University of Economics in Prague

Faculty of Economics

Major: Economics

THE SHORT RUN EXCHANGE RATE ELASTICITY OF EMPLOYMENT IN THE CZECH REPUBLIC

Bachelor thesis

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On this place I would like to thank Mr Johnson for his devotion for this thesis, careful reading and useful comments.

I declare on my honour that I wrote this thesis independently, and I used no other sources and aids than those indicated.

Jaromír Šimáně
Prague, May 18 2012

Assignment

What is the impact of EUR/CZK exchange rate to different labour markets in the Czech Republic?

The aim of this thesis is to find the impact of the exchange rate between Czech Crown and Euro to the different labour markets in the Czech Republic. The hypothesis is that labour markets which consist of people with less human capital will be affected more (lower hiring and firing cost). The data from Ministry of Labour and Social Affairs of the Czech Republic and data from Czech National Bank is going to be used. The non-linear method offered by Belke and Göcke is going to be used to capture the impact properly. This method expects a "band of inaction" when firms do nothing (even if the exchange rate changes) and after that big actions occur, when firms go away or inside the market. As the instrumental variables, rate of growth of GDP, price of energy, labour productivity, overall price level, wages and seasonal dummies are used as control variables.

The articles:

Ansgar Belke & Matthias Göcke, 2005. "**Real Options Effects on Employment: Does Exchange Rate Uncertainty Matter for Aggregation?**," German Economic Review, Wiley Blackwell, vol. 6(2), pages 185-203, 05.

Belke, A. and Göcke, M. (2001), **Exchange rate uncertainty and employment: an algorithm describing 'play'**. Applied Stochastic Models in Business and Industry, 17: 181–204. doi: 10.1002/asmb.436

Rodrik, D. (2008). **The Real Exchange Rate and Economic Growth.** *Brookings Papers On Economic Activity*, 365-412.

Abstract

The short-run impacts of real and nominal exchange rate between Czech Crown and Euro to Czech labour markets are investigated. 27 different labour markets are analysed, 5 of them are significantly affected by exchange rate with elasticities ranging from -0.09 to -0.50. Appreciation decrease employment in all of them. Non-linear method offered by Belke and Göcke is explained, used and compared with standard least squares. Standard labour market statistics are augmented with the job vacancies to find elasticity on number of jobs as well.

Keywords: Czech Republic, employment, exchange rate, exchange rate uncertainty, labour market hysteresis

JEL classification: E24 F16 F41 J21

Abstrakt

Tato práce zkoumá krátkodobé vlivy reálného a nominálního měnového kurzu mezi Českou korunou a Eurem na český trh práce. 27 různých trhů práce je analyzováno, 5 z nich je signifikantně ovlivněno směnným kurzem s elasticitami mezi -0.09 a -0.50. U všech z nich posílení koruny snížilo zaměstnanost. Nelineární metoda autorů Belke a Göcke je vysvětlena, použita a porovnána s metodou nejmenších čtverců. Běžné statistiky zaměstnanosti jsou rozšířeny o počty volných míst.

Klíčová slova: Česká republika, zaměstnanost, směnný kurz, nejistota směnného kurzu, hystereze na trhu práce

JEL klasifikace: E24 F16 F41 J21

Table of contents

Introduction 7
Related literature 9
Model 13
Total cost of labour (LC) 14
Productivity 14
Seasonal dummies 15
Price levels 15
GDP 16
Energy 16
Spurt 16
Model estimated 19
Data 20
Results 23
Conclusion 27
References 28
Appendix 30

Introduction

There is a number of articles in Czech newspapers referring to problems of Czech firms with Czech Crown being too strong (in terms of its exchange rate) and have to cut jobs because it makes their exports more expensive and thus less competitive on foreign markets. Another day we can read that a weak Crown increases oil price and some firms have to cut jobs as well. After reading this we can conclude that any change of ER decreases the employment. It might be true, but for certain firms only, not for the economy as a whole. Some firms will fire, others will hire and majority will not do anything. The aim of this thesis is to find the resulting impact of these changes to different labour markets.

When other authors calculated the impact of ER to labour market they used more than one currency[1]. This thesis uses the CZK/EUR exchange rate only. There are two reasons for it - during 2010 10 countries from Eurozone were among 30 countries we mostly trade with and made up 58 per cent of volume there[2], so the bias should not be big.

The Czech Republic made a commitment to accept Euro as the country's currency. When we join the Eurozone, exchange rate with Eurozone will be fixed. When we know how floating ER affects our labour markets we will know what we could lose[3] joining Eurozone. This is the second reason.

The result of this thesis could help us to understand how better policy might decrease employment in the short run. Every significant elasticities showed us that appreciation of the Czech Crown decreases the employment in some part of the labour market. When politicians make Czech Republic better place for investments, the ER will rise[4] and it will affect industry workers, white collar workers and craftsmen as well. Some of them will lose their job.

In the short-run[5] the overall reaction of employment is negative as well and even higher[6] that reaction in manufacturing accompanied by administration[7]. The elasticies range from -0.09 to -0.5 in administration.

Results prove the expectation that lower qualified occupations are affected more thanks to relatively lower costs connected with hiring and firing them. This is especially significant for

[1] E.g. HUA P. (2007), Zeng X. et al. (2011)., Alexandre et al. (2010).
[2] Czech statistical office, access online: czso.cz/csu/2011edicniplan.nsf/t/1800364FB4/$File/60081104.xls, accessed 17.5.2012
[3] The word "lost" does not have pejorative meaning here – we can lose something good or bad.
[4] The potential yield from an investment will rise and motivate investors to buy more Czech Crowns. This rise of demand will then appreciate CZK and put Czech interest rate to the world level.
[5] Long run reaction is unknown
[6] Higher by total number of people affected. Elasticity is lower.
[7] In means that opposite reaction in other labour market is very weak (e.g. a firm that could hire more people thanks to cheaper price of foreign inputs)

manufacturing and administration jobs. Both these sectors can be assumed as open[8] so it can prove that openness leads to higher elasticity.

The exchange rate was used non-linearly in regression. It was modified into another variable (Spurt[9]) and then used in least square regression. This method was compared with the method where ER went into regression directly.

In non-linear method, the number of markets that reacts significantly on ER is 5. It is five times more than the reaction when linear method was used. Coefficients were slightly higher using the former method[10].

The thesis is divided as follows: it begins with the description of related literature, and then non-linear method is introduced – how the exchange rate is transformed into the Spurt variable and follows with description of auxiliary variables used and their possibly bias to results. In the next section, data are introduced with their descriptive statistics and tests.

Then the interpretation of results is shown (the results are in the tables in the very end of this thesis), it continues with comparison of elasticities and with an attempt of prediction. The comparison of linear and non-linear method is there as well. Next part concludes.

[8] Manufacturing – low transportation costs allow its cheap outsourcing while the administration (for example accounting and related services) can be easily outsourced because of developed ICT infrastructure.
[9] Spurt is a function of Exchange rate and exchange rate uncertainty.
[10] It is in contrast to the study of Belke and Göcke (2001). When they use method with spurt they found the elasticity nearly two times higher.

Related literature[11]

There are at least 2 studies from China that are concerned with the impact of exchange rate (ER) to employment.

HUA P. (2007) used 10 years of panel data from China to find the elasticity of real Renminbi[12] to manufacturing employment between the years 1993 to 2002. His results were quite big – one per cent rise of Renminbi related to a 0.69% decrease of (man.) employment. When he used the residual variables (instead of levels) he found an elasticity of -2.33.

He described three reasons why real ER should affect labour markets. Appreciation decreases the price of inputs and increases relative wages. The second reason is that appreciation will make domestic goods more expensive in foreign markets. This decrease exported volume and employment. Third reason is more difficult – it says that clever people goes back to China thanks to currency appreciation. They are more productive, work as more people and decrease employment.

However the first reason is not clear (whether it will decrease or increase employment), as Koren M. (2001) found. He decomposed channels through which ER affects employment. The First one is 'negative' (thanks to an increase in prices of domestic goods abroad). The second one is 'positive' – the price of inputs decreases and it increases the labour demand[13].

This logic is totally opposite from Hua P. (2007) – he assumed the labour and import goods to be substitutes, while Koren assumed both types of relationships and admitted that the second channel could be diminished when the connection is substitutional.

His results were both negative and positive but much smaller than Hua's. The short-run elasticities were -0.04 (depreciation increases employment) for food and tobacco industries and +0.06 for metallurgy. He found the long-run relationship as well. Only one result was significant – -1.92 for the food and tobacco industry.

The second study from China is Zeng X. et al. (2011). They analysed the impact of different macroeconomic policies to employment. They found that a stable and competitive ER is more important for employment than fiscal and monetary policy.

