Price Setting Behaviour in the Czech Republic, Micro Data Evidence

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Abstract

The aim of this analysis was to obtain information on the strategies of retailers of consumer goods and services in terms of changes to final prices. From detailed data on many price changes in all the monitored stores we have evaluated, for example, how often the prices of specific items change or rise or fall, and by how much on average, how these indicators change during the year, whether downwards price rigidity exists and so on.

The average price change frequency for all the selected items came to 0.26, which means that approximately one in every four prices was changed compared to the month before. A typical characteristic of the prices of regulated items was that these prices mainly rose and this usually by steps of higher percentages and mostly at the start of the year. Food prices had a higher frequency of price changes, mainly in the case of unprocessed foods, which is a consequence of the volatile development of the prices of agricultural commodities. The prices of tradables excluding food and fuels continuously fell for the whole of the monitored period and only had a low price change frequency. The prices of non-regulated non-tradables continuously and smoothly rose and, with the exception of hypothetical rent and package holidays, this subgroup demonstrated the lowest frequency of price changes. The prices of fuels changed most frequently while on average these price changes were the lowest in size, as they react relatively quickly to changes in the prices of raw materials and the koruna exchange rate.

Keywords

Price setting, micro data, price frequency, rigidity, price changes, individual consumer price

JEL code

D40, M31

INTRODUCTION

The aim of this analysis was to obtain information on the strategies of retailers of consumer goods and services in terms of changes to final prices. Our approach was based on similar analysis, calculated on the data of Spain (Álvarez, 2004) and Portugal (Dhyne, 2005). For this purpose we performed a detailed analysis of an extensive database describing price movements for individual items in individual stores. For this purpose, the Czech Statistical Office provided us with the necessary data on all the prices found for the selected items in all the stores where it had obtained such data.

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In view of the significant quantities of data and calculations we selected only part of all the items in the consumer basket. However, we did this in such a way as to ensure that this selection best represented the whole consumer basket and its subgroups. We selected such a quantity of items in the consumer basket that represented 60 % of the constant weight of the whole consumer basket as well as all evaluated consumer basket subgroups.

We first quantified and evaluated the necessary statistics for all the selected items on an individual basis and then we merged these results using their weight in the consumer basket into various groups and evaluated the results for those groups. However, to keep this text to a manageable size, we will mainly present only the results for the whole consumer basket and its main subgroups (as understood by the Czech National Bank).

We used data from the period from January 2001 to December 2005 in the form of prices in koruna for the relevant weight or volume unit. During this time period there were no changes to the consumer basket. There were usually around 190 time series for each item. To put it more simply, each of these time series represented the development of the price of a specific item in a specific store. It was first necessary to numerically clean the data of various "defects" (for example to ensure that a change in price is not considered to be a change if there was also a change to the store at the same time).

The detailed data on price investigations obtained from the Czech Statistical Office enabled us to calculate and analyse the following factors for individual items in the consumer basket:

- *The frequency of price changes,*[2] the frequency of price reductions, the frequency of price rises,
- A comparison between the frequency of price rises and reductions (the existence of downward price rigidity),
- The seasonality of price changes (the frequency of price changes at retailers in a specific month),
- The numbers of variously sized price steps,
- *The average sizes of price changes (as %),* the average price fall, the average price rise,
- A comparison of the sums of rises and falls (the existence of downwards price rigidity),
- The seasonality of the sizes of price changes,
- *The average length of periods without price changes* (directly established[3] and implicitly derived from frequencies[4]),
- The average length of periods without changes after a price fall,
- The average length of periods without changes after a price rise.

1 SELECTIONS OF CONSUMER BASKET ITEMS AND THEIR SPLIT INTO SUBGROUPS

In view of the difficulty and scope of the calculations, we decided to restrict the quantity of consumer basket items used. There are around 800 items in the consumer basket and generating all the data for all

[2] The frequency of price changes is defined as the number of prices that were changed compared to the total number of prices discovered. For example, for Edam block cheese there were 9 331 valid data items and price changes were recorded in 3 003 cases, giving a frequency of 3003 / 9331 = 0.32. This means that frequency can be represented by a value between 0 and 1.

[3] By direct calculation we mean, for the item in question, finding all periods in all stores in which no change in price occurred, and then calculating their average lengths in months (performed using our own programme).

[4] An implicit calculation is performed using the formula (1) *Average length of period without a change in price* = 1 / *frequency of changes* or the formula (2) *Average length of period without a change in price* = –1 / ln (1 – *frequency of changes*). The difference in the results from these two formulas is small. We will present the results using formula (2), the results of which are closer to the directly calculated data. These formulas are based on the assumption that the more frequent the price changes are, the shorter the average length of the period without price changes.

the consumer basket items would be extremely demanding in terms of both capacity and time. It was therefore necessary to select only part of the items from the consumer basket but do this in such a way as to ensure that this selection best represented the whole consumer basket and its subgroups.

We decided on the following procedure for the selection of the items. We started with a basic 12 groups in the consumer basket (the main division according to the Classification of Individual Consumption by Purpose — COICOP):

- Food and non-alcoholic beverages,
- Alcoholic beverages and tobacco,
- Clothing and footwear,
- Housing, water, electricity, gas and other fuels,
- Furnishings, household equipment and routine maintenance of the house,
- Health,
- Transport,
- Post and telecommunications,
- Recreation and culture,
- Education,
- Restaurants and accommodation,
- Other goods and services.

We combined this division with the basic division of the consumer basket used by the Czech National Bank (CNB calculates inflation development of other subgroups of consumer prices for analytical reasons — due to various factors which influenced them. See footnotes 7 and 9):

- Regulated prices (administered prices),
- Food prices,
- Other non-tradables (i.e. unregulated),
- Other tradables without fuels (i.e. without food prices),
- Fuel prices.

We further divided each of the 12 basic groups (when appropriate) according to the division used by the CNB. In this way we divided the consumer basket into around 30 subgroups.

From each of these subgroups we selected enough items so that their constant weights made up 60 % of the constant weight of the group in question (we considered 60 % to be sufficient in order to obtain information about the development of the whole subgroup). In the great majority of cases we selected from the subgroups items with the largest constant weights. Exceptions to this were, for example, the prices of food, where we also used some items with lower weights for the reason that they were typical representatives of some type of food. We made other exceptions in cases where the selected items with the highest weights were, in terms of their types, too uniform. For example, in the regulated housing prices group, the selection would include practically only several electricity and gas price items, and so we selected less of them, meaning that items of a different type also made it into the selection. In addition, we can assume that all the electricity charges and also all the gas charges would change together at the same time, and so restricting the selection in this way is also pragmatic in view of the aim of our analysis.

This approach led to the selection of 257 items, for which we performed all the calculations. We thus covered 60 % of the constant weight of the whole consumer basket as well as a sufficient quantity of subgroups necessary to calculate the results for all the regularly used items in the consumer basket.

To keep the text a manageable size, in later chapters we will comment in greater detail only on the aggregated results for several subgroups of the consumer basket.[5] These subgroups were determined in view of the subgroups used during the analysis of the structure of inflation by the CNB. In addition, the prices of foods were split into processed and unprocessed and a subgroup was created — other non-tradables without holidays and hypothetical rent price items (the given excluded items had significantly different results than the whole group of non-tradables).

