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RETAIL FOOD PRICES IN THE CZECH REPUBLIC – THE INFLUENCE OF SELECTED FACTORS

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Abstract

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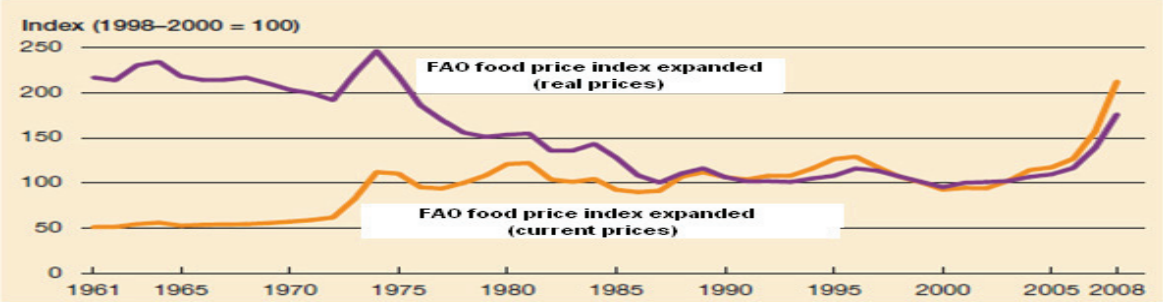
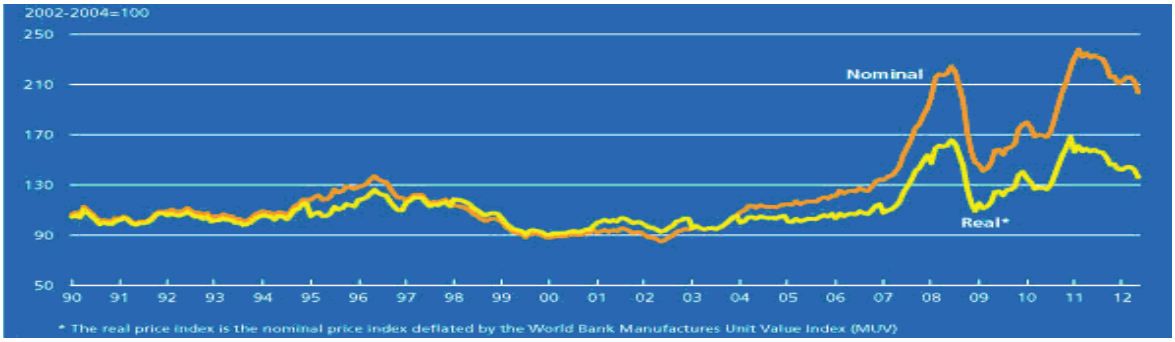
During the last decade (2000–2010), we have witnessed an unprecedented rise in food prices, especially from the world and European market viewpoint. The article aims to analyze the development of prices in the food market in the Czech Republic and to identify the influence of global and European prices development on domestic food price development and price development of selected food products. The article focuses primarily on the sensitivity of Czech food price development and especially on sensitivity of the selected commodity aggregations price development on the global and European market price growth. Furthermore, it is analyzed the impact of changes in value added tax rate from 10% to 14% on food prices in general and then on the prices of selected food products in retails network. The results of the analysis are following. The Czech food market reacts sensitively to changes in food prices on the global market as well as on the EU market but the EU price development is determining for the CR. In terms of price response to change in the VAT rate, it appears that the growth rate is not absorbed on the production side but it is largely transferred to consumer prices. The selected food sample also showed high responsiveness in the development of prices to changes in the EU market prices but there are certain variations given by specifics of the Czech market.

world, European Union, Czech Republic, market, food, price, development, change, analysis, influence, correlation, flexibility, value added tax (VAT), impacts

In recent years, food prices represent a very dynamically developing segment of the global economy (Brinkman *et al*., 2010). In the years 1961–2000, increase of food prices expressed in current prices was very slow (about 2 index points per year – see Fig. 1) (FAO, 2010). Expressed in real prices, it can be even noted that food prices were falling very significantly during the years 1960–2000 (Valder *et al*., 2011). According to the FAO and other institutions and experts (FAO, 2009; Vološin, 2011) – measured in real prices – the food prices reached their historical minimum at the turn of the millennium. A change in food prices occurs in the second half of the first decade of the 21st century (Webb, 2010) when we had witnessed firstly gradual increase in prices in 2004–2006 (from 108 to about 134 index points). This growth then accelerated in 2007 from an initial 134 index points to about 191 index points and it subsequently reached its maximum in June 2008 when the food prices index was about 224 index points (see Fig. 2). The subsequent decline in prices that occurred in the second half of the year 2008 and during the first months of 2009 did not led to the lowering of prices to the original level from the beginning of the millennium although it was very significant (Horská *et al*., 2010). In February 2009, prices reached their minimum of "only" 141 index points (2002–2004 = 100). Then again there was an acceleration of price growth when the food price index increased to 237 index points in February 2011. Then there was a decline once again but this decline was not able to compensate the previous price increase – currently (May 2012), the value of the food price index can be found around 204 index points – which is two times higher value of the index than in the period 2002–2004.