A more important result for this thesis is shown in the figure below. The horizontal axis is time in years and the vertical axis is the reaction of employment to real ER. Employment reacts negatively to appreciation in the first year. The second year, the reaction is positive and the biggest reaction is seen in the third year when the elasticity is -1.101% (1% appreciation affects the drop of more than 1%)

[11] Positive elasticity means that real currency appreciation leads to rise of employment. It is consistent for all studies below even if the former notation was opposite.
12 Name of the Chinese currency
[13] Labour and inputs are assumed to be complements

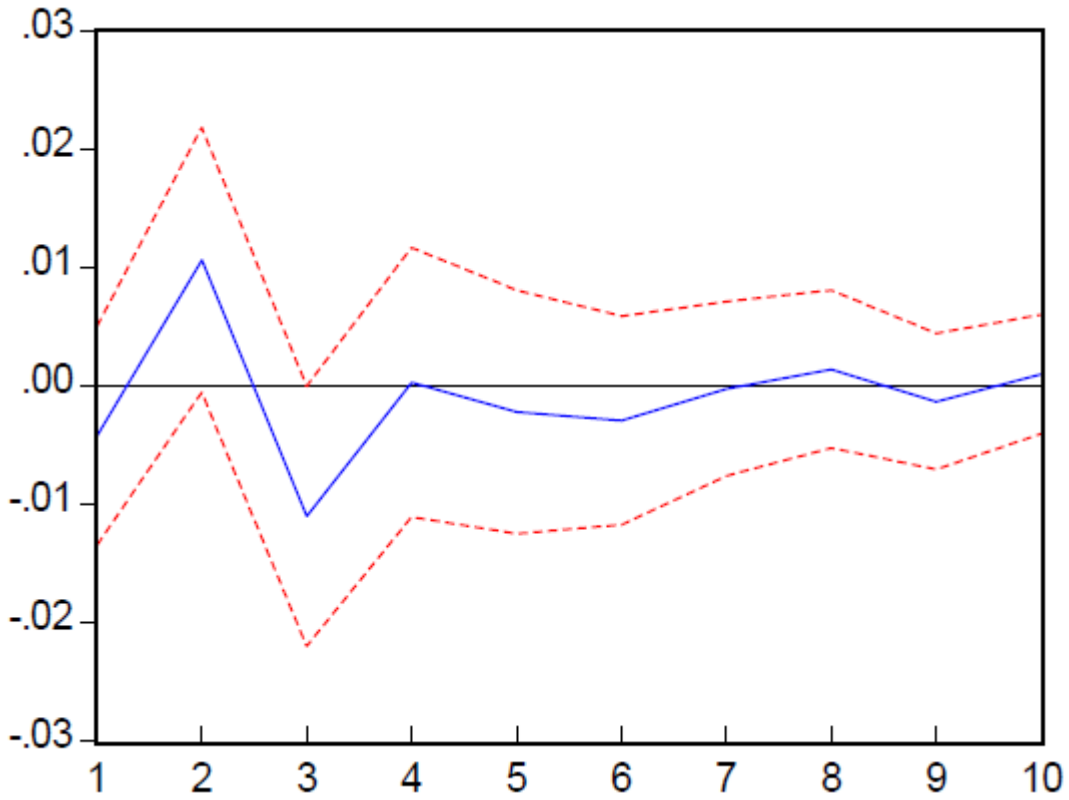


Figure 1, source Zeng X. et al. (2011) Horizontal axis shows number of years after the shock of real ER occurred. Vertical axis shows the first-differenced form of the logarithmic employment

In this thesis I am trying to find the short run reaction of the labour market assuming that in long run the labour market goes to an equilibrium that is not affected by the exchange rate. The figure above supports this assumption.

Contrarily to the studies above, Soto R. (2008) dealt with the relationship of ER and employment in a different way. He explained the real ER with unemployment and other controlling variables. A one percentage point rise in unemployment leads to a 1.27% rise in real ER. This means that a 6 percentage point rise of unemployment between 1990 and 2002 should have caused an 8 per cent appreciation of the exchange rate.

It tells us, that these two variables are connected mutually. Because of this lagged ER is used in this thesis to capture the implication.

Another author who deals with ER and employment is Kim W. (2005). He used data from 28 industries and compared the results. 16 industries showed that real ER depreciation has positive effect on employment (but 8 of them were significant at 10% level only). His results confirmed what he had expected – industries with high openness and low level of imported goods showed a positive reaction to depreciation.

These results are supported by Alexandre et al. (2010). They dealt with hiring and firing cost as this thesis does. They used data from the Czech Republic (apart from other 22 OECD

countries). This study offers us a comparison between countries, low and high technology industries and between sectors relatively closed and opened. They confirmed that higher labour adjustment costs (between countries) decrease the reaction of employment regarding ER. Openness and being in low technology industry increases the reaction.

Open, low technology industries in countries with low labour adjustment cost have elasticity of -0.77. On the other hand close, high technology industries in countries with a rigid labour market react with elasticity +0.47 (depreciation leads to lower employment).

They wrote one more study - Alexandre F. et al. (2009). There they used data from just Portugat but they analysed them more deeply. They divided the process into job creation and job destruction. Only two results in this part were significant. Firstly, low technological firms reduce job destruction by 3.8% with a 1% drop of real ER. Secondly, high technology firms raise the employment by 3.2% with a 1% rise of real ER. It was explained as a result of cheaper inputs for these firms.

Nucci and Pozzolo (2009) approached to the problem in a very similar way as Alexandre et al. (2009). They used Italian data from 1984 to 1998 (when Liras were used as a currency in Italy). They found that firms increase employment by 2.9% when the ER appreciates by 1%, if the share of imported goods a firm uses is 100%. With a lower share the elasticity is smaller. Inversely, firms decrease the number of jobs during 1% appreciation by 1.8% when the share of exported goods is 100%.

They split the process into job creation and destruction. For firms which import everything – a 1% rise of ER increases job creation by 4.8% and job destruction decreases by 1.8pc. For 100% exporters – a 1% rise of ER decreases job creation by 2.3% and job destruction increases by 0.7%. It shows again that that the price of imported goods is more important than the price of exported goods. It could mean (using information from studies above) that more firms in Italy are high- than low-technology.

Demir F. (2010) used firm level data from Turkey. He split the real ER movements into trend factor and its volatility. Rise of the trend section (permanent rise) had negative effect on employment with elasticity ranging from 5% to 10%. The volatility had a much bigger impact with the elasticity from -0.7 to -1.1 (different auxiliary variable used). It means that appreciation has a very big negative[14] impact on unemployment.

Belke and Göcke (2001) used the same method as is used in this thesis. They worked with quarterly data from former West Germany from 1973 to 1997 and found that 1% appreciation of German Mark decreases the employment by 85 thousand people. Since there were working approximately 30 million people[15] during the eighties, the elasticity is approximately -0.3.

[14] Negative effect means that is rises.
15 http://stats.oecd.org

Legrenzi and Milas (2004) deal with non-linearity of real ER and co-integration between variables. They modelled real ER as a function of unemployment and real wages. They found a mutual connection in their model – e.g. real depreciation decrease real wages but workers require higher salaries and then diminish the impact of ER to employment.

They found the reaction of employment to real ER changes was 0.44 in the United Kingdom. This reaction only happened when the ER was far away from equilibrium.

Since the rise of GDP is closely connected with the change of employment we can use studies that find impact of ER to GDP growth. Rodrik, D. (2008) found that a 1% real undervaluation (in comparison with expected ER[16]) accelerate the growth of GDP by 0.026%. Standard deviation of undervaluation was roughly 50%. This implies the acceleration of growth by 1.3 percentage points.

Among Czech studies, Lacina et al. (2007) found that a 5% real appreciation decreases GDP by 1.4%. Okun's law for the Czech Republic is 10.1 pc[17]. Using simple mathematics, we can say they found the elasticity of employment to real ER is -0.028 for the Czech Republic.

[16] He found the relationship between the GDP per capita and ER. From this relationship he calculated the expected ER.
17 Mielcova E. (2011).

Model

The model used in this thesis is a modified version of the model proposed by Belke and Göcke[18]. This model deals with the uncertainty of the real exchange rate. A firm would like to employ certain number of people. Sometimes this optimal number is changing every moment because of different demand. So the firm would like to change the number of employees very often. However, this optimization is connected with huge cost of hiring and firing staff[19]. So when goods produced by a firm are unsalable thanks to appreciation of the domestic currency, or there is an excess demand thanks to depreciation[20], firms can optimize the number of employees immediately or they can wait. Since they are waiting (and not optimizing every moment), it is worth using non-linear methods to find the impact of exchange rate to labour markets.