Specifically, in this text we will evaluate the results in the following subgroups of the consumer basket:

- Processed foods[6] (including alcoholic beverages and cigarettes),
- Unprocessed foods,
- Regulated prices (according to the CNB definition),
- Fuels,
- Other non-tradables,[7]
- Other non-tradables without the holidays and hypothetical rent price items,[8]
- Other tradables without fuels,[9]

and for the whole consumer basket (all the selected items together).

We aggregated the results of the individual items into subgroups using a weighted arithmetic average (using the weights in the consumer basket) as well as using a simple arithmetic average. By comparing the results of the calculated weighted and simple arithmetic averages we obtained another evaluation — whether the pricing strategy for items with higher and lower weights significantly differed. The items with the highest weight are actually the most frequently purchased items (for example for foods these are beer, cigarettes and bread). *In this text we will usually comment on the results obtained by using the weighted arithmetic average.* We will mention the results obtained by using a simple arithmetic average only if they are of interest.

2 RESULTS FOR THE WHOLE CONSUMER BASKET (ALL THE SELECTED ITEMS)

The frequency of price changes for the whole consumer basket calculated using a weighted arithmetic average from the frequency of all the selected items came to 0.26. This practically means that one in every approximately four prices was changed compared to the previous month. This gives a *frequency of price increases as* 0.16 and a *frequency of price reductions as* 0.10. The higher frequency of price increases cor-

5 In the event of interest in detailed results calculated for the individual items of the consumer basket or any of its subgroups not listed here, it is possible to contact the author and request the results. The unabridged original text (in Czech language) is also available and gives a more detailed description of the procedures, methodology and many more results. However, results cannot be provided in cases when this would mean a breach of the fundamentals of the Czech Statistical Office relating to not providing individual company data (i.e. data and results through which something could be deduced about a specific company).

6 The division into processed and unprocessed foods arises from the methodology used by the Czech Statistical Office (respectively Eurostat) for calculating the HICP (the Harmonised Index of Consumer Prices).

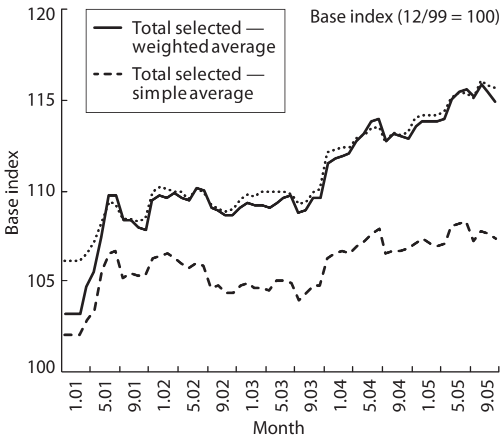
7 Non-tradables are items for which there is mainly no possible foreign competition (these are mainly service items). Other non-tradables = non-tradables without regulated prices.

8 Holidays and hypothetical rent prices showed significantly different results from the majority of other non-tradables and in view of their high weight distorted the results of the whole subgroup, and therefore we excluded them here.

9 Tradables include items for which there can be foreign price competition (these are mainly consumer goods items). Other tradables = tradables without food price items.

responds to the fact that consumer prices were exhibiting a rising trend in the monitored period (see Figure 1).

Figure 1 The price development of the selected items

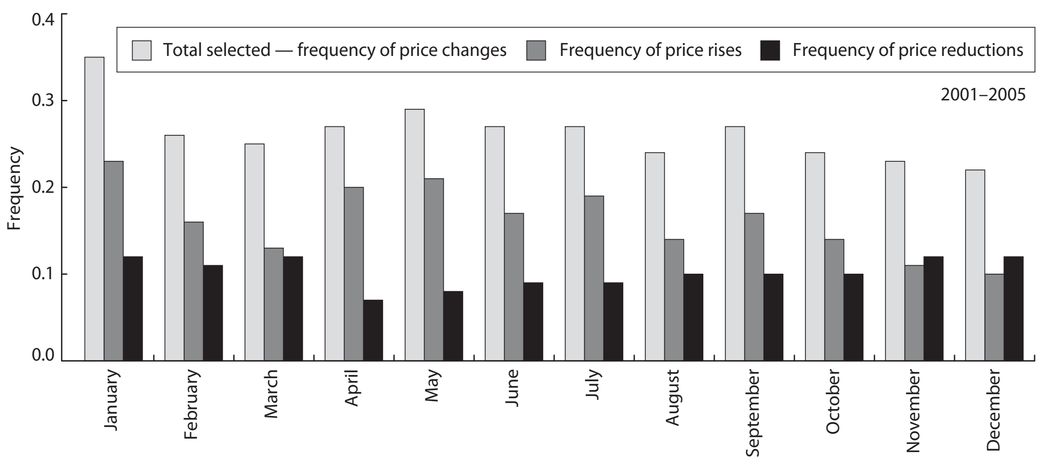


Source: Own construction, Czech Statistical Office

NOTE: *In this analysis the results obtained are in direct connection with inflation for the item in question. From the Figure 1 above we see that in the monitored period total inflation exhibits a rising trend. The significant accord between official inflation and inflation for the selected items (weighted arithmetic average) shows that the selected items are a good approximation for the whole consumer basket. The fact that the simple arithmetic average for inflation for the selected items is positioned lower shows that the prices of the items with a higher weight in the consumer basket rose in sum over the whole period more than the prices of items with a lower weight (mainly through the influence of regulated prices, the prices which usually rise at an above-average rate and have a high weight in the consumer basket).*

We also calculated the frequency for individual months and this gave us an idea of the *seasonality of the frequency of price changes.* Most price rises were in January and in May (see Figure 2), and the least in November and December. The largest number of price reductions was in January, March, November and December. In general, the seasonality of the frequency of reductions in price is less significant than the seasonality of the frequency of price rises. The highest number of price rises in January corresponds to the seasonality of consumer prices, which exhibit the highest seasonal rises precisely in January. In general, however, the seasonality of the frequency and inflation cannot be compared, as they also depend on the size of the price changes.

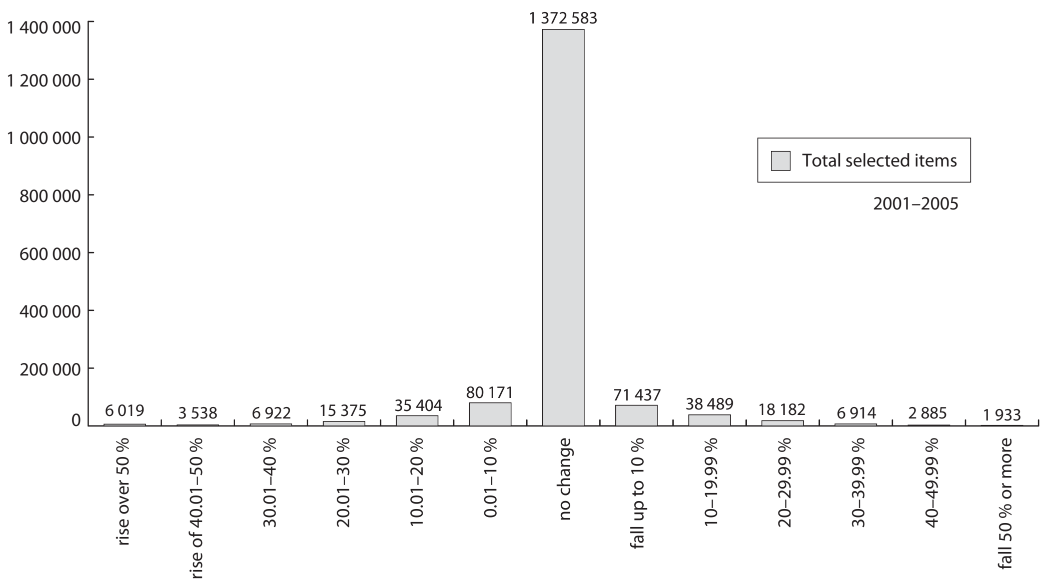
Figure 2 Frequency of price changes in individual months (weighted arithmetic average)



Source: Own construction

We also analysed the *numbers of price changes differentiated according to their sizes.* The Figure 3 shows the differentiation of price changes according to the size of the change, initially with a wider range including the number of zero changes (see Figure 3). We san see that the majority of changes are up to 20 % in size, however the numbers of larger price changes are not insignificant either. A similar differentiation of numbers of changes larger than 20 %, i.e. a similar tempo of fall in the number in terms of larger changes, was displayed by all the described subgroups of the consumer basket except for fuel price items, where there was only one price change of over 20 %.