1: *Development of the food price index according to FAO*
Source: FAO, 2012



2: *Development of the food price index according to FAO with an emphasis on the period 2007–2012*
Source: FAO, 2012

The above mentioned development consequently led to the fact that global food prices have more than doubled in a very short period of about 8 years. Generally, it should be pointed out that the boom has affected sectors which are connected to the production of bio fuels the most (Ruel, Garrett *et al.*, 2010; Pingali *et al.*, 2008) – i.e. cereals, oilseeds and sugar crops. In May 2012, the price index for cereals ranged at about 220 index points, for sugar it was 294 index points and for oil 234 index points (2002–2004 = 100 points). The rise in prices, which we witnessed, had a number of causes and their effect accumulated in the recent years (Timmer, 2008). As an illustration, the most commonly reported factors can be mentioned (Svatoš, 2008; Čechura, Šobrová, 2008): population growth, the growth of global production, growing purchasing power of population, speculation, decrease of stock, increase of non-food use of agricultural and food production (especially fuel and energy), decrease of production in some regions of the world, loss of agricultural land connected to the process of urbanization, climate change, etc. In relation to the impact of rising prices it should be noted that the actual food price growth has different impacts, especially when comparing developed and developing economies of the world (Godfray *et al.*, 2010). In particular, it is reflected very negatively in those countries where the ratio of food expenditure exceeds 40% of average household income in the long-term (Benerjee and Duflo, 2008). In the case of developed countries (OECD members), where food expenditures are on average between 5 to 30% of total household expenditure, the situation is not so critical. In this respect, it is worth mentioning that between developed and developing countries there are huge disparities in terms of household disposable income (Firebaugh, 2006). While in some countries of sub-Saharan Africa the value of GDP / capita is below the 300 USD, in the most developed countries the value of GDP / capita is over 50 000 USD in the long term on the other hand (WB, 2012).

It is important to note that in addition to market factors, food prices are affected by policy as well (Timmer, 1989) – for example, food prices are affected hugely by politically motivated process of liberalization of the world agricultural trade (Smith, 2001), effort of number of governments to control the amount of realized agrarian production is also significant (Poulton *et al.*, 2006) (i.e. the EU's Common Agricultural Policy, etc.) and the level of direct and indirect taxation in different countries is important as well in cases when the amount of taxes significantly affects the final price of food on the shelves in retail trade (Newbery, 1989).

From the arguments above it can be deduce that the price development on the food market is a very complex problem affecting the quality of life in all countries and regions of the world (FAO, 2011). In this respect, however, the ambition of the article is not to analyze the development of global food prices. The article focuses on a much narrower and less ambitious objective. The objective is to analyze the development of food prices on the

Czech market and to find out how are the changing global prices reflected in the development of food prices on the Czech market. Furthermore, the article analyzes the impact of increasing food prices in the EU market and world market on food prices in the Czech market. Special subject of the analysis is to determine the impact of the GDP growth on food prices in the Czech Republic in late 2011 and beginning of 2012.

MATERIALS AND METHODS

From a methodological point of view, the article focuses on analysis of food prices development on the world market, the EU market and then on the market in the CR. The sources of data for analysis come from databases of UN FAO, World Bank, Eurostat, CNB and CSU. The observed period focuses on the development of food prices with emphasis on the years 2006–2012 when there were the most obvious changes. Food price development is analyzed using a standard index of food prices which is calculated by individual institutions mentioned above (the base year 2005 = 100). The analysis of food prices is then processed on the monthly level and development trends are compared through chain indices and other statistical indicators. The relationship between the world prices, prices in the EU market and in the CR is analyzed through the correlation index. The influence of world prices (x_1) and prices in the EU market (x_2) on the food price developments in the CR (y_1) is then analyzed by regression analysis (Tvrdoň, 2001) where price development in the CR acts as an endogenous variable and the development of prices in the EU and world markets plays the role of exogenous variables.

$$y_1 = ax_1 + bx_2 + c. \quad [1]$$

Subsequently, it is evaluated the impact of world prices and the EU market prices on prices in the CR.

$$y_1 = ax_1 + c \quad [2]$$

$$y_1 = bx_2 + c, \quad [3]$$

where:

x_1..... World food market price (food price index development)
x_2..... EU food market price (food price index development)
y_1..... Czech food market price (food price index development)
a, b ... regression coefficients
c..... constant.

To exclude multi-collinearity the individual time series are analyzed through the correlation analysis – correlation matrix calculation. According to Husek (2007), for the regression analysis it is possible to accept if the value of correlation is not exceeding 0.8. To exclude the multicollinearity which appeared among individual variables in nominal values expressions the authors decided to analyze the deviations from average values of individual variables.

Obtained regression results are then tested by t-test, p-value and Durbin-Watson test. Through above mentioned regression, it is then calculated functional elasticity (Ostaszewski, 1993) which specify flexibility in the development of global prices and Czech market prices.

$$E = \sigma y / \sigma x \times (\text{average } x)/(\text{theoretical } y). \quad [4]$$

Finally, impact of changes in VAT rates on the resulting food prices on the CR market is estimated through the point elasticity. In relation to the methodology, it is also appropriate to mention the fact that the authors did not analyze the development in market prices of the CR only through data taken from the CSO database but they conduct own research on food price developments in the retail market of the CR where the food prices were observed for four quarters in the retail network in the Czech Republic for the sample products. In this respect, observed quarters were third and fourth quarter of the year 2011 and the first and second quarter of the year 2012. Own price survey was conducted in the case of the most important chains represented in the CR (Albert, Billa, Interspar, Kaufland, Lidl, Penny Market, Tesco). Among the monitored food products were included the following: 1.5% milk, eggs (10 pieces), flour (1 kg), sugar crystal (1 kg), cheese 30% (1 kg), long-grain rice (1 kg), butter (82%), bread "Šumava" (1200 g), sunflower oil (1 l), whole gutted chicken (1 kg), apples (1 kg), pork with the bones (1 kg), pasteurized semi-skimmed milk (1 l), potatoes (1 kg), beef (1 kg). At the end of the paper the authors analyzed the sensitivity of selected foodstuff products traded in the Czech market on changes in the value of national food price index, EU market food price index and global market food price index. The results of analysis are compared with the sensitivity of individual commodity groups price development in relation to world food price index value development. The sensitivity of individual items or commodity groups price on changes in national, European and global food price index is analyzed through the point elasticity calculation (Ostaszewski, 1993).