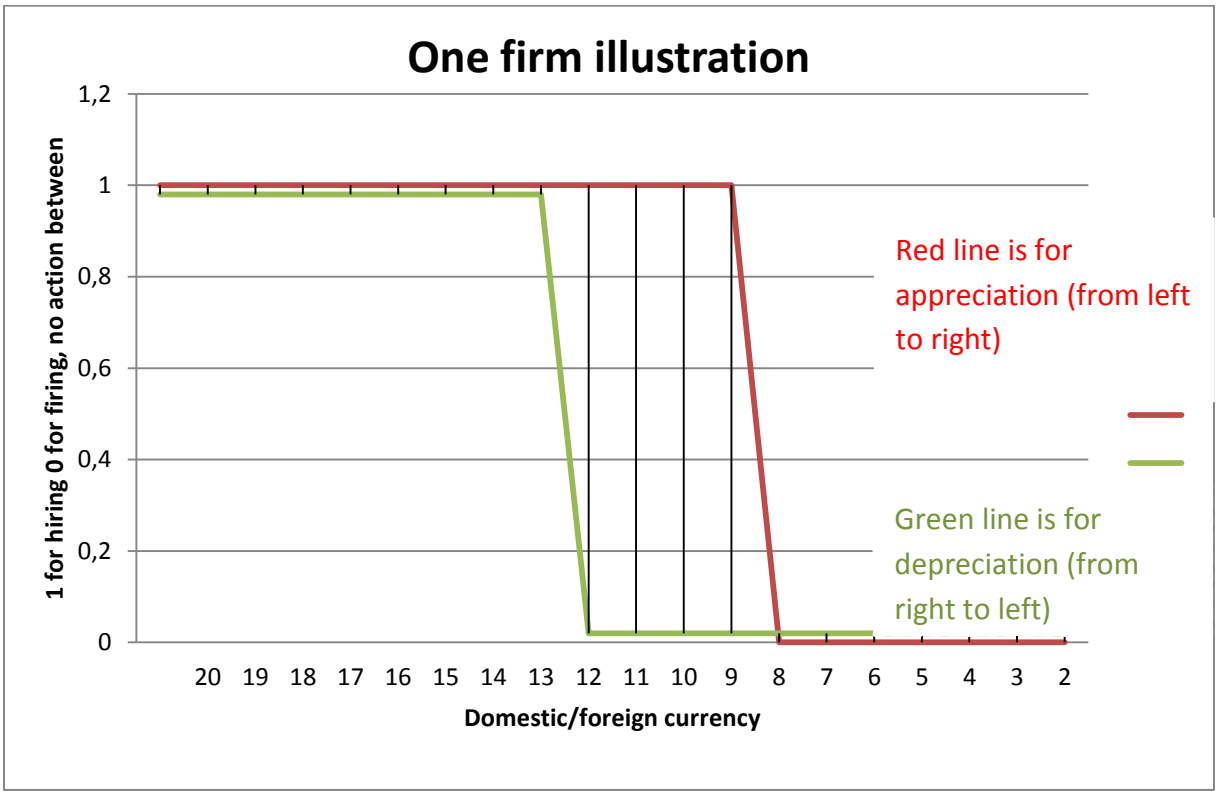


Figure 2

18 Empirically shown in Belke and Göcke (2001), better microeconomic view is in Belke and Göcke (2005).
19 OECD measures it by EPL (employment protection legislation) index. Czech Republic got two points out of six (United Kingdom 0.6 as the lowest and Portugal 3.5 as the highest cost from OECD countries). Data from OECD employment outlook, access online: www.oecd.org/dataoecd/8/4/34846856.pdf
20 Reaction can be swapped if firms imports enough many goods from foreign countries, better described in "Related literature"

In the picture above, there is an illustration of how the model works. In this example the exchange rate is 10 (domestic/foreign currency). If the ER oscillates between 8 and 12, nothing will happen, but out of this area big firing or hiring will occur. The width of this area is different for each individual firm and is affected by the volatility of ER in the past. Real ER is modified into a variable "Spurt" using an algorithm partly described in the picture, partly in "Spurt" subchapter.

Apart from exchange rate, the labour market is affected by other variables. In this model several are used: wages, productivity of labour, seasonal dummies, inflation and the price of energy.

Total cost of labour (LC)

In the econometric testing of the model, two types of labour market data are used. The first shows the actual number of workers and the second shows the total number of workers firms would like to employ[21].

Since wages are highly correlated with LC[22], the rise in LC is proportional to the rise in wages.

Then it is not clear how the level of wages will affect the former group. It depends on labour supply – whether the substitutional effect is higher or lower than the income effect. The latter group of data should be affected negatively with the rise of wages since the demand of labour is a negative function of labour cost[23].

We can assume that the income level is low, because the rise of wages motivates people from other countries to arrive to work in the CR[24]. Then variable LC is assumed to have a negative impact on employment in both cases of data.

Productivity

This variable shifts the labour demand function and rise in productivity should increase the number of workers, keeping other variables constant. Productivity can increase or decrease real ER[25] and then bias the results.

21 It is counted as actual number of employees + number of how many others firms would like to employ. The latter number is from the portal of Ministry of Labour and Social Affairs of the Czech Republic

22 Correlation between them was 99.95 pc between 1994 and 2008. (Data from Czech statistical office, my computation, graph is in the appendix)

23 Labour is one on the factor for making goods. Firms demand for factors is assumed to be negative. E.g. Varian Hal R. (2010).

24 Czech Republic is a member of European free labour market so it is easy to work there for strangers from EU.

25 Soto R. and Elbadawi I. A. (2007): In depends whether the productivity raises more in "traded good sector" or "non-traded goods sector". The elasticities of both types of productivity are similar in absolute value: -0.60 for non-traded and +0.64 for traded sector respectively.

Seasonal dummies

The aim of this thesis is to describe Czech labour market. Since there is very different weather during the year, long school vacations etc. labour markets could be seasonally affected due to this.

Price levels

Two types of models are estimated – the first one with real ER and the second one with nominal ER. Variable price level is used in the latter one only.

If the aggregate supply[26] is upward sloping, the rise in prices evokes higher real GDP and higher demand for labour[27]. Holman, R. (2010) gives us several reasons to assume AS to be rising. E.g.: rigidity in prices or reason that employers know the prices better than their employees and can utilize this knowledge. So it is supposed that the demand side of the labour market will react to inflation positively.

Appreciation of nominal ER could decrease the price level[28] then this change of price level could decrease employment and bias the estimation of nominal ER to employment. However it is not the case, because domestic prices are not correlated with the change of euro. The domestic price level can be determinate by M2 aggregate and the change of DPH (Czech value added tax) in the beginning of 2008.

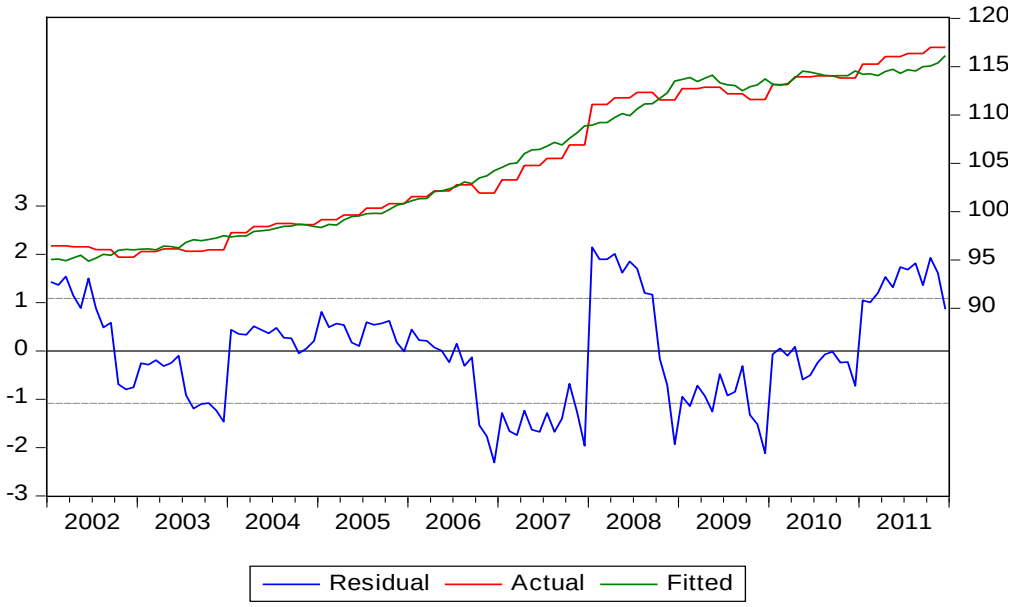


Figure 3: it shows the price level explained by M2 aggregate. The biggest deviation is around the first quarter 2008 thanks to the change of Czech VAT. The level of explanation (R^2) is 97pc.

26 Aggregate supply (AS) is the relationship between price level and real GDP.
27 Let's assume production function $f(K^+,L^+)$ where K is Capital and L is Labour. Since capital is assumed to be constant in the short run, rise of output is affected by the rise of labour.
28 If prices of some imported goods are not rigid, cheaper euro would decrease them.

GDP

Real GDP movement is used to capture other impacts on labour markets. It can capture institutional changes as well as changes in faith in economy or changes of ER against non-EMU business partners. Since productivity is used in the model, the growth of the GDP should be connected with a rise in employment. If it was not there, the rise of GDP could be connected with a drop in employment as well[29].

Energy

The impact of the prices of main energetic resources on the labour market is unclear as well. It depends whether energy and labour are more complements or substitutes. If there is complementary relationship, the rise in price should make labour demand smaller. Conversely if they were substitutes, there can be a rise of employment. Micro-level substitutions are not assumed, but workers could move from other industries to energy production.

Spurt

This variable is a modified variable of prior quarter ER. It changes when ER changes but the rate of change depends on the uncertainty of ER (reaction is even zero when we are inside of the play area).

We are working with "play area" – it the example shown in figure 4. It is the area where the exchange rate is between 23 and 27 CZK/EUR. It is the area of ER when firms are waiting and do not optimize the number of employees. The width of it is defined as

$$Width(Play) = c + d*(\text{standard deviation of } ER_{t-1})$$

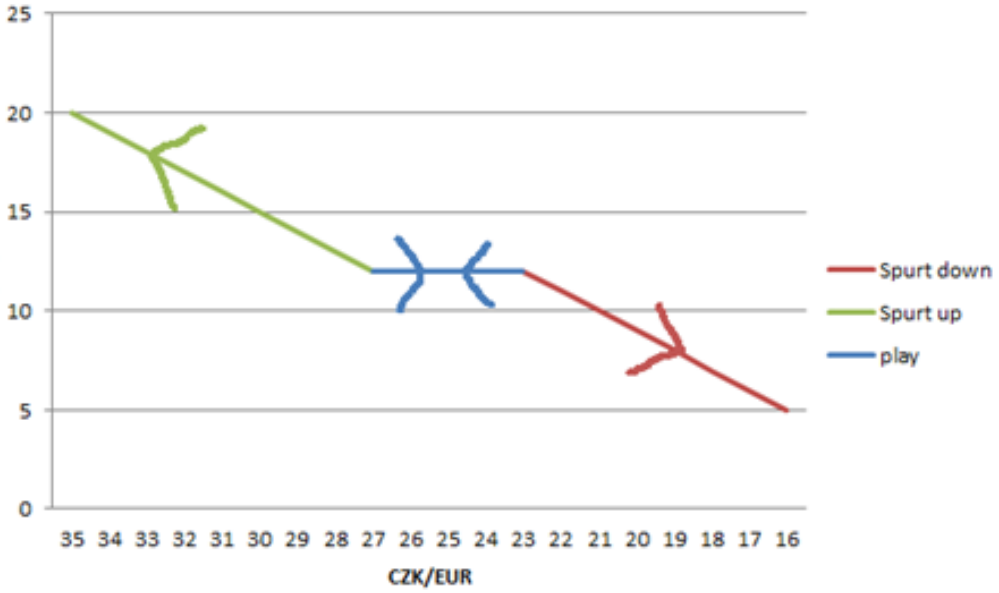
Where *c* can be considered as general ignoring of ER and

d is the multiplying factor of its standard deviation

The parameters c and d is found empirically by grid search regarding the highest R^2 of employment equations. Sub-program in Eviews 7 estimates the equations one hundred times. Only variables c and d change. Both change 10 times keeping other unchanged, so 100 times in total. They determine the width of play area in each quarter. And the width determines how ER Spurt is affected by ER changes. Spurt is the only one variable that is changed in every equation. When we know the Spurt that implies the biggest R^2, we know the value of variables *c* and *d*.