Figure 3 Numbers of changes in price according to size



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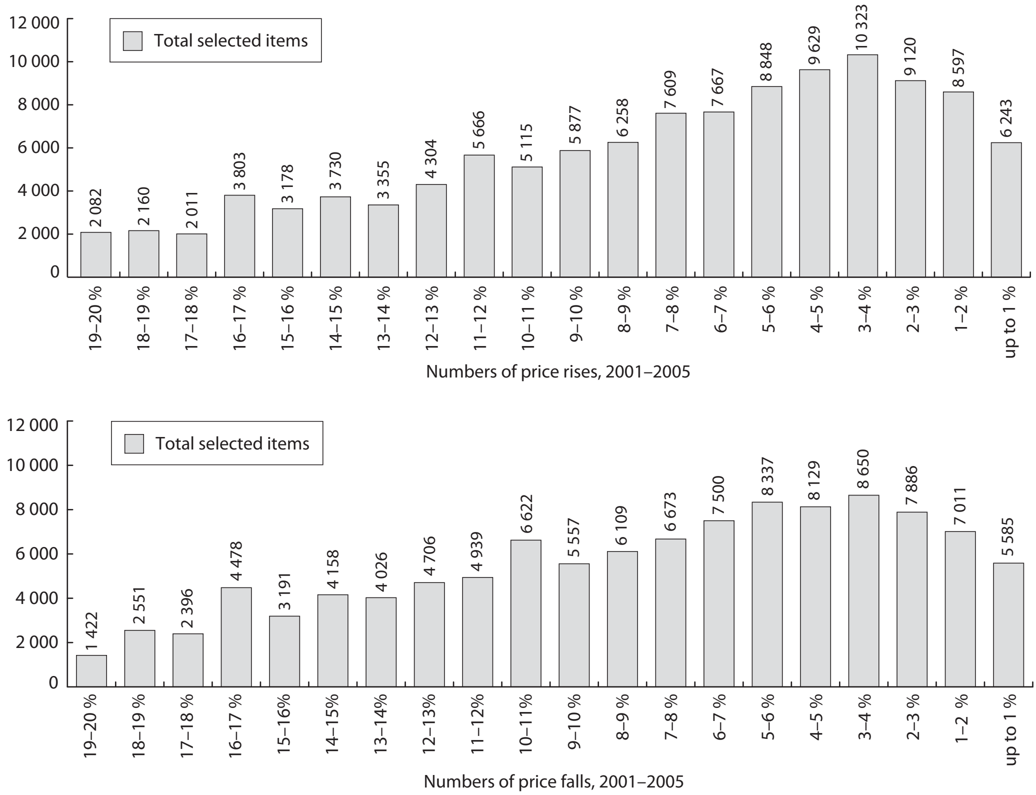
We also split price changes of up to 20 % more finely. The first graph below (see Figure 4) gives the numbers of price rises and the second graph the numbers of price falls. As you can see, the division of the numbers of price changes according to size is similar for price rises and price falls. The majority of the changes are between 3 % and 4 %. Thereafter, the numbers of changes fall smoothly on both sides with the exception of slight deviations around 11 % and 16 %.

We intuitively expected higher numbers of changes with "round" percentage sizes (5 %, 10 % and 15 %) and for many items this was confirmed. It was also frequently the case that the highest number of changes was not by these round percentages, but by one per cent more, and so there were higher numbers of changes for example by 11 % and 16 %, and this was the case for all the selected items in total. The reason for this phenomenon could be the rounding of prices. In this case it would mean that retailers more commonly round in the direction of the price change — meaning that they round up when increasing a price and round down when decreasing a price.

NOTE: *The results on the numbers of variously sized changes for the whole basket were less showing than similar results for individual items from which it was possible to discover different pricing strategies. For example, raising prices in small steps, dropping prices in large steps of round percentages and so on. For the sake of clarity we will present one example — the division of price changes according to size for Edam cheese*

Figure 4 Numbers of price rises and falls between 0 % and 20 %



Source: Own construction

blocks (total number of observations 9 331, number of price changes 3 003, frequency 0.32, frequency of price increases 0.18, frequency of price reductions 0.14), see Figure 5.

A more detailed division shows that for Edam cheese blocks the most frequent price rises and falls are by around 5 % and 10 %. In terms of larger changes, those around 15 % are the most popular. This unequivocally shows a certain rationality in the behaviour of the retailers. On the one hand this will is connected with minimising the costs for price changes and most likely also with the expectations of the retailers regarding the psychological effect on customers (customers do not like price rises but the size of the change is not so important – this means that it is better to change the prices less often but by larger amounts). These graphs (Figure 5) also enable us to understand the differences between strategies when increasing and decreasing prices (specifically here there is no significant difference).

The overall *average price rise* (for the whole consumer basket) was *10.7 %,* and fall *–9.1 %*. The rise in consumer prices in the monitored period was thus implemented through a higher frequency of price rises as well as a higher average size of price rise than price fall. A comparison with the results obtained using the simple arithmetic average shows that on average *the prices of items with lower weight change less frequently, but in larger steps.*

We also calculated the average sizes of price changes for individual months and thus obtained the *seasonality of average sizes of price changes* (see Figure 6). The average size of price rises smoothly increased

Figure 5 Numbers of price rises and falls between 0 % and 20 % for Edam cheese blocks