RESULTS AND DISCUSSION

If we analyze food price developments in the global market, the EU market and the CR market, generally it can be said that existing differences in market prices between the EU countries and world market are gradually disappearing. This can be observed the most clearly especially in the case of primary agricultural products prices development (FAOSTAT, 2012) where prices in the EU market are for a wide range of products (e.g. corn) lower

than prices in the global market (FAOSTAT, 2012). A higher price level in the case of the EU countries in comparison with the world market is particularly evident in the case of final products with high processing level and which are more labour-intensive (FAOSTAT, 2012). However, it should be noted that due to the dynamic growth of prices in the global market compared to the EU market the existing differences between the EU and world market are being gradually eliminated as mentioned above. While in case of the EU market, in the years 2006–2012 the food price index reached a maximum value of 122 (2005 = 100), in case of the world market the index was 202 points. In the particular months of the period, the average food price index was about 112 in case of the EU countries and about 150 index points in case of the global market. During the observed period, food prices in the global market raise by about 0.7% per month on average, while prices in the EU market increased by about 0.25% per month in the same period. The lower dynamic of price growth rate and substantially lower levels of price fluctuations on the EU market are undoubtedly positive effects resulting from the EU common policies (Common Agricultural Policy and EU Common Commercial Policy). These policies act as a shield (Bielik *et al.*, 2010) particularly in relation to fluctuations in the global market which are transferred to the markets of each Member State of the European Union only in a limited extent (Svatoš, Smutka, 2011). Particular tables (Tab. I and II) listed below shows fairly accurate information about the interconnection of the EU market with the global market through the correlation analysis. The results of the analysis shows that there exist a strong link between the development of prices in both markets with some exceptions - in this regard, it is primarily the impact of the world market prices

Ia: *Correlation of the price index development in 2006 (January)–2012 (May) – in the case of the CR market, the EU market and world market – Part 1*

Variable	Correlation – Marked correlation are statistically significant at level. p < ,05000, N = 77				
	Averages	Standard Dev.	EU	World	ČR
EU	112.3517	6.18090	1.000000	0.5945	0.8215
World	151.9368	31.20983	0.5945	1.000000	0.5673
ČR	110.6260	6.50573	0.8215	0.5672	1.000000

Source: Own processing, 2012

Ib: *Selected characteristics of food price development on the world market, the EU market and the CR market in the observed period – Part 2*

Food Price Index, 2005 = 100	2006	2007	2008	2009	2010	2011	2012	Average value GEOMEAN	Average value Chain Index
European Union	103.66	109.87	114.52	113.55	116.92	120.31	122.46	112.18	1.00252
World	114.68	162.83	126.29	151.82	190.39	179.69	173.88	148.71	1.00687
CR	101.50	112.90	112.00	108.10	114.10	120.20	124.80	110.44	1.00287

Source: Own processing, 2012

IIa: *Basic statistical characteristics of the price index development on the world market, the EU market and the CR market in 2006 (January)–2012 (May) – Part 1*

Descriptive statistic Variable	Descriptive Statistic					Descriptive Statistic		
	N valid	Average	Minimum	Maximum	St.dev.	Geometric average	Harmonic average	Median
EU	77	112.3517	101.1700	122.4600	6.18090	112.1811	112.0078	113.8200
World	77	151.9368	103.3195	202.8520	31.20983	148.7101	145.4771	149.0938
ČR	77	110.6260	100.0000	125.7000	6.50573	110.4373	110.2487	111.5000

Source: Own processing, 2012

IIb: *Basic statistical characteristics of the price index development on the world market, the EU market and the CR market in 2006 (January)–2012 (May) – Part 2*

Variable	Descriptive Statistic						
	Quartile 90,0	Variance	Quartile Variance	Variance	Lower quartile	Upper quartile	Quartile 10,00
EU	119.7200	21.29000	10.07000	38.2035	105.4400	115.5100	102.6700
World	196.6150	99.53253	58.91028	974.0532	124.7271	183.6374	107.4598
ČR	117.8000	25.70000	10.00000	42.3246	105.0000	115.0000	101.0000

Source: Own processing, 2012

on the development of prices in the market of EU countries. However, it can be seen more progressive increase in prices in the global market compared to the EU market. This implies that the common policy must function as a sort of bump preventing the transmission of fluctuations of the world market to the internal market of the EU countries. It can be seen a certain independence with regard to price development in the market of the EU countries in relation to the world market.

Analysis of market prices in the Czech Republic

Based on analysis of price development on the global, European and Czech market, it can be stated that there is a correlation among the above mentioned prices. In this regard, it should be noted that significantly higher dependence of food prices in the CR market exists in relation to the EU market than in relation to the development of the world market prices (in detail, see Tab. I). The explanation is very easy. The Czech Republic is a member of EU and because of the EU countries are members of one "Common" market – there is existing the huge pressure to unify prices (the Law of One price). The following tables (Tab. III, IV and V) summarize the development of Czech food prices in relation to the development of EU market food prices (Tab. III) and in relation to the development of world market food prices (Tab. IV) through the regression functions. Tab. V provides an overview of the cumulative impact of world prices and the EU prices on the development of food prices in the CR market. Results of individual processed regressions suggest a significant influence of the EU market prices on food price development in the CR market. In the case of the world market, it is also proved the impact of world prices on Czech market prices. Nevertheless, this impact is significantly lower compared with the influence of prices on the EU internal market. A calculated elasticity values based on the individual regression functions (for details see methodology – equation [4]) clearly show the higher impact of the EU market price changes on the Czech food prices compared with impact of global market price change. Tab. III implies that if price index value in the EU market changes by 1%, the price index value in the CR market changes by about 0.57%. From Tab. IV, which characterizes the relationship between the global market and the CR market, it can be derived following in relation to the elasticity – if the price index on the world market changes by 1%, the food prices index in the CR market changes by 0.54%. It is important to note that even lower impact of changes in global market prices on the development of the Czech market prices