29 If productivity rises faster than GDP it might decrease employment.

Figure 4: Spurt as a function of ER



And how does the ER affect spurt? In the figure 4 we begin[30] when the ER is 27 (left side of the blue line). If CZK depreciates, Spurt will rise; when it appreciates slightly, Spurt will not be changed, but if the (summarized) depreciation is higher than play area, Spurt will decrease linearly with ER. When we are on the green line, depreciation will directly affect Spurt. It is similar for the red line and appreciation. When ER appreciates on the green line or depreciates on the red one, Spurt will not change (and we have jumped to play area in the middle). For example when actual ER is 20 and it depreciates to 21, Spurt does not change. If it then appreciates, it affects Spurt, but when it depreciates nothing will happened until it depreciate cumulatively to jump over the play area to upward sloping green line. These "jumps" move the total graph as shown. E.g.: when actual ER is 20 and it depreciates to 21, right end of the play area moves to 21 and shifts the graph.

We can see that the Spurt variable is very similar to ER but smoother in some parts. The red line is ER (with a one quarter lag) and Spurt is blue. Parameters used on this picture: (c = 0.9, d = 4).

30 this beginning is quite artificial, so 3 extra observations are used before employment data are used (other variables begin in second quarter 1999, while employment data begins in the year 2000)

Figure 5 – Spurt and ER, year is in the horizontal axis, levels in the vertical

Implication versus correlation

Lagged ER was used so it is very hard to expect that actual employment affects the exchange rate 2 quarters earlier.

Unemployment versus employment

If the domestic currency appreciates, it could motivate people from other countries to come and work in the Czech Republic. So the impact of ER to employment should be higher than the impact on unemployment – some people lose jobs and the others could be squeezed out by foreigners offering their service of labour cheaper.

Model estimated

Employment in this thesis is assumed to be a function of exchange rate modified into Spurt, labour cost LC, productivity Prod, last quarter GDP, price level P, price of energy and D2, D3 and D4 as season dummies. Equations with real ER will not use price level.

Variables are used 2 quarters lagged, Spurt is a function of 2 quarters lagged ER, so it is not lagged in equations.

In the first part this equation is estimated, variable E means employment:

$$E_t = C_1 * Spurt_t^{\beta 1} * LC_{t-2}^{\beta 2} * Prod_{t-2}^{\beta 3} * GDP_{t-2}^{\beta 4} * P_{t-2}^{\beta 5} * Energy_{t-2}^{\beta 6} * D2^{\beta 7} * D3^{\beta 8} * D4^{\beta 9}$$

The second part is similar, but the desirable number of employees is considered as dependent variable, so

$$W_t = C_1 * Spurt_t^{\beta 1} * LC_{t-2}^{\beta 2} * Prod_{t-2}^{\beta 3} * GDP_{t-2}^{\beta 4} * P_{t-2}^{\beta 5} * Energy_{t-2}^{\beta 6} * D2^{\beta 7} * D3^{\beta 8} * D4^{\beta 9}.$$

Where W is the sum of people employed and job vacancies.

More precisely, equations above are estimated in logarithms, so

$$Log(E_t)\ [log(W_t)\ respectively] = C_2 + \beta_1 * log(Spurt_t) + \beta_2 * log(LC_{t-2}) + \beta_3 * log(Prod_{t-2}) + \beta_4 * log(GDP_{t-2}) + \beta_5 * log(P_{t-2}) + \beta_6 * log(Energy_{t-2}) + \beta_7 * D2 + \beta_8 * D3 + \beta_9 * D4$$

Where $C_2 = log\ (C_1)$

The advantage of using logarithms is that it considers the changes in variables relatively, for example this model will identify differences between 80 and 80.8 in the same way as difference between 120 and 121.2 (both 1% rise). For easy interpretation of results, natural logarithms are used.

Data

Quarterly employment data from Czech statistical office are used. They cover the period from year 2000 to 2011, respectively 2005 to 2011 in second table.

Total employment (full time equivalents) is divided into 19 different industry categories in first table.

In the second table there is total number of workers firms would like to employ. It is divided into 9 categories by employment status.

Numbers are shown in thousands of workers.

T o t a l		**3 878.9**
Agriculture, forestry and fishing	**A**	**134.4**
Mining and quarrying	**B**	**45.8**
Manufacturing	**C**	**1 159.4**
Electricity, gas, steam and air conditioning supply	**D**	**38.5**
Water supply; sewerage, waste management and remediation activities	**E**	**52.0**
Construction	**F**	**258.0**
Wholesale and retail trade; repair of motor vehicles and motorcycles	**G**	**466.8**
Transportation and storage	**H**	**266.6**
Accommodation and food service activities	**I**	**115.6**
Information and communication	**J**	**84.0**
Financial and insurance activities	**K**	**66.9**
Real estate activities	**L**	**43.8**
Professional, scientific and technical activities	**M**	**131.0**
Administrative and support service activities	**N**	**122.5**
Public administration and defence; compulsory social security	**O**	**290.7**
Education	**P**	**267.6**
Human health and social work activities	**Q**	**249.1**
Arts, entertainment and recreation	**R**	**49.5**
Other services activities	**S**	**36.8**

T o t a l		**4985.94**
Legislators and managers	α	**292.28**
Specialists	β	**567.32**
Technicians and associate professionals	γ	**1119.65**
Officials	δ	**382.66**
Workers in services and sales	ε	**625.28**
Skilled workers in agriculture, forestry and fishing	ζ	**68.43**
Craft and related trades workers	η	**908.87**
Plant and machine operators and assemblers	θ	**686.39**
Labourers	λ	**335.05**

.

Exchange rate - Quarterly averages from Czech central bank (CNB) were used[31].What is shown is the nominal exchange rate (ER_N). Real ER was count as $ER_r = ER_N / (P_{czk} / P_{eur})$[32].

In the year 2005 $P_{czk} = P_{eur} = 100$, so if the price level in the Czech Republic is 1% higher than in EMU[33] it will increase the value of ER_r by 1%.

P_{czk} and P_{eur} are levels of consumer prices. Quarterly data are used from Eurostat[34].P_{czk} makes a separate variable as well (price levels).

Standard deviation of ER is counted as a deviation of month averages from quarter average.

Quarterly data about productivity, real GDP and total cost of labour are from Eurostat. Value in 2005 is 100.

Energy -Prices of gas, electricity and petrol (and diesel) were used. Data of gas and electric. energy are from Eurostat. Average price of petrol are from business.center.cz[35]. Consumption of electricity in 2010 was about 150 billion Crowns[36], of gas was about 50 billion[37] and of petrol about 60 billion[38] (with taxes). Consumption of these sources is quite inelastic so we can use this total consumption as scales for variable energy. It is defined as 100 in 2005 and it rises approximately 0.6% when the price of electricity rises 1%, about 0.2% when price of gas goes up and similarly with petrol. Approximately the rations of 60, 20, 20 are used because this is the ratio of how much do we spend for these kinds of energy resources in the Czech Republic.

In the table below there are summary statistics from 1999Q1 to 2011Q4

	Mean	median	max	min	std. dev.	skewness	kurtosis	#
ER_N	29.73	29.68	37.61	24.09	3.90	0.27	1.95	52
ER_R	29.24	29.62	37.95	23.16	4.14	0.20	2.01	52
Wages	99.32	100.90	112.80	80.10	8.75	-0.50	2.36	52
Productivity	98.67	100.40	112.90	78.40	11.38	-0.27	1.56	52
Real GDP	98.69	99.59	116.07	77.06	13.57	-0.13	1.40	52
Price level	102.13	100.20	117.80	85.70	9.61	0.15	1.77	52
Energy	102.13	100.20	117.80	85.70	9.61	0.15	1.77	52
Std. dev. ER_r[39]	0.29	0.27	0.73	0.05	0.16	0.72	3.04	52

31 http://www.cnb.cz/cs/financni_trhy/devizovy_trh/kurzy_devizoveho_trhu/prumerne_mena.jsp?mena=EUR
32 This method was similarly used by Stěpán Jurajda in Anatomy of the Czech Labour Market: From Over-Employment to Under-employment in Ten Years? I used relative price levels for both currencies – level in 2005 was 100. So the final variable is not real ER, but its relative changes are the same.
33 European monetary union
34 http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database
35 http://business.center.cz/business/finance/cestnahr/benzin.aspx
36 http://oze.tzb-info.cz/106825-spotreba-elektriny-v-cr-letos-podle-odhadu-vzroste-o-tri-procenta
37 http://energetika.tzb-info.cz/zemni-plyn/6251-zemniho-plynu-se-loni-spotrebovalo-mene
38 http://zpravy.kurzy.cz/243219-spotreba-benzinu-a-nafty-klesla-jako-jeste-nikdy-v-historii-ceska/
39 This variable (used during the transformation of ER to spurt) is count within one quarter so its mean is much smaller than the standard deviation of ER

In the next table there are results from Augmented Dickey-Fuller test[40]. Apart from energy every variable is I (1) variable. Energy could be I (2).