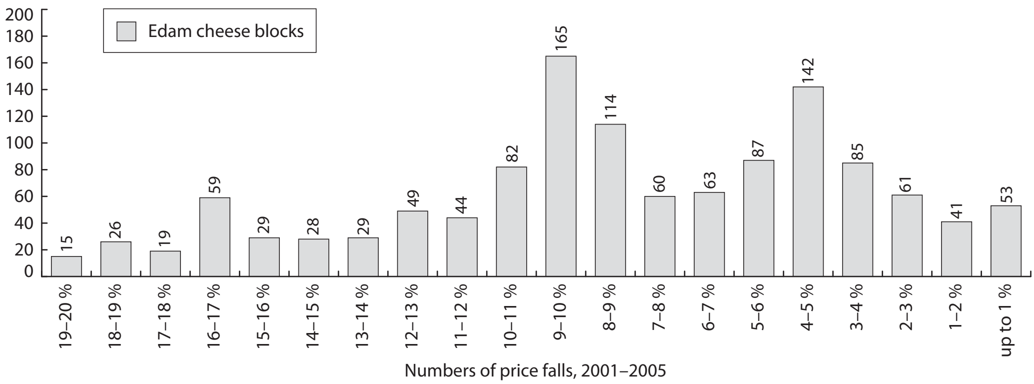


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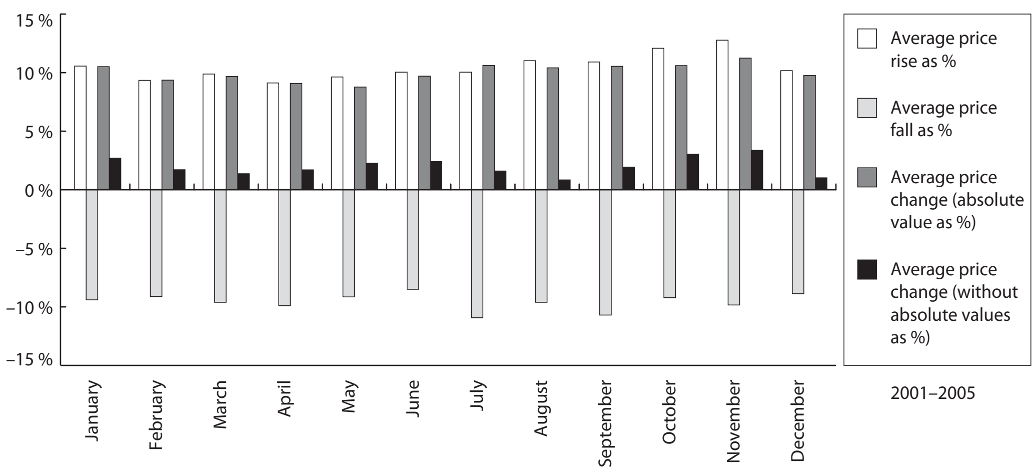
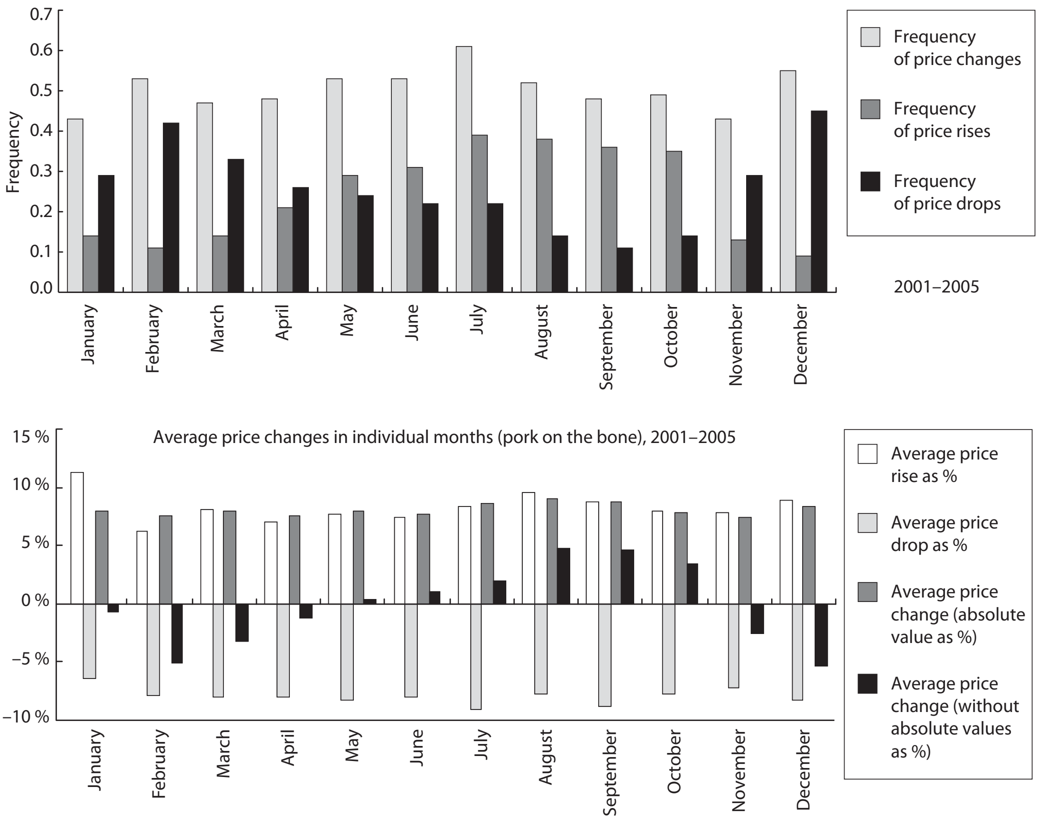
Figure 6 Average price changes in individual months (weighted arithmetic average)



Source: Own construction

Figure 7 Frequency of price changes and average price changes for item: pork on the bone



Source: Own construction

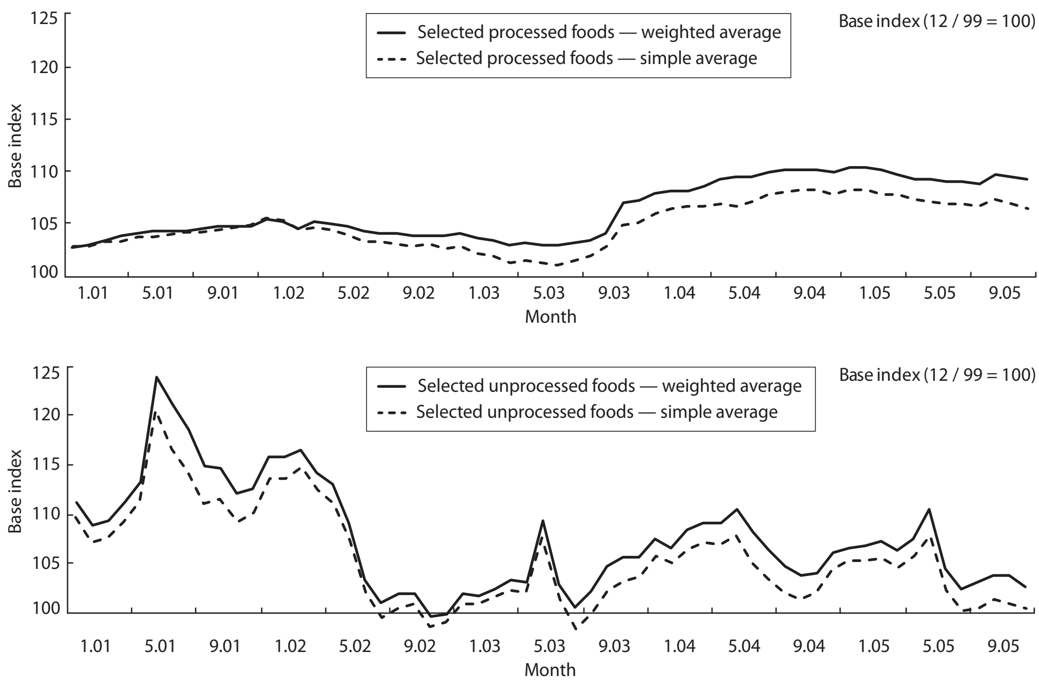
between June and November. Higher values are also achieved in January. The average size of price falls is more stable during the year — there are higher values in July and September (in July there is the perceptible influence of the higher seasonal drop in the prices of food and in September the influence of seasonal drops in the price of holidays and related items; these seasonal influences also significantly influence the seasonality of overall inflation).