III: *Impact of price development in the EU countries on the food price development in the CR [equation No. 3 – in methodology]*

N=77	Regression results with dependent variable : Food price in ČR R = .8215 R2 = .6749 Adjusted R2 = .6705 F(1,75) = 155.67 p < 0,0000 Est. Standard deviation : 2.1585, alfa = 0.05					
	b*	St.dev from b*	b	St.dev from b	t(75)	p-value
Abs. value			0.5601	0.4509	1.2423	0.2180
EU price	0.8215	0.0658	0.9161	0.0734	12.4767	0.000000

Source: Own processing, 2012

IV: *Impact of price development in the world market on the food price development in the CR [equation No. 2 – in methodology]*

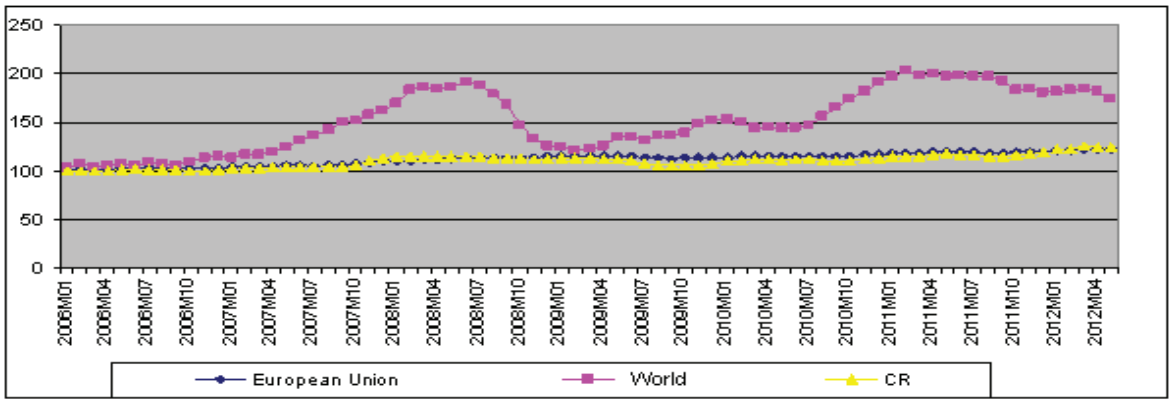
N=77	Regression results with dependent variable : Food price in ČR R = .5673 R2 = .3218 Adjusted R2 = .3128 F(1,75) = 35.588 p < 0,0000 Est. Standard deviation: 3.1174, alfa = 0.05					
	b*	St.dev from b*	b	St.dev from b	t(75)	p-value
Abs. Value			1.4022	0.7399	1.8951	0.000000
World price	0.5673	0.0951	0.1424	0.0239	5.9655	0.000000

Source: Own processing, 2012

V: *Overall impact of price development in the world and EU market on food price development in the CR market [equation No. 1 – in methodology]*

N=77	Regression results with dependent variable : Food price in ČR R= ,93144656 R2= ,86759270 Adjusted R2= ,86401413 F(2,74) = 242,44 p < 0,0000 Est. Standard deviation: 2,3991, alfa = 0.05*, 0.13**					
	b*	St.dev from b*	b	St.dev from b	t(74)	p-value
Abs.value			0.1435	0.52609	0.2727	0.007315
EU price	0.7489	0.0812	0.8352*	0.09055	9.2229	0.000000
World price	0.1220	0.0812	0.0306**	0.02038	1.5027	0.137182

Source: Own processing, 2012



3: *Development of the food market price index in the years 2006 (January)–2012 (May) –(2005 = 100)*
Source: Own processing, 2012

can be deduced from Tab. V where the cumulative effects of the world prices and EU market prices on the Czech market prices are expressed. Elasticity calculated from this function (for details see methodology – equation [4]) refer to the fact that if the food price index in the global market changes by 1%, the value of the same market index in the CR changes by about 0.44%. The influence of the price development in the EU market is more significant – the value of elasticity food price index on the Czech market in relation to the food price index on the EU market reaches 0.38%. The results of analysis prove a high dependency of Czech food price development in relation to both global and EU food price development – but it should be emphasized, that on the base of correlation index – Czech food price development is more dependent on EU market food price development. In this case it must be highlighted that because of liberalization processes and because of EU CAP reform the EU food price development is much more dependent on global market food price development than it was in the past – the differences between EU food price and global food price development are not so high as it was ten-twenty years ago. It is explaining a similar sensitivity of Czech food price development both in relation to global and EU food prices development.

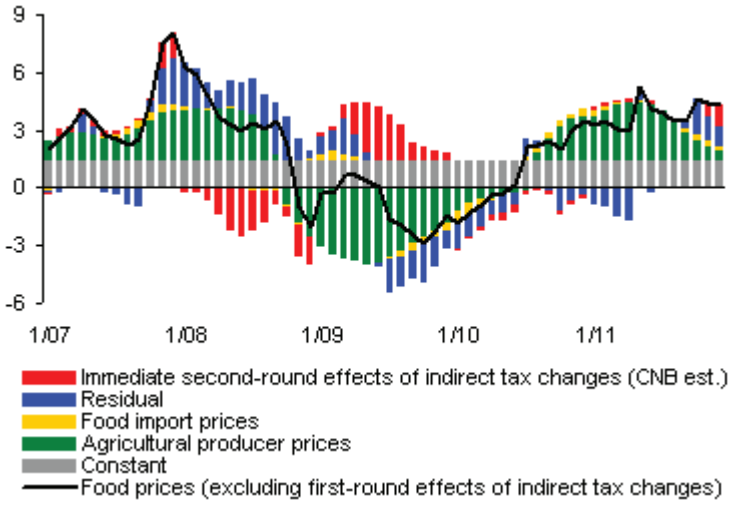
Fig. 3 implies greater interconnection in the CR market price development to the EU market price development. This fact is clearly shown in Tab. I and then in the Tab. II. The high compliance rate is shown by the values of average price development, achieved maximum and minimum price in the observed period, calculated value of the variance, standard deviation, quartiles and percentiles, etc.