To avoid spurious regression[41] all variables are estimated in their first differences[42]. We have to keep in mind that with this transformation we are losing a lot of information[43] - E.g.: long-run relationship between these variables.

d(var) means the transformation into first differences, log (var) means transformation into natural logarithms.

	intercept	+trend		intercept	+trend
ER_R	-1.63	-3.16	d(ER_R)	-5.06	-5.1
ER_N	-1.70	-2.64	d(ER_N)	-5.53	-5.6
wages	-2.37	-1.55	d(wages)	-3.06	-3.71
productivity	-1.44	-1.51	d(prod.)	-4.07	-4.21
GDP	-1.24	-1.49	d(GDP)	-3.15	-3.25
price level	-0.17	-2.54	d(price l.)	-3.44	-3.4
energy	-1.39	-2.58	d(energy)	-2.73	-2.5
Log(NER_N)	-1.51	-3.57	d Log(NER_N)	-5.13	-5.15
Log(NER_R)	-1.42	-2.76	d Log(NER_R)	-5.46	-5.46
Log(wages)	-2.64	-1.64	d Log(wages)	-2.83	-3.46
Log(prod.)	-1.72	-1.35	d Log(prod.)	-3.95	-4.23
Log(GDP)	-1.42	-1.23	d Log(GDP)	-3.03	-3.24
Log(prices)	-0.59	-2.99	d Log(prices)	-3.4	-3.37
Log(energy)	-1.36	-2.75	d Log(energy)	-2.87	-2.59

40 T-values for

intercept	1% level	-3.57	intercept+trend	1% level	-4.17
	5% level	-2.92		5% level	-3.51
	10%level	-2.60		10%level	-3.18

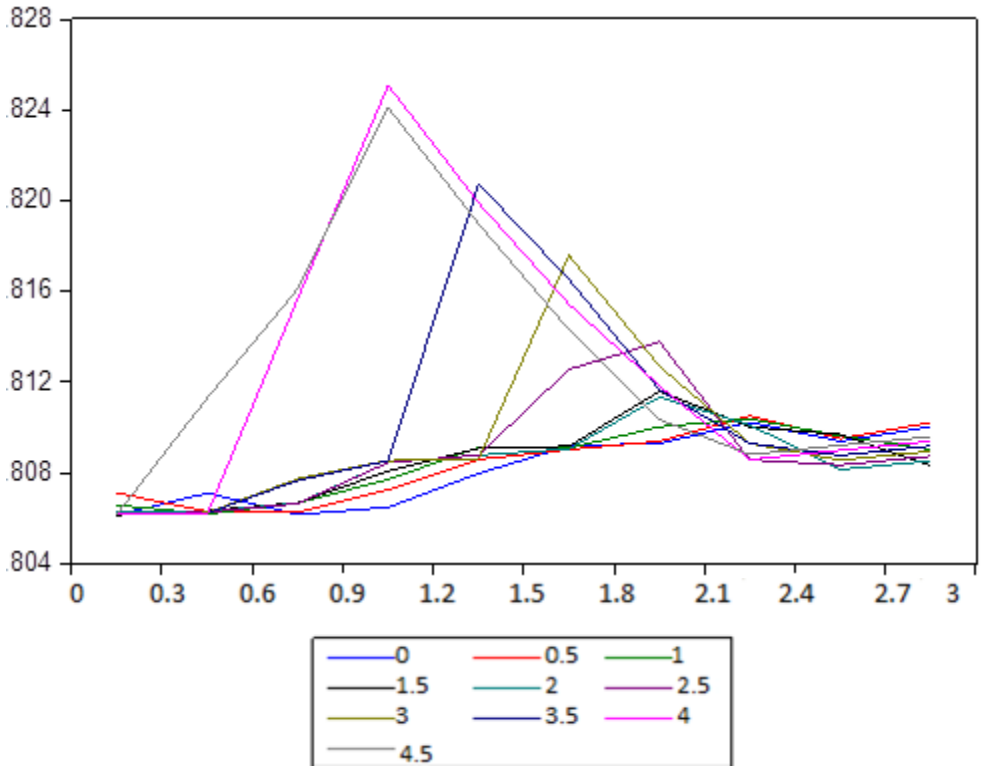
41 Artl J., Artlova M. (2009): It happens when 2 variables have similar trend but are not economically connected. Using least squares method, the results could show us good t-tests and F-test, but economic interpretation is impossible.

42 There is still probability (on 10% level), that Energy is I(1), so it is not necessary to differentiate it two times

43 Again in Artl J., Artlova M. (2009):

Results

Modifying ER into Spurt was made in Eviews 7 in sub-program using algorithm by Belke and Göcke (2001). Result of width of the play area was found during the first estimation of total number of employees. Play = 0.9 + 4*standard deviation.



Example of estimating play: on horizontal axis there is c. On the vertical there is R^2. 10 lines are used. Each one matches one d. The highest R^2 is for c=0.9 and d=4.0 (purple line).

This width was used for other estimations; however in the part of methods comparison it is counted and compared for every significant market.

In the end of this thesis there are several tables of results. In the first two there are results of estimations with nominal ER and on the next two there are results with the real ER. The tables are divided into sections of 2 rows – in the first row there are coefficients and in the second there are t-values.

We will only consider results where F-statistics show a value higher than 1.8375[44] and where Durbin-Watson statistics lies between 1 and 3[45] to avoid autocorrelation. Unfortunately F-statistics rejected virtually every result that used second type of employment data (showing

[44] F(8;38) = 1.8375 at 10% level.

[45] 5 pc significant points for 45 observations and 9 variables is 1.089. Rounding to 1 does not change which markets are significant. Source of table: Departamento de Économia, Universidad Carlos III de Madrid, online at http://www.eco.uc3m.es/~ricmora/MEI/materials/Durbin_Watson_tables.pdf

how many people firms would like to employ). 3 estimates have significant F-test only. It is probably affected thanks to lack of observations (28 - 1).

We can begin analysing these results. Estimations of total number of employees, craft workers and labourers can be analysed. Since we are interested in ER, we cannot use results where t-value of Spurt is lower than 1.678[46].

Then we can interpret two results – total number of employees and labour market of craft workers. Rise of nominal ER by 1% drops the number of positions (vacant or occupied) in the Czech economy by 0.1% (that is about 5000 positions).With regarding to craftsmen, the elasticity is nearly 4 times bigger and a 1% nominal appreciation destroys roughly 3500 jobs there.

Thanks to a wider period of observations, the F-test accompanied with the Durbin-Watson statistics rejected only 4 labour markets – workers in financial industry, in real estate, in "public administration and defence" and "others". Regarding the t-value of Spurt variable it seems that only 4 partial labour markets and the sum of Czech employment are affected by ER changes.

On the whole, Czech labour market is affected by changes of Euro. A 1% appreciation (nominal or real)[47] affects drop of overall employment by 0.09% (3500 full time equivalent jobs). So it is consistent with results above even when the period here is 5 years longer and we focused on full time equivalent of jobs.

A 1% rise in the euro affects 0.19[48]% (2200 people) drop of employment in manufacturing. The biggest reaction was found in industry of Administrative and support service activities. There the elasticity is -0.5[49], so a 1% rise of nominal ER decreases the employment there by 0.5%, and 0.63% respectively for the real ER. It is 600 and 750 jobs respectively.

Industry of "Human health and social work activities", agriculture and water supply industry were significant in table of nominal (real respectively) ER only, so it will not be considered further.

Luckily when we count up how many people will lose their job (of find one if the Euro depreciates), we will get approximately 2950[50] jobs. It is approaching to the number 3500 - Czech overall reaction.

[46] Critical value for t-statistics at the 10% level. For 5% it is 2.012
[47] In results the elasticites of real and nominal changes are very similar.
[48] 0.18 when we consider real ER, 0.15 when we consider nominal
[49] 0.5 when we consider real ER, 0.63 when we consider nominal
[50] 2200 for manufacturing + 750 for jobs in administrative sector

Comparison of the elasticities

One of the research questions of this thesis was whether the exchange rate affects workers with less human capital more than others. The other was about industries and international openness: whether the industries that are more opened have higher elasticity than those closed. Manufacturing can be assumed as an open industry, since the goods can be transported easily. Workers there are assumed to be fewer educated than in other industries.

The highest elasticity was found in "Administrative and support service activities". Then it seems that finding administrative workers is easy[51] and there exist an international competition (offshoring).

Craftsmen might be under international competition of their products – there is big possibility of "openness of this labour market" thanks to the international trade of their final goods.

As a little conclusion, it seems likely that the most affected labour markets are those employing people with less human capital and those in greater international competition.

