxes	4.Chemicals and related products, n.e.s.	5.Manufactured goods classified chiefly by material	6.agro-food sector in all
2014	-178,82415	23,932697	13,035692	-664,32352	265,71374	-76,25528
2015	-222,88832	30,740943	18,31738	-825,33689	311,49002	-56,865917
2016	-272,68877	38,579787	24,614461	-1006,886	360,10521	-47,823078
2017	-328,62114	47,52031	31,996965	-1210,3873	411,75512	-34,607678
2018	-391,1183	57,640285	40,541518	-1437,3903	466,65397	-16,925161
2019	-460,65486	69,024978	50,332128	-1689,5942	525,03665	5,547422
2020	-537,75228	81,768081	61,461105	-1968,8659	587,16123	33,164918
SUM	-2392,5478	349,20708	240,29925	-8802,7842	2927,9159	-193,76477

Appendices 3: Nominal Prices of Sums, Base Year 2014

	1.Food and live animals	2.Beverages and tobacco	3.Animal and vegetable oils, fats and waxes	4.Chemicals and related products, n.e.s.	5.Manufactured goods classified chiefly by material	6.agro-food sector in all
2014	-178,82415	23,932697	13,035692	-664,32352	267,00846	-76,626844
2015	-214,69816	29,61135	17,644298	-795,00943	301,50615	-55,043252
2016	-257,36289	36,411494	23,231058	-950,29617	341,52232	-45,355213
2017	-304,01083	43,961533	29,600725	-1119,7418	382,77501	-32,171924
2018	-354,80266	52,288339	36,777206	-1303,9275	425,38749	-15,428459
2019	-409,92395	61,423409	44,789161	-1503,5229	469,49208	4,9605503
2020	-469,58733	71,403239	53,670355	-1719,2944	515,23161	29,102082
sum of years	-2189,21	319,03206	218,74849	-8056,1158	2702,9231	-190,56306
sum of all categories	-7195,1851					

Appendices 4: Prognosis of CZK without Intervention
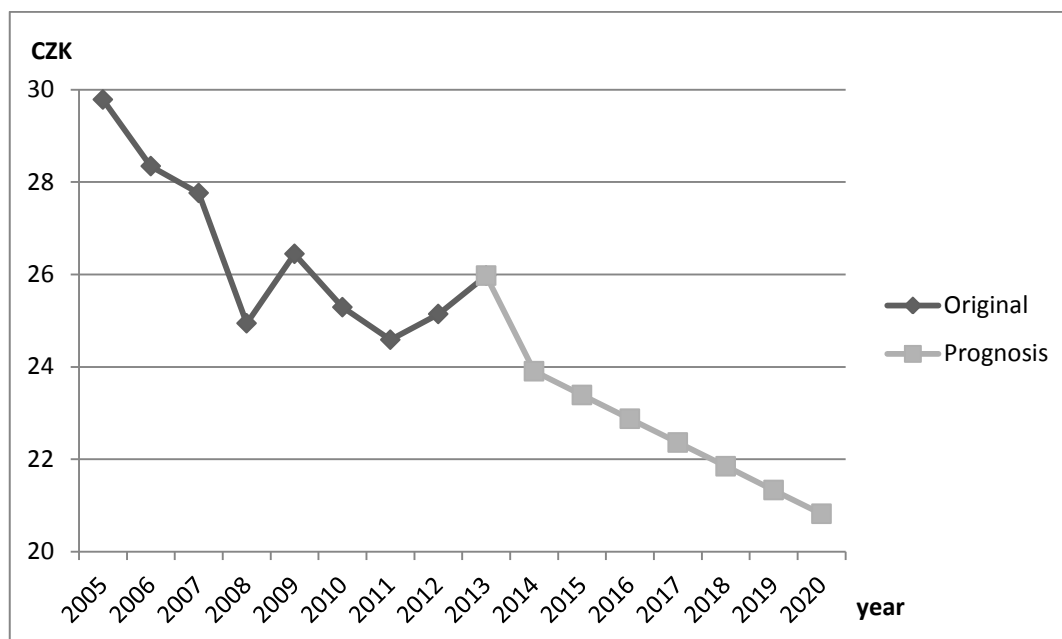
Appendices 5: List of Selected Food Items (Average Price per Month), Annually Basis

Quality beef
Loin of pork on bone
Ham sausage
Drawn chicken
Half-cream milk, pasteurized
Cheese "Eidam"
White yoghurt, fat content: low
Fresh eggs
Unsalted butter
Vegetable butter
Wheat flour
Rice, long-grain
Egg pasta products
Caraway-flavoured bread
White wheat bread
Granulated sugar
Table mineral water, carbonated
Quality-grade white wine
Bottled beer, 3.4-4.1% of alcohol
Potatoes
Oranges
Bananas, yellow
Table apples

Tomatoes, red, round
Green peppers
Carrot

Appendices 6: List of Selected Food Items (Average Price per Month), Monthly Basis

| |
|---|
| Quality beef |
| Loin of pork on bone |
| Ham sausage |
| Drawn chicken |
| Half-cream milk, pasteurized |
| Cheese "Eidam" |
| White yoghurt, fat content: low |
| Fresh eggs |
| Unsalted butter |
| Vegetable butter |
| Wheat flour |
| Rice, long-grain |
| Egg pasta products |
| Caraway-flavoured bread |
| White wheat bread |
| Granulated sugar |
| Table mineral water, carbonated |
| Quality-grade white wine |
| Bottled beer, 3.4-4.1% of alcohol |
| Ware Potatoes |
| Oranges |
| Bananas, yellow |
| Table apples |
| Tomatoes, red, round |
| Green peppers |
| Carrot |