The food prices development on the CR market in the last four quarters

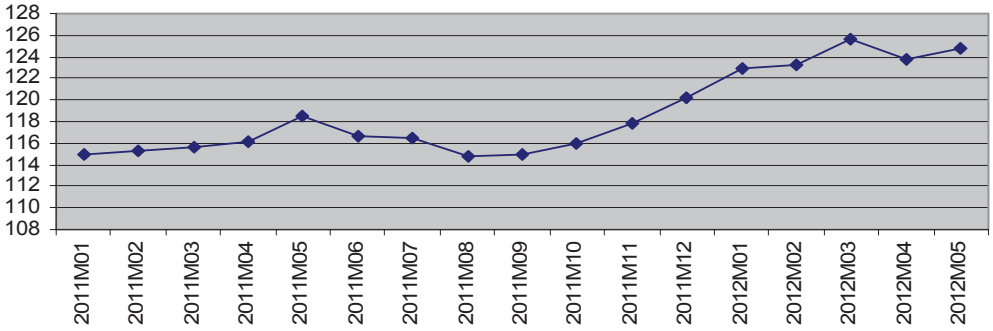
Food prices in the CR market are developing very dynamically. As it was mentioned above, the growth rate of the CR market price is below the level of the global market growth; however, its price growth follows the EU market price growth. In recent years, food prices in the Czech market increased by almost one fifth (Fig. 4). In the years 2006–2012 (May), the value of food prices index was about 25 index points (from 100.4 to 124.8; 2005 = 100). Food price growth was, as mentioned above, influenced by the global growth in food prices as well as by growing food prices on the EU market. Another important factor which affected the growth of prices in the last period was the growth of VAT (in late 2007 and 2008 from 5 to 9% for the first time and then at the turn of 2011 and 2012 from 10% to 14%).

On the Czech market, the most dynamic growth in the food price index was recorded at the turn of 2007 and 2008 and then at the turn of 2011 and 2012.

In this regard, it is worth mentioning that the change in VAT rate contributes not only to increase in prices itself but it has inflationary effect – beside others, it is shown by an excerpt from a research report published by the CNB in 2012. The report states the following: The increase in food prices due to the VAT changes at the start of this year implies a first-round effect on inflation of 0.6 percentage point. According to the forecasts in Inflation Reports III/2011 and IV/2011, the VAT change was not expected – owing to subdued demand – to pass through to consumer prices in advance, as had happened at the end of 2007. At that time, more than half of the effect of the approved change to the reduced VAT rate from 5% to 9% as from January 2008 had passed through to food prices two months in advance. Given the different position of the economy in the business cycle and the different agricultural producer price situation compared to 2007, the potential pass-through of the higher VAT rate to food prices at the end of 2011 was considered in Inflation Report IV/2011 to be only a temporary upside risk to the forecast. However, strong across-the-board growth in food prices in October to December 2011 suggested that the VAT change might again have passed through in advance to prices of food (excluding alcohol and tobacco, which are not affected by the recent VAT change). Seasonally adjusted food prices rose by 2.7% in 2011 Q4, with most food items recording increases. An econometric analysis reveals that the pick-up in



4: *Food price factors – Food prices were affected at the end of 2011 by an increase in VAT (annual percentage changes; contributions in percentage points)*
Source: CNB, 2012



5: *Development of the food price index in the CR in January 2011–May 2012 (2005 = 100)*
Source: Own processing, 2012

food price inflation in this period can be explained to only a very small extent by the currently rising imported food prices or the weaker exchange rate (see Chart 1). By contrast, the effect of the high domestic agricultural producer prices in the past on food prices is fading noticeably. At the same time, a comparison of food price inflation in the Czech Republic with that in neighbouring countries shows that the Czech Republic had the fastest growing food prices at the end of 2011 (see Fig. 4). This difference has no significant cause other than the VAT change. A similar difference between prices in the Czech Republic and other countries was observed in late 2007 and early 2008.

The development of food prices - field research in July 2011–June 2012

The second half of the year 2011 along with the first and second quarter of the year 2012 was marked by significant price increases. To the price growth contributed significantly the three factors already mentioned above. High prices in the global market, price growth on the EU market and the growth rate of VAT which was also accompanied by efforts of individual market actors in the CR to increase their own selling prices in order to offset increase in costs associated with rising prices of fuel, energy, inputs, etc in the past periods. The following Fig. 5 shows the development of food price index in the period January 2011–May 2012. The data presented in the figure shows a high growth rate of prices, especially in the period August 2011–March 2012. From the CNB conclusions (2012) and further analysis of the CSO (2012) follows that this increase was dynamised by the chains effort to offset increase of the VAT rate and then offset the cost increase associated with an increase in input prices in previous periods - when the chains tended not to increase prices for final consumers because of competitive fights. Cost increase of individual entities involved in the vertical production, processing and sale of agricultural products and food was rather redistributed between primary production and processors – but ultimately there was prices increase for final consumers as well.