Prediction

Worse results occurred during prediction. Using the coefficient of regression, an attempt to "count" the employment in the first quarter of is this year was made.

$$\Delta Log(E_t) = \beta_0 + \beta_1 * \Delta log(Spurt_t) + \beta_2 * \Delta log(LC_{t-2}) + \beta_3 * \Delta log(Prod_{t-2}) + \beta_4 * \Delta log(GDP_{t-2}) + \beta_5 * \Delta log(P_{t-2}) + \beta_6 * \Delta log(Energy_{t-2})$$

$$=$$

$$\underline{-0.019843} + \underline{0.093284*0} + \underline{0.097328*0.000367} + \underline{0.171545*(-0.00076) + 0.356829*(-0.00107)} + \underline{-0.08664*0.000854} + \underline{0.044812*0.004473}$$

$$= -0.0205$$

So the logarithm of employment decreased by 0.0205 from 2011Q4 to 2012Q1. Since 3.740.600 people (full time equivalent) were working in the last quarter of 2011, 3.664.700 should work in 2012Q1. 3.715.600 people were working in 2011Q1 so the year to year drop is counted to 50.900 people. The reality is that employment rose by 4.100.

[51] Portal of Ministry and labour and Social Affairs: in December 2011 there were 35,246 people seeking jobs in administration and only 453 vacancies.

Comparison of the non-linear method and the standard one

We are analysing the results of tables V, VI, VII and VIII in the appendix section; there we are going to compare these methods. Only labour markets that were significant during estimation are used. In each row, the coefficient is on the left, while t-value is on the right side.

Because of big processor demand, one function describing width of the play area was used in previous estimations. In this part every estimation uses the proper one and the results of coefficients c and d are in the tables.

Coefficients are now higher

The same model was used in table V and table VI on nominal ER. A non-linear method was used in the former table while standard least squares in the latter. When the standard method was used, only one estimation appeared to be significant. It was total number of job positions (vacant and occupied together). The elasticity was a bit smaller than in the non-linear method (0.12 versus 0.13).

A very similar result as above was found between table VII and table VIII where real ER was used. Only one difference is that the coefficients there were the same (0.09 vs. 0.09).

Comparison of width of play areas for different labour markets

Since standard deviation of ER is about 0.25, we can compute the average width of the play area for each labour market. Average width = c+0.25*d; results are in the table below.

AVG width	SUM industrial	C	N	SUM positions	η
nominal	1.9	3.9	1.9	1.1	2.7
real	3	2.1	2.9	0.9	2.1

When we compare the sum of full time equivalent jobs (first column) and the total number of working place in the economy (the fourth one) we can the first one is 2 to 3 times bigger.

It means that firms need 2 or 3 times larger deviation from at that time ER when they decide whether to fire or hire somebody than when decide about optimal number of workers[52].

The width of the play area seems to be similar for manufacturing, administrative as for the economy as a whole. Craftsmen market (5th) has similar width as first 3 markets. It should

[52] The last two columns change when firing and hiring occur and when the firms report different numbers of vacancies to the Ministry of Labour Social Affairs

have been similar with the fourth column[53]. It might be because craftsmen work in smaller firms or alone and do not need to report data to Ministry of Labour and Social Affairs[54].

Conclusion

For further research in this area I would recommend treating variables as co-integrated (since each is a least first order integrated I(1)). Then the long run relationship between variables could be found.

Some papers from "related literature" found the elasticity to be much bigger (unit elasticity or higher) so I would recommend using the same method for the Czech Republic and e.g. China and find whether this big difference of elasticities will hold among countries. If it holds it could be explained with higher dependency of the Czech economy to foreign exports.

Another improvement would be to separate the impact of ER to employment on effect of appreciation and depreciation and find whether these 2 reactions are the same in absolute values or not[55].

In OECD Employment Outlook[56] is written that movements of ER affect women and youth mainly, so another possibility of further study is to find the impact of ER to particular social groups. From women and youth it can be augmented to Roma as well.

It this thesis each independent variable is lagged 2 periods. A better microeconomic foundation should be found to know how lagged variables should be used. For example insurance against nominal ER fluctuation could delay the impact on employment. Other variables (wages or productivity) could be treated as non-lagged assuming that firms know their future productivity.

Other approaches could make the research question narrower and focus on the impact of speculations only[57]. It would help to the discussion about accepting euro as well.

[53] 4th is the sum of 5th and others
[54] One of the source of this type of data
[55] as Alexandre F. et al. (2009) did
[56] OECD Employment Outlook: 2004 Edition
[57] Using word "speculation" I mean situation when people buy an instrument (here a currency) at the price that somehow know is higher than its inner value, because they expect they will sell it even more expensive. The experimental prove: Williams, A. and Smith, V. (1984).

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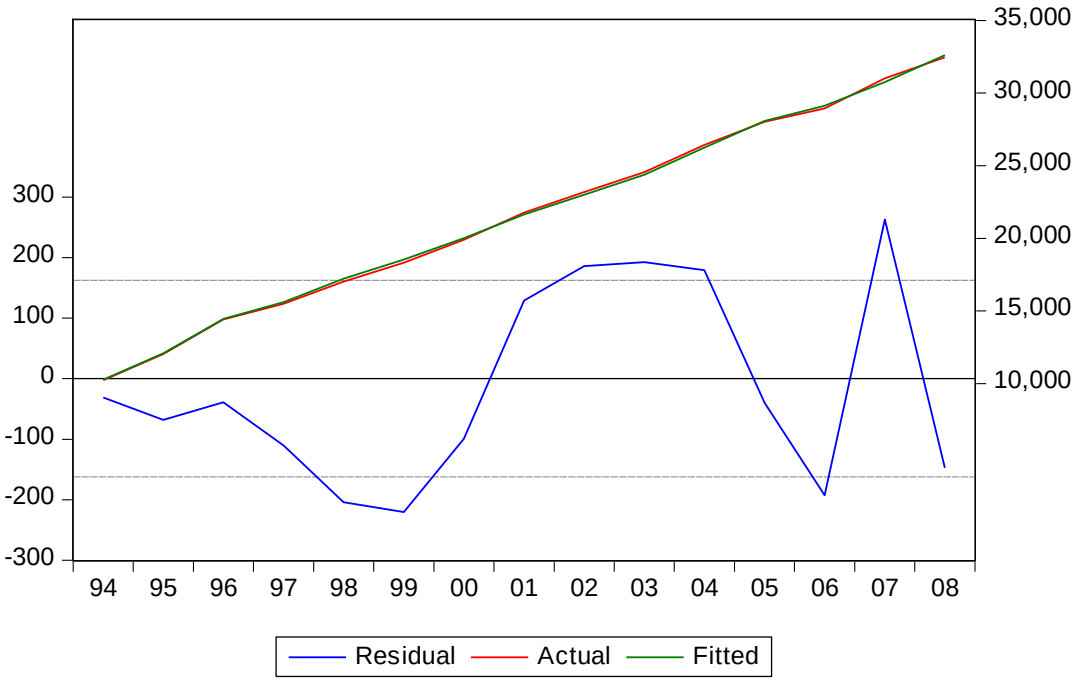
Appendix

Correlation between wages and labour cost between 1994 and 2008. (Data from Czech statistical office).

Variable	Coefficient	Std. Error	t-Statistic
wages	**1.56971**	**0.002912**	**539.096**