NOTE: *The results of the average sizes of price changes illustrated different pricing strategies for various items: for example either the average size of price changes was stable during the year (the change in consumer price was achieved through a higher or lower frequency of price changes) or on the contrary the average size of price changes during the year significantly changed and the frequency of price changes was stable (changes in consumer prices were achieved mainly through variously sized price changes with a stable number of price changes). As an example we can present the results for the item: pork on the bone (total number of observations 9 239, number of price changes 4 667, frequency 0.51, frequency of price increases 0.25 and frequency of price reductions 0.26). The Figure 7 shows the seasonality of frequency and the seasonality of average sizes of price changes.*
These graphs show the relatively significant seasonality of the frequency of price changes together with a relatively stable average size of price changes during the year (with the exception of January and February).

Seasonal price drops are most in evidence from November to April, while price rises preponderate from May to October. There are no strong reasons for this seasonality at a pork meat plant and neither was the cause of this seasonality any fundamental phenomenon (developments in global prices etc.) This means that the causes will be pricing strategies, also very probably taking into account the influence of the spread of demand during the year. Further, it is possible to read from the results that with the exception of January and February retailers on average change prices by relatively stable large steps and change the frequency of these steps according to need. In January and February they have a different strategy. In January compared to other months the average size of price increases is significantly higher, yet their frequency is lower. In February the frequency of price increases rises but the price increases themselves are below average in size. The anomaly in January could be connected to repricing at the start of the year — setting prices at new levels (not complying with the usual size of steps).

The last group of parameters that we calculated were *average lengths of periods without price changes* (a change after one month = length 1). For *the whole consumer basket* (all the selected items) the directly calculated *average length of periods without price changes came to 5.7 months, 5.96 months after a price rise and 5.12 months after a price fall.* However, only 39.1 % of all the input data could be used for the calculation, and therefore these results are significantly distorted downwards (we provide a more detailed explanation in chapter 3.3). The actual situation will be closer to the implicitly calculated data. *The implicitly calculated length of periods without price changes for all the selected items came to 10.72 months.* We calculated the lengths of periods without price changes for all the selected items (as well as for other groups of items) as the weighted arithmetic average of the lengths of periods without price changes for individual items, and therefore these results differ from the result that we would obtain through an implicit calculation from the overall frequency.

Figure 8 The development of the prices of processed and unprocessed food differs significantly



Source: Own construction

3 RESULTS FOR SELECTED SUBGROUPS OF THE CONSUMER BASKET

3.1 Price development for selected subgroups

As we indicated in the introduction, in order to keep the size of this text manageable we will only describe in detail the results for the subgroups of the consumer basket used during the analysis of the structure of inflation by the CNB. In addition, food prices have been divided into processed and unprocessed and a subgroup — other non-tradables without the price of holidays and hypothetical rent items — was created (the list of subgroups, more information on their selection and their definitions are given in chapter 1).

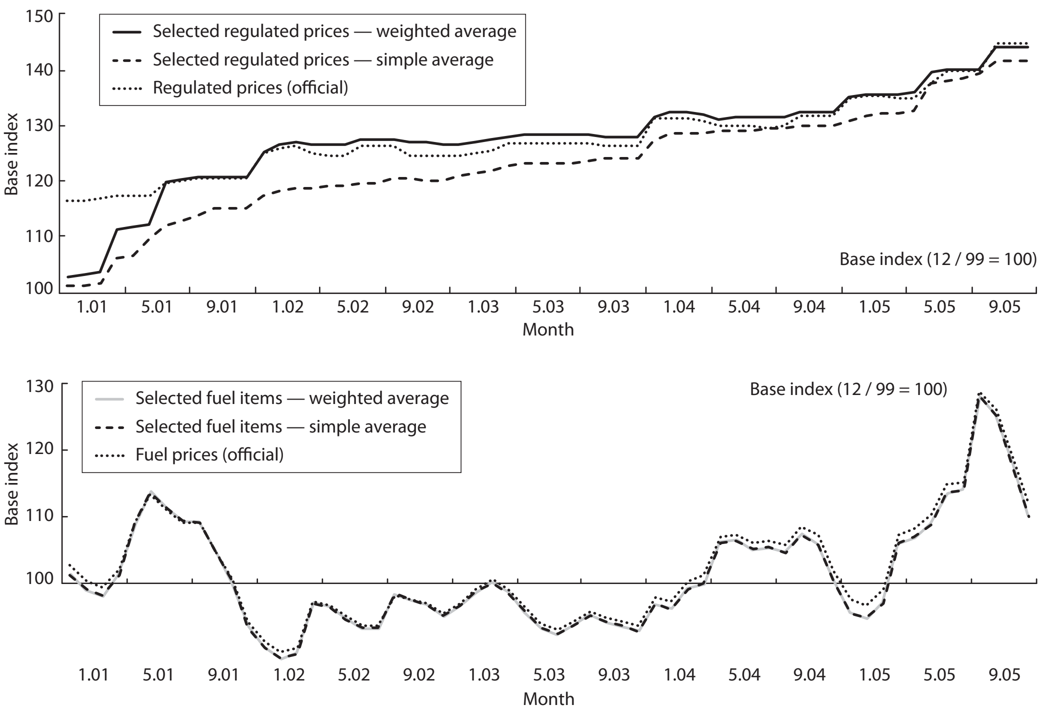
First we will acquaint ourselves with the development of the consumer prices of selected subgroups of items (see Figure 8–11). If this is normally published data, the graphs also give official figures. The closeness between the series of these official figures and the weighted arithmetic average for the selected items shows that the selected items represent the whole group sufficiently well.

For regulated prices the weighted arithmetic average of the base indexes of the selected items differs from the official figures only in 2001, when a change in the basket meant that detailed data for electricity and water prices, which were subject to high rises in that period, were missing from the database of selected items. For fuel prices the figures differ only minimally (see Figure 9).

After excluding holidays and hypothetical rent prices from the development of the prices of other non-tradables (i.e. unregulated), both the seasonality also the difference between the weighted and simple arithmetic average disappear (see Figure 10).

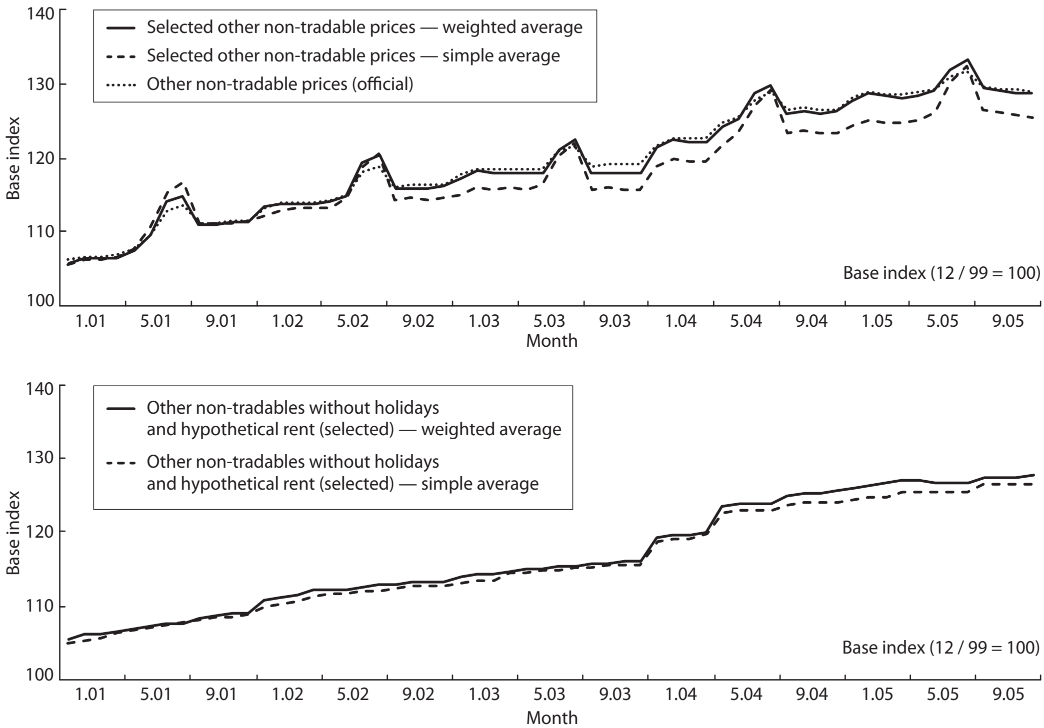
For the prices of other tradables without fuels (i.e. without food prices), on average the prices of items with higher weight fell faster (mobile telephones, personal computers, video recorders, women's footwear and so on) and therefore the prices of the selected items are lower than the prices for the whole group (see Figure 11).