Results of the field survey in the various quarters in the period July 2011 to June 2012 showed the following findings. Tab. VI provides an overview of average prices of observed products in the case

VI: *Development of prices of selected food segment on the Czech market*

	3q2010	4q2011	1q2012	2q2012
1L the cheapest sunflower oil	29,91	33.76	35.73	33.57
1 kg flour	6.76	8.47	9.10	8.50
1 kg sugar crystal	15.76	22.04	23.61	22.90
1 kg long grain rice	18.47	20.19	20.19	19.90
Edam 45 % box	148.01	149.49	161.32	205.20
Edam 30 % box	126.01	126.93	139.03	141.84
The cheapest milk durable - 1l	12.04	13.84	13.61	12.90
Bread "Šumava" piece 1 200g	18.08	25.90	25.90	24.40
Back beef without bone	179.93	184.67	193.13	199.53
Pork with bone	100.22	101.93	106.48	106.23
Pork ham without bone	103.54	103.05	109.02	109.06
Whole gutted chickens	57.03	58.50	58.98	62.46
Pasteurized semi-skimmed milk	17.74	18.10	18.80	18.75
Butter	140.48	142.64	142.08	133.60
Edam cheese (counter)	122.76	121.54	132.05	128.73
Fresh hen eggs	2.19	2.53	4.41	3.60
Wheat flour	11.30	11.45	11.33	10.53
Potatoes	10.88	8.82	10.41	10.37
Apples	31.35	27.05	28.98	29.58

Source: Own processing, 2012

of retail chains Albert, Billa, Intersper, Kaufland, Lidl, Penny Market and Tesco. Prices were collected in sales units located in Prague, Brno and Ostrava. Additional collections were also made in other towns (Olomouc, Zlín, Třebíč, etc.).

The research results point to the fact that the average growth rate of the value of food products was around 3% in the fourth quarter compared to the third quarter of 2011. The increase in prices between the fourth quarter of 2011 and the first quarter of 2012 was much stronger. Prices increased by about 4.3% between these two observed periods. Subsequently, there was a stagnation of growth in prices and food prices decreased by about 1%

VII: *Chain index of selected products development in the observed period*

Indices	4q2011	1q2012	2q2012	GEOMEAN
Fresh hen eggs	1.1568	1.7421	0.8157	1.180192
1 kg sugar crystal	1.3989	1.0713	0.9698	1.132712
Bread "Šumava" piece 1 200g	1.4328	1.0000	0.9421	1.105167
1 kg flour	1.2537	1.0742	0.9341	1.07949
1L the cheapest sunflower oil	1.1290	1.0585	0.9394	1.039311
Back beef without bone	1.0263	1.0458	1.0331	1.035066
Whole gutted chickens	1.0257	1.0083	1.0590	1.03076
1 kg long grain rice	1.0928	1.0000	0.9858	1.025142
The cheapest milk durable - 1l	1.1495	0.9835	0.9475	1.023183
Pork with bone	1.0170	1.0447	0.9977	1.019603
Pasteurized semi-skimmed milk	1.0201	1.0389	0.9972	1.018565
Pork ham without bone	0.9953	1.0579	1.0004	1.017475
Edam cheese (counter)	0.9901	1.0865	0.9749	1.015964
Potatoes	0.8109	1.1807	0.9958	0.984225
Butter	1.0154	0.9961	0.9403	0.983393
Apples	0.8627	1.0712	1.0208	0.98078
Wheat flour	1.0130	0.9898	0.9294	0.97675
Average growth rate of selected item	1.0296	1.0435	0.9902	1.020879

Source: Own processing, 2012

VIII: *Sensitivity of the selected items of the Czech food market to the change of national, European and world price index by one percent*

	EU	World	ČR
Fresh hen eggs	1.16864	1.217699	1.151324
1 kg sugar crystal	1.12162	1.168709	1.105005
Bread "Šumava" piece 1 200g	1.09434	1.140289	1.078134
1 kg flour	1.06892	1.113796	1.053085
1L the cheapest sunflower oil	1.02913	1.072341	1.013889
Back beef without bone	1.02493	1.067961	1.009748
Whole gutted chickens	1.02067	1.063518	1.005548
1 kg long grain rice	1.0151	1.057722	1.000067
The cheapest milk durable - 1l	1.01316	1.0557	0.998156
Pork with bone	1.00962	1.052006	0.994663
Pasteurized semi-skimmed milk	1.00859	1.050935	0.99365
Pork ham without bone	1.00751	1.049811	0.992587
Edam cheese (counter)	1.00602	1.048251	0.991113
Potatoes	0.97459	1.015504	0.96015
Butter	0.97376	1.014646	0.959339
Apples	0.97118	1.011949	0.956789
Wheat flour	0.96719	1.007791	0.952858

Source: Own processing, 2012

IX: *Elasticity of individual groups of agricultural and food products operated on global market to change in global food price index by 1%*

	Meat Price Index	Dairy Price Index	Cereals Price Index	Oil Price Index	Sugar Price Index
Period January 1990–May 2012	1.0127	0.9811	0.9978	1.0031	0.9946
Period July 2011–May 2012	0.9995	1.0005	1.0008	1.0030	1.0016

Source: Own processing, 2012

between the first and the second quarter of 2012. The results above from field surveys are more or less in line with the findings of the CSO. The results of the performed research indicates that the most dynamic item of the Czech retail sector in observed the period (within the studied products) was chicken eggs. The rise in price of this product was not affected by the VAT rate development neither by the development of global prices. The rise in prices was mainly influenced by the specific situation that appeared in the CR market in early 2012 due to ban of import of eggs from hens bred in cages and then also because all the actors involved in chicken eggs vertical decided to take advantage of the confusing situation in the market and increase their margins (despite the many protests that it this was not true) at the expense of final consumers. Dynamic growth in prices was also observed in the case of sugar, bakery products, oils and meat.

In relation to the development of the world and EU market prices, the Czech food market prices react sensitively to EU countries market prices; their sensitivity to global prices is limited as it is mentioned above. As for the studied products, the highest sensitivity in relation to changes in world market and identically on the EU and the CR market showed the following items: eggs (due to their specific position in the market in early 2012), sugar, bread, flour, chicken and beef. Tab. VIII provides an overview of the sensitivity of the selected food segment to the price index development on the global market and the markets in the EU and the CR.