R^2 0.999457



Results table I – Nominal exchange rate and employment by industries

	C	**Spurt**	W	Prod	GDP	Price	Energy	D2	D3	D4	R^2	F-st	DW
SUM	-0.02	**0.09**	0.10	0.17	0.36	-0.09	0.04	0.02	0.02	0.02	0.83	19.39	1.86
	-7.62	**2.00**	2.07	0.72	1.50	-0.56	1.53	3.14	5.74	8.64			
A	-0.07	**0.18**	0.02	-0.81	1.03	0.33	-0.01	0.10	0.08	0.02	0.93	58.37	2.12
	-13.01	**1.98**	0.27	-1.71	2.18	1.09	-0.17	8.73	11.22	4.41			
B	-0.04	**0.11**	-0.10	-0.15	0.70	0.13	-0.09	0.05	0.02	0.02	0.59	5.81	1.78
	-7.57	**1.17**	-1.06	-0.32	1.46	0.41	-1.61	4.35	3.41	3.95			
C	-0.02	**0.19**	0.13	0.47	0.64	0.12	0.05	0.01	0.02	0.02	0.64	7.26	1.16
	-4.71	**2.23**	1.50	1.09	1.49	0.43	0.86	0.69	3.04	3.99			
D	-0.04	**0.16**	-0.26	-1.20	0.76	0.23	-0.27	0.08	0.03	0.03	0.54	4.87	2.26
	-5.75	**1.27**	-2.04	-1.87	1.19	0.54	-3.46	4.74	2.86	4.14			
E	-0.02	**0.06**	0.14	0.33	-0.01	-0.30	0.08	0.02	0.03	0.01	0.77	13.58	1.83
	-3.74	**0.82**	1.86	0.88	-0.02	-1.23	1.78	2.13	4.68	2.16			
F	-0.06	**0.02**	0.17	0.34	0.22	-0.29	0.13	0.08	0.07	0.05	0.91	39.24	1.72
	-9.70	**0.19**	1.54	0.61	0.40	-0.81	1.90	6.05	8.68	7.73			
G	-0.02	**0.01**	0.31	0.60	0.11	-0.73	0.20	-0.01	0.03	0.04	0.71	10.04	1.89
	-3.03	**0.15**	3.17	1.21	0.23	-2.25	3.18	-0.58	3.99	6.88			
H	-0.02	**0.11**	0.03	-0.04	0.38	0.17	-0.02	0.02	0.02	0.01	0.40	2.78	2.62
	-4.05	**1.36**	0.37	-0.11	0.93	0.64	-0.39	1.62	3.10	3.23			
I	-0.02	**-0.15**	0.17	0.63	-0.39	-0.40	0.17	0.02	0.02	0.03	0.47	3.58	2.18
	-2.27	**-0.93**	1.04	0.75	-0.47	-0.74	1.65	0.90	1.74	2.75			
J	-0.01	**0.12**	0.15	-0.60	1.06	0.14	0.05	0.00	0.01	0.02	0.41	2.88	2.04
	-1.10	**1.45**	1.73	-1.36	2.41	0.48	0.90	-0.25	1.29	3.35			
K	0.00	**-0.09**	-0.14	-0.25	0.39	-0.02	-0.09	0.01	-0.01	-0.01	0.29	1.68	1.42
	-0.29	**-0.97**	-1.55	-0.54	0.87	-0.06	-1.59	0.99	-1.07	-1.69			
L	-0.01	**-0.14**	-0.01	0.39	-0.41	-0.16	0.06	0.01	0.01	0.02	0.10	0.48	1.39
	-1.20	**-0.66**	-0.03	0.36	-0.38	-0.23	0.42	0.48	0.51	1.83			
M	0.00	**0.11**	0.24	-0.11	0.62	-0.21	0.13	-0.01	0.01	0.02	0.42	2.93	2.05
	-0.37	**1.06**	2.33	-0.21	1.22	-0.63	2.11	-1.12	0.77	2.89			
N	-0.01	**0.50**	0.31	-0.23	1.41	-1.18	0.05	0.01	0.06	0.03	0.46	3.45	2.14
	-1.17	**2.28**	1.40	-0.20	1.27	-1.62	0.37	0.38	3.45	2.47			
O	-0.02	**-0.04**	0.00	0.08	-0.13	0.16	-0.05	0.04	0.02	0.01	0.80	16.32	0.74
	-6.42	**-0.65**	0.07	0.26	-0.43	0.87	-1.36	5.71	4.89	4.28			
P	0.00	**-0.01**	-0.15	0.04	-0.20	0.05	-0.08	0.01	-0.05	0.05	0.96	90.39	2.20
	0.27	**-0.21**	-2.23	0.11	-0.59	0.21	-1.78	1.21	-10.19	12.37			
Q	0.00	**0.07**	0.02	-0.05	-0.05	0.21	-0.01	0.01	0.01	0.00	0.59	6.02	2.15
	-1.52	**1.90**	0.55	-0.27	-0.29	1.78	-0.52	2.39	3.68	2.24			
R	-0.01	**-0.04**	0.03	0.02	0.36	-0.28	-0.07	0.02	0.01	0.00	0.52	4.41	2.32
	-1.70	**-0.47**	0.39	0.06	0.83	-1.00	-1.21	2.02	1.35	-0.50			
S	0.01	**-0.06**	-0.21	0.22	-0.32	-1.04	-0.02	0.02	0.00	0.00	0.28	1.63	2.42
	1.49	**-0.40**	-1.41	0.29	-0.43	-2.17	-0.27	0.99	-0.05	0.26			

Results table II - Nominal exchange rate and employment by type of types of job

	C	**Spurt**	W	Prod	GDP	Price	Energy	D2	D3	D4	R^2	F-st	DW
SUM	-0.01	**0.08**	0.22	0.44	0.15	0.06	0.04	0.01	0.01	0.02	0.82	5.20	1.35
	-3.86	**1.22**	1.45	1.12	0.49	0.23	0.49	0.44	2.93	2.51			
α	-0.08	**0.08**	-0.77	-0.44	1.26	1.63	-0.45	0.11	0.04	0.03	0.56	1.40	2.29
	-3.75	**0.17**	-0.77	-0.17	0.60	0.89	-0.76	1.41	1.25	0.60			
β	0.03	**0.01**	1.55	0.48	1.16	-1.66	1.21	-0.13	0.00	0.07	0.47	0.97	1.95
	1.39	**0.01**	1.26	0.15	0.44	-0.73	1.64	-1.42	-0.05	1.14			
γ	-0.07	**0.25**	-2.30	-2.91	0.90	3.71	-1.19	0.24	0.01	-0.06	0.43	0.83	1.46
	-2.37	**0.37**	-1.54	-0.73	0.29	1.35	-1.33	2.08	0.26	-0.76			
δ	0.08	**-0.39**	1.58	3.33	-1.52	-2.85	0.93	-0.20	-0.03	0.01	0.51	1.15	1.78
	3.19	**-0.68**	1.29	1.01	-0.58	-1.26	1.25	-2.11	-0.85	0.15			
ε	0.05	**-0.04**	1.95	3.43	-1.64	-2.61	1.08	-0.16	0.01	0.06	0.34	0.58	2.19
	1.75	**-0.07**	1.45	0.96	-0.58	-1.05	1.34	-1.58	0.27	0.89			
ζ	-0.02	**0.12**	0.85	2.50	-1.24	-1.45	0.15	-0.01	0.06	0.05	0.49	1.06	2.81
	-1.20	**0.27**	0.86	0.95	-0.59	-0.80	0.26	-0.17	1.89	1.12			
η	-0.01	**0.30**	0.76	1.07	0.57	-0.16	0.08	-0.02	0.02	0.03	0.77	3.80	1.64
	-1.84	**1.60**	1.91	1.00	0.68	-0.21	0.32	-0.56	1.51	1.76			
θ	0.00	**0.06**	0.48	1.02	-0.70	-0.53	0.07	-0.02	0.02	0.03	0.46	0.94	1.41
	-0.65	**0.36**	1.27	1.01	-0.88	-0.76	0.31	-0.85	1.27	1.61			
λ	-0.09	**0.15**	-1.28	-1.74	1.69	2.46	-1.03	0.20	0.06	-0.01	0.69	2.48	2.44
	-4.55	**0.31**	-1.24	-0.63	0.78	1.30	-1.66	2.47	1.73	-0.22			

Results table III - Real exchange rate and employment by industries

	C	**Spurt**	W	Prod	GDP	Energy	D2	D3	D4	R^2	F-st	DW
SUM	-0.02	**0.09**	0.11	0.25	0.27	0.05	0.02	0.02	0.02	0.82	21.49	1.75
	-8.11	**1.82**	2.31	1.10	1.19	1.67	3.11	5.98	8.71			
A	-0.07	**0.15**	0.07	-0.70	0.92	0.01	0.09	0.08	0.02	0.93	63.27	2.26
	-13.05	**1.53**	0.76	-1.53	2.04	0.13	8.35	12.45	4.52			
B	-0.04	**0.10**	-0.07	-0.09	0.63	-0.09	0.05	0.03	0.02	0.58	6.58	1.72
	-7.84	**1.01**	-0.77	-0.21	1.42	-1.51	4.27	3.95	4.08			
C	-0.02	**0.18**	0.17	0.57	0.54	0.06	0.00	0.02	0.02	0.63	8.11	1.10
	-4.75	**2.05**	1.99	1.37	1.33	1.09	0.21	3.61	4.16			
D	-0.04	**0.16**	-0.21	-1.17	0.72	-0.26	0.07	0.03	0.03	0.54	5.55	2.30
	-5.88	**1.23**	-1.67	-1.92	1.22	-3.43	4.62	3.48	4.30			
E	-0.02	**0.12**	0.15	0.27	0.04	0.07	0.02	0.03	0.01	0.77	15.81	1.78
	-4.33	**1.65**	2.01	0.77	0.13	1.62	2.42	4.89	2.20			
F	-0.06	**0.01**	0.16	0.43	0.12	0.13	0.09	0.07	0.05	0.90	44.38	1.67
	-10.51	**0.12**	1.40	0.81	0.23	1.91	6.59	8.98	7.73			
G	-0.02	**0.07**	0.29	0.64	0.05	0.18	0.00	0.02	0.04	0.67	9.72	2.10
	-3.72	**0.62**	2.73	1.29	0.11	2.82	0.01	3.21	6.47			
H	-0.02	**0.06**	0.05	0.10	0.23	-0.01	0.01	0.02	0.02	0.38	2.88	2.62
	-4.01	**0.68**	0.59	0.26	0.59	-0.11	1.31	3.49	3.31			
I	-0.02	**-0.17**	0.11	0.67	-0.43	0.16	0.03	0.02	0.02	0.46	4.06	2.16
	-2.70	**-0.98**	0.69	0.84	-0.55	1.58	1.36	1.42	2.67			
J	0.00	**0.09**	0.18	-0.48	0.93	0.06	-0.01	0.01	0.02	0.39	3.08	1.81
	-0.96	**1.02**	1.99	-1.15	2.26	1.14	-0.63	1.59	3.45			
K	0.00	**-0.07**	-0.15	-0.32	0.47	-0.09	0.01	-0.01	-0.01	0.28	1.89	1.50
	-0.35	**-0.79**	-1.71	-0.74	1.12	-1.74	1.22	-1.21	-1.76			
L	-0.02	**-0.25**	-0.07	0.63	-0.65	0.06	0.02	0.00	0.02	0.13	0.68	1.42
	-1.43	**-1.17**	-0.33	0.62	-0.65	0.48	0.76	0.19	1.80			
M	0.00	**0.04**	0.23	0.16	0.34	0.14	-0.01	0.00	0.02	0.39	3.06	2.03
	-0.59	**0.38**	2.22	0.32	0.70	2.29	-1.10	0.33	2.87			
N	-0.02	**0.63**	0.37	-0.01	1.13	0.04	0.01	0.05	0.03	0.44	3.68	2.05
	-1.65	**2.71**	1.66	-0.01	1.07	0.28	0.45	3.25	2.53			
O	-0.02	**-0.06**	0.00	0.07	-0.11	-0.05	0.04	0.02	0.01	0.80	18.61	0.78
	-6.56	**-0.97**	0.02	0.25	-0.41	-1.29	5.91	5.58	4.33			
P	0.00	**0.01**	-0.15	-0.03	-0.13	-0.08	0.01	-0.05	0.05	0.96	104.15	2.25
	0.37	**0.08**	-2.16	-0.08	-0.41	-1.89	1.23	-10.92	12.55			
Q	0.00	**0.02**	0.03	0.06	-0.16	0.00	0.01	0.01	0.00	0.53	5.35	2.15
	-0.96	**0.45**	0.86	0.35	-0.91	0.04	1.65	4.21	2.28			
R	-0.01	**0.02**	0.02	-0.09	0.47	-0.08	0.03	0.01	0.00	0.50	4.82	2.41
	-2.10	**0.26**	0.28	-0.22	1.15	-1.51	2.44	1.20	-0.57			
S	0.01	**0.10**	-0.24	0.04	-0.16	-0.06	0.03	-0.01	0.00	0.20	1.19	2.39
	0.85	**0.61**	-1.55	0.05	-0.22	-0.67	1.61	-0.75	0.14			