Figure 9 The development of regulated and fuel prices



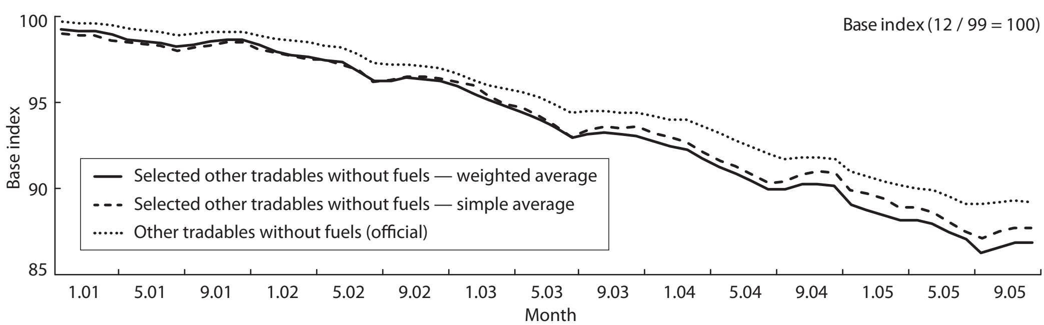
Source: Own construction, Czech National Bank

Figure 10 The development of other non-tradables prices



Source: Own construction, Czech National Bank

Figure 11 The development of other tradables prices without fuels



Source: Own construction, Czech National Bank

From these graphs of the price development, it is also very clear, how the development of prices among individual subgroups differs as it is one of the reasons why the consumer basket has been divided precisely in this way for the purposes of the analysis. Regulated prices and the prices of other non-tradables continuously rose in the monitored period. Non-tradables (mainly services) are generally dependent in particular on the development of domestic cost pressures and the level of domestic demand. The basis for their continuous rise is mainly the gradual rise in domestic salaries. On the

Table 1 Frequency of price changes and average price changes

January 2001 to December 2005	Unprocessed food	Processed food	Regulated prices	Fuels	Other non-tradables	Other non-tradables without holidays and hypothetical rent	Other tradables without fuels	Whole consumer basket
Frequency of price changes	0.42	0.19	0.10	0.85	0.39	0.06	0.12	0.26
Frequency of price rises	0.22	0.11	0.07	0.32	0.31	0.05	0.05	0.16
Frequency of price falls	0.21	0.09	0.03	0.53	0.09	0.02	0.07	0.10
Average price change as %	1.60	2.28	5.97	–0.21	5.02	8.25	–2.04	2.57
Average price change in absolute value as %	14.23	9.95	7.83	4.34	9.55	13.21	12.69	10.18
Average price rise as %	15.44	10.65	9.00	5.50	9.90	13.89	12.55	10.74
Average price fall as %	–13.03	–8.77	–3.99	–3.64	–9.08	–12.27	–12.73	–9.11

Source: Own costruction

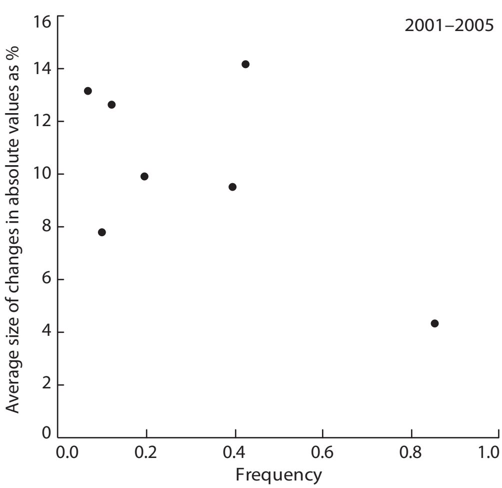
other hand, for the development of the prices of other tradables, the main roles are played by the high level of competition, the wide range of imported consumer goods and the long-term strengthening of the koruna exchange rate. Thus in the monitored period these prices continuously fall even under the conditions of rising domestic costs.

3.2 Frequency and average size of price changes

The comparison table (see Table 1) shows that of the monitored subgroups of the consumer basket, the prices of fuels clearly change most frequently, which was the expected result (the prices of fuels react relatively quickly to changes in the global prices of oil and developments in the koruna exchange rate). Unprocessed food is some way back in second place, where frequent price changes are caused in particular by the volatile prices of fruit and vegetables. Then follow the prices of other non-tradables, for which, however, the higher frequency of price changes was caused mainly by hypothetical rent and holidays prices. Both have a high weight in the consumer basket and their prices change very frequently. The frequency of price changes of other non-tradables without hypothetical rent and holidays is, on the contrary, the lowest of all the monitored subgroups in the consumer basket, even lower than for regulated prices. Other tradables without fuels also have a low frequency of price changes.

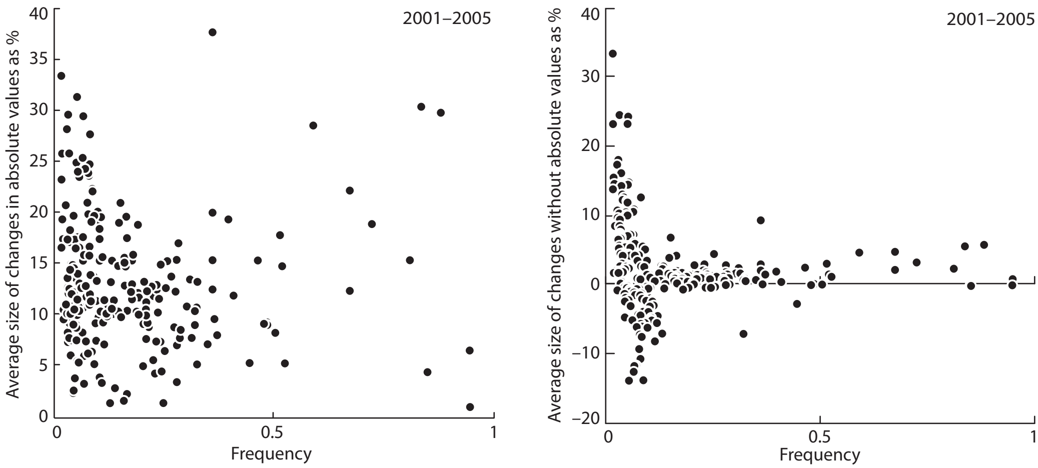
Unprocessed food has the highest average sizes of price changes and this is once again caused by the prices of fruit and vegetables, for which high rises and falls in price of tens of percentage points are normal. If we disregard non-market regulated prices and the very volatile prices of unprocessed

Figure 12 Relation between frequency and average size of changes



Source: Own costruction

Figure 13 Relation between frequency and average size of changes



Source: Own costruction

food, it is possible to see a certain regularity in the case of the average sizes of changes for the evaluated subgroups of the consumer basket: *the lower the frequency for a subgroup of price changes the larger the average size of the price change.* This relationship is shown in the Figure 12.