Appendices 7: Second Differences of selected food items, Anually Bases

Rice, long-grain	Quality beef	Loin of pork	Frozen file	Fresh one egg	Bananas, yellow
0,85878	-1,45634	-0,96098	-7,43732	0,012195	-6,2878
1,099607	-1,40546	-4,88988	4,903522	0,638469	-0,18923
10,43912	-1,28888	-1,80142	-0,064	-0,63131	-3,72653
-2,96368	2,689575	-5,08259	11,26991	0,081348	-0,4042
-2,48897	-1,69711	-6,92206	0,996315	-0,53822	-0,72887
0,918595	1,921316	4,893298	7,967237	0,340756	-0,55764
-1,1642	9,551693	5,761968	6,388049	0,548821	3,991799
0,251901	0,438124	1,45202	4,161847	-0,34783	0,385446
0,408865	4,925303	4,438466	4,655281	0,217988	0,002037
0,156963	4,487179	2,986446	0,493434	0,565816	-0,38341

Appendices 8: Selected Food Items, Monthly Bases

Ham sausage	Half-cream milk, pasteurized	Fresh eggs	Rice, long-grain	White wheat bread	Bananas, yellow	Tomatoes, red, round
3,820796	1,02855	9,432717	0,655383	3,058396	7,42544	5,299839

Appendices 9: Effect on Consumers, Changes in Prices Monthly (Oct 14/13 and Jan 14/13)
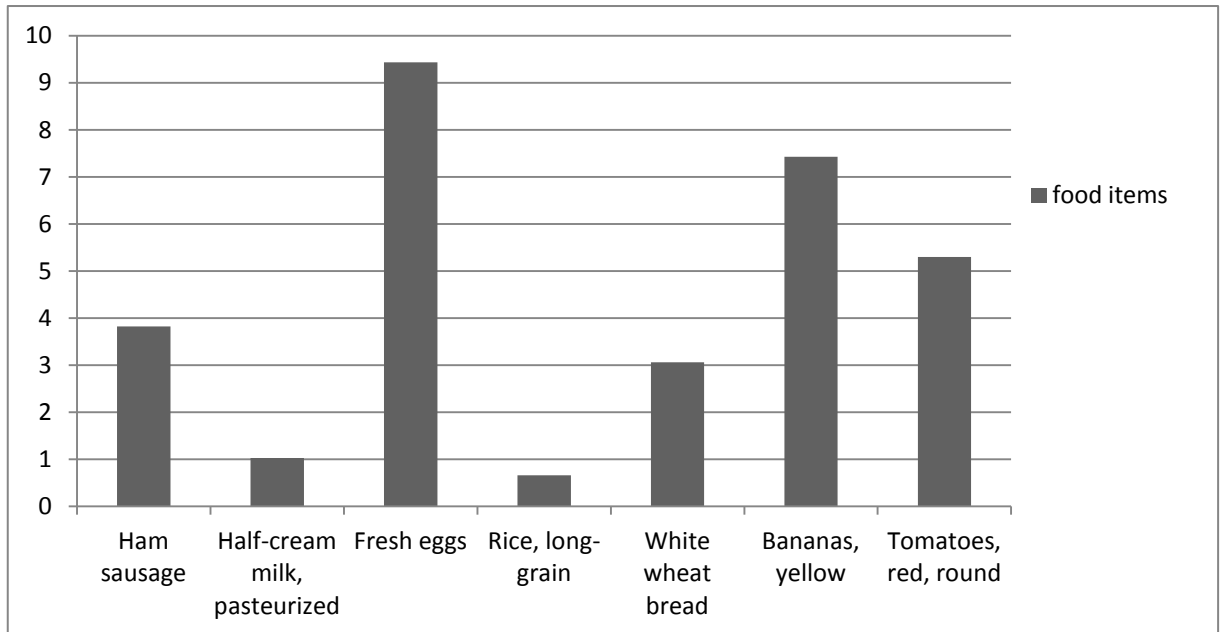
Model 1: ARIMA, using observations 1996-2013 (T = 18)
Dependent variable: (1-L) v1
Standard errors based on Hessian

	Coefficient	*Std. Error*	*z*	*p-value*	
const	141331	33251.3	4.2504	0.00002	***
phi_1	0.129174	0.338919	0.3811	0.70310	
theta_1	0.535603	0.283473	1.8894	0.04883	*

Year	GDP at Purchaser Prices (mil. CZK)
1995	1 579 147
1996	1 811 409
1997	1 951 376
1998	2 140 801
1999	2 231 902
2000	2 375 025
2001	2 564 900
2002	2 674 570
2003	2 801 059
2004	3 053 070
2005	3 255 432
2006	3 510 590
2007	3 835 015
2008	4 012 148
2009	3 924 649
2010	3 950 607
2011	4 019 714
2012	4 048 121
2013	4 086 354