Results table IV - Nominal exchange rate and employment by types of job

	C	**Spurt**	W	Prod	GDP	Energy	D2	D3	D4	R^2	F-st	DW
SUM	-0.01	**0.10**	0.28	0.42	0.21	0.03	0.00	0.01	0.02	0.84	7.44	1.38
	-4.07	**1.91**	2.72	1.27	0.77	0.38	-0.05	4.08	4.14			
α	-0.07	**-0.26**	-0.37	0.39	0.82	-0.38	0.07	0.05	0.05	0.53	1.57	2.22
	-3.77	**-0.67**	-0.48	0.16	0.40	-0.65	1.31	2.05	1.51			
β	0.03	**0.46**	1.20	-0.66	1.93	1.12	-0.10	-0.01	0.04	0.47	1.22	1.85
	1.43	**0.99**	1.31	-0.22	0.79	1.59	-1.54	-0.45	1.00			
γ	-0.06	**-0.59**	-1.34	-0.76	-0.36	-1.03	0.16	0.04	0.00	0.37	0.79	1.48
	-2.17	**-0.99**	-1.14	-0.20	-0.11	-1.15	1.82	1.03	0.07			
δ	0.07	**0.14**	0.71	1.92	-0.87	0.85	-0.13	-0.06	-0.04	0.43	1.05	2.04
	2.88	**0.29**	0.73	0.61	-0.33	1.12	-1.75	-1.68	-0.83			
ε	0.04	**0.63**	1.36	1.76	-0.55	0.94	-0.11	-0.01	0.02	0.33	0.68	2.18
	1.72	**1.21**	1.34	0.54	-0.20	1.21	-1.51	-0.24	0.38			
Z	-0.03	**0.51**	0.62	1.61	-0.62	0.05	0.01	0.05	0.03	0.50	1.39	2.76
	-1.37	**1.37**	0.85	0.69	-0.32	0.09	0.16	1.94	1.00			
η	-0.01	**0.39**	0.92	0.95	0.74	0.01	-0.03	0.02	0.04	0.81	5.85	1.92
	-1.85	**2.80**	3.38	1.09	1.02	0.06	-1.44	1.85	2.88			
Θ	-0.01	**0.20**	0.41	0.73	-0.50	0.03	-0.02	0.01	0.02	0.47	1.22	1.50
	-0.76	**1.39**	1.46	0.81	-0.67	0.14	-0.87	1.14	1.76			
Λ	-0.09	**-0.31**	-0.66	-0.65	1.19	-0.93	0.14	0.08	0.03	0.65	2.52	2.40
	-4.31	**-0.73**	-0.80	-0.25	0.54	-1.47	2.35	2.79	0.68			

Results table V - Nominal ER in Spurt

	SUM industrial		C		N		SUM positions		η	
C	-0.02	-7.62	-0.02	-4.79	-0.01	-1.17	-0.01	-4.68	-0.02	-2.30
Spurt	0.09	2.00	0.32	2.35	0.50	2.28	0.13	3.46	0.77	2.80
Wage(-2)	0.10	2.07	0.11	1.35	0.31	1.40	0.22	2.28	0.49	1.35
Prod(-2)	0.17	0.72	0.53	1.30	-0.23	-0.20	0.46	1.84	0.58	0.65
GDP(-2)	0.36	1.50	0.54	1.35	1.41	1.27	0.22	1.05	0.75	1.10
Price(-2)	-0.09	-0.56	0.24	0.83	-1.18	-1.62	0.15	0.82	0.98	1.20
Energy(-2)	0.04	1.53	0.05	0.97	0.05	0.37	-0.05	-0.67	0.04	0.21
D2	0.02	3.14	0.01	0.83	0.01	0.38	0.00	0.67	0.01	0.30
D3	0.02	5.74	0.02	2.75	0.06	3.45	0.01	2.03	0.00	0.38
D4	0.02	8.64	0.02	4.34	0.03	2.47	0.02	3.76	0.02	1.24
play.c	0.90		2.70		0.90		0.60		1.80	
play.d	4.00		4.50		4.00		2.00		3.50	
R^2	0.83		0.64		0.46		0.91		0.84	
F-st	19.39		7.41		3.45		10.96		5.87	
DW	1.86		1.23		2.14		1.54		2.02	

Results table VI – real ER, linear method

	SUM industry		C		N		SUM position		η	
C	-0.02	-7.21	-0.02	-4.38	-0.01	-1.10	-0.01	-4.29	-0.01	-1.63
ERN(-2)	-0.03	-0.61	-0.06	-0.73	0.20	0.91	0.12	2.00	0.18	0.95
W(-2)	0.10	2.00	0.13	1.46	0.27	1.17	0.24	1.98	0.99	2.60
Prod(-2)	0.46	2.21	1.06	2.77	1.09	1.10	0.69	2.31	1.98	2.10
GDP(-2)	0.03	0.16	-0.02	-0.04	0.22	0.21	0.06	0.25	0.01	0.02
Price(-2)	-0.14	-0.86	0.01	0.03	-1.23	-1.58	0.11	0.47	-0.46	-0.62
Energy(-2)	0.06	2.11	0.08	1.50	0.13	0.91	-0.02	-0.18	-0.02	-0.06
D2	0.02	2.75	0.00	0.37	0.01	0.20	0.00	0.28	-0.04	-1.25
D3	0.02	5.21	0.02	2.52	0.05	2.69	0.01	1.93	0.01	0.83
D4	0.02	8.30	0.02	3.82	0.03	2.42	0.02	3.66	0.05	2.72
R^2	0.81		0.60		0.39		0.86		0.74	
F-st	17.31		6.06		2.67		6.59		3.16	
DW	1.65		1.05		2.05		1.14		1.37	

Results table VII – real ER and Spurt

C		**-0.02**	**-0.02**	**-4.75**	**-0.02**	**-1.28**	**-0.01**	**-4.69**	**-0.01**	-1.80
Spurt	0.09	1.96	0.18	2.05	0.61	2.86	0.09	3.16	0.38	2.80
W(-2)	0.10	2.16	0.17	1.99	0.30	1.38	0.31	3.55	0.95	3.49
Prod(-2)	0.26	1.19	0.57	1.37	0.11	0.11	0.47	1.81	1.05	1.22
GDP(-2)	0.24	1.13	0.54	1.33	0.88	0.89	0.27	1.22	0.65	0.92
Energy(-2)	0.05	1.62	0.06	1.09	0.03	0.22	-0.04	-0.51	0.01	0.05
D2	0.02	3.21	0.00	0.21	0.01	0.56	0.00	-0.38	-0.03	-1.53
D3	0.02	6.04	0.02	3.61	0.04	2.93	0.01	3.86	0.02	1.72
D4	0.02	8.57	0.02	4.16	0.03	2.27	0.02	5.24	0.04	3.05
play.c	1.80		1.20		1.80		0.60		1.50	
play.d	4.50		3.50		4.50		1.00		2.50	
R^2	0.82		0.63		0.45		0.89		0.81	
F-st	21.83		8.11		3.82		11.26		5.85	
DW	1.73		1.10		1.96		1.44		1.93	

Results table VIII – real ER, linear method

C		**-0.02**	**-0.02**	**4.72**	**0.02**	**1.52**	**-0.01**	**-4.17**	**0.01**	1.81
ERR(-2)	-0.01	-0.20	-0.06	-0.80	0.31	1.57	0.09	1.88	0.22	1.54
W(-2)	0.09	1.83	0.13	1.44	0.24	1.02	0.29	2.79	0.95	2.92
Prod(-2)	0.48	2.30	1.06	2.84	1.22	1.23	0.68	2.33	2.02	2.22
GDP(-2)	0.03	0.15	-0.02	-0.05	0.13	0.13	0.06	0.24	-0.07	-0.10
Energy(-2)	0.06	2.02	0.08	1.52	0.11	0.76	0.01	0.06	-0.04	-0.17
D2	0.02	3.18	0.01	0.51	0.01	0.46	0.00	-0.32	-0.03	-1.40
D3	0.02	5.46	0.02	2.86	0.04	2.35	0.01	3.63	0.01	0.86
D4	0.02	8.26	0.02	3.97	0.03	2.10	0.02	4.45	0.04	2.83
R^2	0.80		0.60		0.37		0.84		0.73	
F-st	19.41		7.02		2.77		7.39		3.76	
DW	1.63		1.05		1.91		1.17		1.21	