With the exception of the unprocessed food point (at the top in the middle) and the regulated prices point (bottom left) the points almost lie on a straight line.

Fuel prices have the highest frequency and the lowest average size of price changes. These are followed by other non-tradables with the second-highest frequency and the second-smallest average length of price changes. Then we have processed food, followed by other tradables without fuels. Other non-tradables without holidays and hypothetical rent have the lowest frequency and highest average size of price changes.

In the case of individual items, however, the situation is different. We cannot expect any uniform pricing strategies across all the items. The Figure 13 (on the left) shows the relationship between frequency and the average size of price changes in absolute values. The one on the right gives the average size of price changes without absolute values.

The image in the graph on the right shows the picture where the points form an image of a capital "T" lying on its side. This means that for many items, irrespective of the frequency of the changes, the average size of price changes (without absolute values) hovers around zero, respectively slightly above zero. Also here, however, we have a group of items with a very low frequency of price changes, but with a significantly positive or negative average change in price (their prices change infrequently, but by large steps mainly in a single direction). The points that deviate most significantly in the upwards direction are mainly regulated price items: television fees, nursery school fees, higher education fees, drawing up wills, but here there are also some unregulated prices in the area of services. The points that deviate most significantly in the downward direction are for clothing and footwear items followed by electronics.

The average sizes of price changes calculated for the whole consumer basket using the simple arithmetic average were 13.4 %, respectively –11.8 %, which together with the information that the simple arithmetic averages of the frequency of price rises and falls were 0.09, respectively 0.08, implicates that on average the prices of items with lower weight change less frequently, but by larger steps (in comparison with the results obtained using a weighted arithmetic average).

3.3 Lengths of periods without price changes

The calculation of the average length of periods without price changes has shown itself to be the most problematic. Due to many defects in the data that hinder the coherency of the investigation of the prices of a specific item at a specific place (for example a change of store, change of the specific type of item) a large percentage of input data was excluded from the direct calculation (see footnote 3). Deducting the length of a period without a change was logically correct only in the case when no such defect arose between two price movements. This interruption in time series was relatively frequent and thus a lot of input data had to be excluded from the calculations (see the indicated percentage of data used in Table 2). If this was not done, only a "false" price change would arise in the time series (for example when making the deduction in a different store, the price there could be different to that in the original store, while in both stores no price change might actually have taken place).

This therefore meant that only data sections when there was no defect between two price changes could be used (so data from the start and the end of the time series was not used). The lower the frequency of changes an item had, the larger the quantity of unusable data — sections without price changes were long and thus it was more probable that some form of defect would occur in the data during this longer period, and this was frequently confirmed in practice.

This means that the lengths of periods without price changes directly calculated from the data are very probably shorter than in reality, as the longer sections were more likely to be excluded (because of defects in data). On the other hand, the implicitly calculated lengths of periods without changes (see footnote 4) could be somewhat longer than in reality. For example, in a situation in which two sections in the data without price changes are separated by a section for which there is no available data, the calculation will

Table 2 Lengths of periods without price changes

January 2001 to December 2005, in months	Unprocessed food	Processed food	Regulated prices	Fuels	Other non-tradables	Other non-tradables without holidays and hypothetical rent	Other tradables without fuels	Whole consumer basket
Implicit average length of period without a price change	2.51	7.03	16.65	0.52	12.19	21.50	12.21	10.72
Average length of a period without a price change discovered from data								
– total*)	2.36	5.71	9.12	1.18	6.47	10.76	4.19	5.70
– after a rise	2.55	6.03	9.61	1.09	6.51	11.05	4.56	5.96
– after a fall	2.16	5.78	7.07	1.22	6.12	9.98	3.80	5.12
*) *useable quantity of data for its calculation, as %*	*70.70*	*57.70*	*40.10*	*91.40*	*39.40*	*30.50*	*23.00*	*39.10*

Source: Own construction

actually see this as a single longer section without a price change (as no price change occurred during it, and so the calculated frequency does not increase and therefore the implicitly calculated length of the period without price changes is not reduced). While a price change could have taken place in the period for which data is missing.

The results for the lengths of periods without price changes (Table 2) show that for many items the individual prices change relatively infrequently. With the exception of fuel prices and unprocessed food prices, individual prices change on average only after around five months and, for example, for the prices of other non-tradables without holidays and hypothetical rent prices, the estimated change is less than once a year on average.

From the table it can be seen that the larger the percentage of data used, the more the directly calculated length of the period obtained from that data without price changes corresponded to the implicitly calculated length of the period without price changes. The implicitly calculated length of a period without price changes is therefore very probably closer to the real situation.

NOTE: *Please also note the result that the length of a period without price changes after a price increase directly calculated from the data is longer than that after a price decrease. This applied for all the described subgroups of the consumer basket with the exception of fuel prices. This could be because some price reductions are temporary special offers for a limited period, i.e. that the price will return to its original level soon after the special offer. However, it could also indicate some type of downwards price rigidity — reducing prices is less pleasant for the retailer, and therefore there is another price correction sooner than after a price increase.*

3.4 Some other results for subgroups or individual items

From the *processed food* subgroup (including alcoholic beverages and cigarettes) the following products had the highest frequency of changes: eggs at 0.41, butter at 0.37 and granulated sugar at 0.33. The products with the lowest frequency were cigarettes at 0.05 to 0.06, white wheat bread products at 0.08 and regular caraway-seed bread at 0.13. The seasonality of frequencies was not marked and the majority of the price changes were 4 % to 5 % in size. In August and October processed food displayed an above-average level of price rises.

The prices of cigarettes themselves had a very low frequency of changes (0.06), with a frequency of price increases 0.05 and price decreases 0.01. The prices of cigarettes were most often increased by 10 %, followed by an increase of 3 %, while they were most often decreased by 3 %. The low frequency of changes in cigarette prices is also influenced by the fact that the price change is bound by the amendment of price stamps which are affixed to cigarette packages.

The prices of *unprocessed food* are much more closely connected with the fluctuating developments of the prices of raw materials. Unprocessed food include (according to the methodology used for the HICP): all raw meat, smoked meats, tinned meat, fruit, potatoes, vegetables and pulses. In our selection of items, fruit and vegetables had the highest frequency of price changes (0.6 to 0.9) and Hungarian salami and pork livers the lowest at 0.15 and 0.16. With a breakdown of price changes according to the size of the price changes a different strategy was visible for increasing prices and decreasing prices. The prices were increased most frequently by 3 % to 4 % and decreased most frequently by 5 % to 6 %. The average size of price changes was stable for most of the year.