With the exception of eggs, the results above point to the fact that selected food prices respond to the global market price changes much more sensitively than it was the average sensitivity of the aggregate global market to change of food prices index in the observed period (see comparison Tab. VIII and Tab. IX).

CONCLUSIONS

The results of the analysis shows that food prices on the world market as well as on the market of EU countries were growing very dynamically in recent years. Their growth was dynamised in the second half of the first decade of the 21th century in particular. The most significant increase in the global and European food prices occurred in the period immediately preceding the global economic crisis. In the subsequent period, the prices declined significantly, however, they did not fall to the original level of the late nineties and the beginning of the first decade of the 21th century (when the global food prices were on their long-term minimum). Subsequently, during the years

2010 and 2011, the European and global food prices has began to rise again, and the growth rate of the world prices significantly exceeded the growth dynamics of prices on the EU market. Food prices on the CR market reacted to this development by gradual growth. In terms of relation to the other markets, prices in the Czech market followed the EU market where the mutual degree of correlation achieved over 90% in the case of the food price index development. In relation to the world market, the degree of correlation is significantly lower - this can be explained by the influence of the common EU policy on its own market food price development. However, if we analyze the relationship between the development of prices in the EU market and the world market, there is a correlation rate around 80% which therefore implies that the global market development affects the CR market price development indirectly – through the development of prices in the EU countries market. Processed analysis also points to the fact that food prices in the CR market do not wholly copy EU countries market development despite the high degree of correlation – in some years, the price development shows autonomous tendencies – given by the specifics of the Czech market. More precisely the development is influenced by factors that are currently specific to the market in the CR (e.g. VAT rate change, law change, import conditions change, etc.). Regarding the sensitivity of the Czech food prices to changes in food prices on the world market and the EU market, the results of the analysis shows that the CR is much more sensitive to changes in prices on the EU market (a measure of elasticity in the period reached 0.38%, the revised value 0.57%) compared with changes in world market prices (0.44% – revised value 0.55%). The most sensitive response to the global market price change had mainly sugar, grain products, products of oil crops and then the meat products (especially beef and chicken). However, food price development in the CR market is not influenced only by prices in the EU market and in the world market, political influences are also important in this regard. For example, the growth of VAT rate in early 2012 led to a non-negligible increase in food prices. This increase was confirmed by the authors own research as well as by survey results published by the CNB. The results published by the CNB also point to the fact that the growth of VAT rate is not absorbed only by the producers and sellers but it is largely transferred to the final consumer prices – which was demonstrated not only by the development after the VAT rate increase in 2012 but by a similar situation in 2007 when the VAT rate increase from 5 to 9%. Regarding the price development in the CR market, the survey shows that retailers did not wait to raise prices until the very introduction of the growth of VAT rate but they began to gradually increase the prices in the period that preceded the actual one in which the VAT rate changed. Already during the fourth quarter of 2011, there had been an increase in prices of a selected food sample by about 3% on average (growers, processors and manufacturers justified this price increase by offsetting the increased cost of own production and activity – but it is clear that they were preparing for the growth of VAT rate to be able to visually recognize that immediately after the introduction of higher VAT rates they had made a positive step towards the customer by not immediately increasing the prices by the change of VAT rate). The situation in the first quarter of 2012 was following, at the beginning (January) the sellers kept prices at the level of December 2011 but already in the following months they have started raising prices again. In the first quarter of 2012, the food price of the observed sample increased by about 4.4% on average comparing with the last quarter of 2012 (according to CSO data, it was even more – etby about 5.9%). During the second quarter of the 2012, food price increase slowed down. During the last four observed quarters (July 2011–June 2012), the highest price growth rate dynamics in terms of the observed sample and performed research in the food retail chains in the CR market showed following items: eggs, sugar, bakery products, sunflower oil, beef and chicken. On the contrary, pork and dairy products showed a much lower rate of growth dynamics.

SUMMARY

Food market represents very dynamically developing global market segment. A very significant feature influencing the development of the food market is the development of food prices themselves. During the last decade (2000–2010), we have witnessed an unprecedented rise in food prices, especially from the world market viewpoint. Just during the years 2006–2012, the food price index (2005 = 100) more than doubled (the maximum was at the turn of 2010/2011 – 203 index points). Logically, rising food prices in the global marketplace influenced the development of prices on the EU market even though the price increase have not reached such significant values, especially because of the common EU policies – in the years 2006–2012, the food price index increased by 22 index points (from 100 to 122). The Czech Republic has been an EU member since 2004 – its food market is significantly influenced by the development of particular market of the EU countries. Thus food prices tend to converge to the long-term average prices in the EU market and follow EU price development except of some variations. The article aims to analyze the development of prices in the food market in the Czech Republic and to identify the influence of global and European prices development on domestic food price

development and price development of selected food products. The article focuses primarily on the sensitivity of Czech food price development and especially on sensitivity of the selected commodity aggregations price development on the global and European market price growth. Furthermore, it is analyzed the impact of changes in value added tax rate from 10% to 14% on food prices in general and then on the prices of selected food products in retails network (Albert, Billa, Interspar, Kaufland, Lidl, Penny Market, Tesco were the surveyed chains). The results of the analysis are following. The Czech food market reacts sensitively to changes in food prices on the global market as well as on the EU market but the EU price development is determining for the CR. In terms of price response to change in the VAT rate, it appears that the growth rate is not absorbed on the production side but it is largely transferred to consumer prices. The selected food sample also showed high responsiveness in the development of prices to changes in the EU market prices but there are certain variations given by specifics of the Czech market (for example the price of hens eggs - in recent months, it has been strongly influenced neither by the EU market prices nor the world market prices but it was affected by the legislative step of government when the government banned imports of eggs coming from caged birds into the Czech Republic).