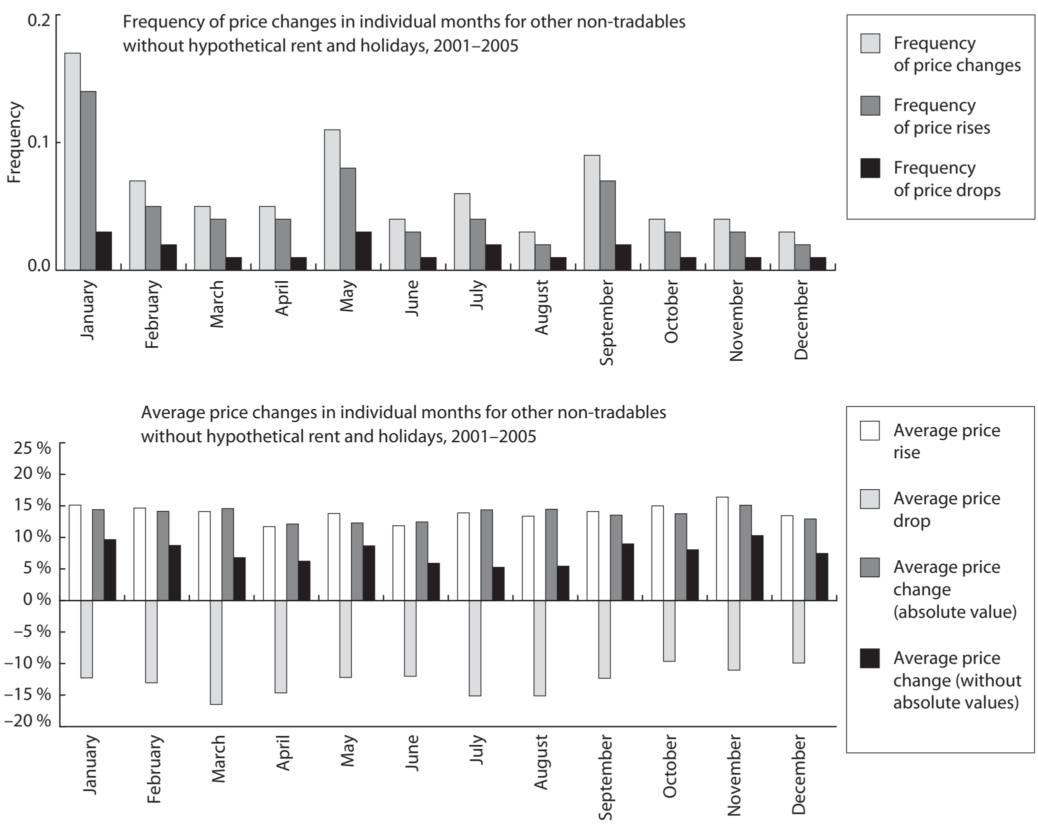
Regulated prices in the monitored period rose practically continuously and often in steps rather than smoothly, which is typical for them. Among the regulated price items, regulated rent and the waste removal had the lowest frequency of changes (0.04). Items with higher frequencies included in particular medical items. The seasonality of frequency is given for regulated prices by the fact that their prices change most from the start of the year and then from the start of the quarters. The only exception to this rule was May, and this because from May 2004 there was a reduction in the basic VAT rate from 22 % to 19 %, which affected many regulated price items.

With regulated prices the division of price changes according to size for price increases and price decreases differed greatly. Regulated prices were reduced significantly less often than they were increased and significantly the most reductions in their prices were of sizes up to 1 %, which confirms that the “willingness” to reduce their prices was low, and when they were actually reduced, then this was only by a small amount. For regulated prices there was thus a clear downward price rigidity.

From *other non-tradables* the following items had the lowest frequency at 0.02: rent for garages, the payment of services connected with the rental of an apartment and a contractually rented 2-room apartment. The hypothetical rent (0.95) and holidays price (up to 0.95) items had the highest frequency. Other non-tradables had in sum over all the months a significant preponderance of price rises compared to price reductions. The most price rises occurred in January and in July. Price lists are changed in January and holidays prices are increased in July. When breaking down the price changes according to size, the largest number of price changes was price increases and decreases between 1 % and 2 %.

In the results for this group, hypothetical rent and holidays prices had a fundamental influence because of their high weight and different results. *Hypothetical rent* is the theoretical level of rent that would be paid by people living in their own houses. It is thus a type of summary price calculated from several items and so it is logical that the level of hypothetical rent is always changing and thus has a high frequency of price changes. Hypothetical rent had a frequency of changes of 0.95. Of this, the frequency of price increases was 0.78 and the frequency of price reductions 0.17. *Holidays prices* also displayed a higher than average frequency. The reason for this is the variability of their prices during the year — during the tourist season prices initially increase and then decrease once again. Winter holidays items are represented in the consumer basket far less than summer holidays items and thus the results valid for the whole holidays group are given in particular by the development of summer holidays prices. *Other non-tradables without the holidays and hypothetical rent items* had a relatively stable size of average changes in individual months while on the other hand their frequency of price changes displayed a significant seasonality (see Figure 14).

Figure 14 Frequency of price changes and average price changes for other non-tradables without hypothetical rent and holidays



Source: Own construction

The great majority of selected items in the *other tradables without fuels* group have a frequency of up to 0.2. Cut flowers had the highest frequency of price changes with a frequency of around 0.5. Fireworks and wedding rings (both 0.02) had the lowest frequency of price changes from this group, followed by gold chains and woven carpets (both 0.03). From September to November other tradables without fuels had a higher frequency of price increases than price decreases, otherwise the frequency of price reductions predominated. The number of price rises was in total lower and they also had lower percentages, while there were many more price drops and these were also by large steps. The situation corresponds to the fact that the prices of other tradables without fuels continuously fell in the monitored period (in particular as a consequence of the long-term strengthening of the koruna exchange rate).

CONCLUSION

The aim of this analysis was to obtain knowledge about the strategies of consumer goods and services retailers in terms of changes to final prices. We evaluated various indicators, the frequency of price changes, the average size of price changes and the average lengths of periods without price changes. We calculated these indicators for selected individual consumer basket items, for different subgroups of the consumer basket as well as for the whole consumer basket.

The knowledge gained has shown that there are various strategies for price changes not only for different types of items but also for items of the same type. In spite of this it has been possible to indicate prevailing characteristics of pricing strategies in selected subgroups of the consumer basket.

The typical characteristics of the prices of regulated items were that these prices mainly only rise and also do this in larger-sized steps and mostly at the start of the year. Food prices display a higher frequency of price changes mainly in the case of unprocessed food, which is a consequence of the volatile development of the prices of agricultural commodities. Tradables without the prices of food and fuels continuously fell for the whole of the monitored period and displayed only a low frequency of price changes. The prices of non-regulated non-tradables continuously rose smoothly and, with the exception of hypothetical rent and holidays items, the lowest frequency of price changes was recorded in this subgroup. On the contrary, hypothetical rent and holidays price had a high frequency of price changes. The definition of hypothetical rent means that it changes practically every month and holidays prices often change due to the fluctuations of their prices during the year. Fuel prices changed most frequently and on average displayed the lowest size of price changes, as they react relatively quickly to rapid changes in the prices of raw materials and the koruna exchange rate.

The prices of the whole consumer basket mainly rose in the monitored period. The frequency of price changes for all the selected items in sum was 0.26, which means that approximately one in every four prices was changed compared to the month before. The average size of the price changes was 10.18 %. For the presented subgroup the rule applied that the lower the frequency of price changes, the higher the average size of those price changes was. The average length of periods without price changes was calculated using various methods with different results. We estimate that the actual average length of periods without price changes was approaching the value of 10.7 months from below.

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