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REFERENCES

BANERJEE AV, DUFLO E., 2008: *What is middle class about the middle classes around the world?* Journal of Economic Perspectives. Volume 22: 3–28. ISSN 0895-3309.

BIELIK, P., 2010: *Economics, Social Policy and Citizenship in the European Union*. SPU Nitra, Slovensko. ISBN 978-80-552-0448-2.

BRINKMAN, H. J., DE PEE, S., SANOGO, I., SUBRAN, L., BLOEM, M. V., 2010: *High Food Prices and the Global Financial Crisis Have Reduced Access to Nutritious Food and Worsened Nutritional Status and Health*. Journal of Nutrition, Volume 140, Issue 1. ISSN 1541-6100.

CECHURA L., SOBROVA L., 2008: *The price transmission in pork meat agri-food chain*. Agricultural Economics, Volume 54, Issue 2, pp. 77–84. ISSN 0139-570X.

CNB, 2012: *Promítnutí DPH do cen potravin v závěru roku 2011* (online). (cit. 21/06/2012), Dostupné: http://www.cnb.cz/cs/menova_politika/zpravy_o_inflaci/2012/2012_I/boxy_a_ prilohy/ zoi_2012_I_box_1.html.

CSU, 2012: *Ceny potravin po sedmi měsících klesly* (online). Cit. 20/06/2012. Dostupné: http://www.czso.cz/csu/csu.nsf/informace/cisc051012.doc.

FAO, FAOSTAT database 2012: dostupné: http://faostat.fao.org/, náhled: 08/08/2010.

FAO, 2009: *State of Food and Agriculture 2007 (The). Paying farmers for environmental services*. Roma. ISBN 978-92-5-205750-4.

FAO, 2010: *The State of Food and Agriculture*. FAO, Roma. ISBN 978-92-5-105980-4.

FIREBAUGH, G., 2006: *The new geography of global income inequality.* Cambridge, MA: Harvard university press. ISBN 9780674019874.

GODFRAY, H. C. J., BEDDINGTON, J. R., CRUTE, I. R., HADDAD, L., LAWRENCE, D., MUIR, J. F., PRETTY, J., ROBINSON, S., THOMAS, S. M., TOULMIN, C., 2010: *Food Security: The Challenge of Feeding 9 Billion People.* Science, 12, February 2010: Volume 327, Issue 5967 pp. 812–818. ISSN 1095-9203.

HORSKÁ, E., 2010: *European studies on intercultural dimension of international business: marketing and managerial consequences*. SPU Nitra. ISBN: 978-80-5520530-4.

HUŠEK, R., 2007: *Ekonometrická analýza*. Oeconomica, Praha. ISBN 978-80-245-1300-3.

NEWBERY, D. M., 1989: *The Theory* of *Food Price Stabilization*. Economic Journal, Volume *99*, Issue 398, December 1989, pp. 1065–1082. ISSN 1468-0297.

OSTASZEWSKI, A., 1993: *Mathematics in Economics.* Blackwell Publishers. ISBN 0-631-18055-9 0-631-18056-7.

PINGALI. P., RANEY, T., WIEBE, K., 2008: *Biofuels and Food Security: Missing the Point*. Applied Economic Perspectives and Policy, 30, (3): 506–516. ISSN 2040-5790.

POULTON, C., KYDD, J., WIGGINS, S., DORWARD, A., 2006: *State intervention for food price stabilisation in Africa: Can it work?* Food Policy. Volume 31, Issue 4, August 2006, pp. 342–356. ISSN 0306-9192.

RUEL, M.T., GARRETT, J. L., HAWKES, C., COHEN, M. J., 2010: *The food, fuel, and financial crises affect the urban and rural poor disproportionately: a review of the evidence*. Journal of Nutrition, Volume 140, Issue 1. ISSN 1541-6100.

SMITH, L. D., 1997: *Price stabilization, liberalization and food security: conflicts and resolutions?* Food Policy. Volume 22, Issue 5, October 1997, pp. 379–392. ISSN 0306-9192.

SVATOŠ, M., 2008: *Selected trends forming European agriculture*. Agric.Econ.-Czech, 54. ISSN 0139-570X.

SVATOŠ, M., SMUTKA, L., 2011: *The Process of Price Convergence in Selected EU Countries*. Acta Universitatis Bohemiae Meridionales, The

Scientific Journal for Economics, Management and Trade, Volume 16 (2). ISSN 1212-3285.

TIMMER, C. P., 1989: *Foodpricepolicy: The rationale for government intervention*. Food Policy. Volume 14, Issue 1, February 1989, pp. 17–27. ISSN 0306-9192.

TIMMER, P. C., 2008: *Causes of High Food Prices*. Asian Development Bank. October 2008. ISSN 1655-5252.

TVRDOŇ., J., PETEROVÁ, J., HÁLOVÁ, P., 2001: *Cvičení z ekonometrie*. PEF ČZU v Praze ve vydavatelství CREDIT Praha. ISBN 80-213-0741-2.

VALDER, A. et al., 2011: *Vnitřní a vnější faktory formující český trh s potravinami*. Powerprint. ISBN 978-80-87415-27-6.

VOLOŠIN, J., SMUTKA, L., 2011: *Analysis of external and internal influences on CR agrarian foreign trade*. Agric. Econ. – Czech, Volume 57, Issue 9, pp. 422–435. ISSN 0139-570X.

WB, 2012: *WDI database* (on-line). Dostupné: http://data.worldbank.org/data-catalog/world-development-indicators.

WEBB, P., 2010: *Medium – to Long-Run Implications of High Food Prices for Global Nutrition*. Journal of Nutrition, Volume 140, Issue 1. ISSN 1541-6100.

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