NATIONAL BANK OF BELGIUM

WORKING PAPERS - RESEARCH SERIES

HOW FREQUENTLY DO PRICES CHANGE? EVIDENCE BASED ON THE MICRO DATA UNDERLYING THE BELGIAN CPI

Luc Aucremanne (*)
Emmanuel Dhyne(**)

This study has been developed in the context of the "Eurosystem Inflation Persistence Network". We thank participants in this network, the Workshop "Microeconomic Pricing and the Macroeconomy" organised at the Central European University in Budapest and an internal seminar at the NBB, in particular Jordi Galí, Andy Levin, Attila Ratfai, Christoph Weiss and Alan Kackmeister for very useful comments on earlier drafts of this paper. We thank Jerzy Konieczny, Raf Wouters and David Cornille for very insightful and stimulating discussions and Jacques Drèze for his valuable comments. We are also grateful to an anonymous referee. Finally, we thank the Federal Public Service "Economy, SMEs, Self-employed and Energy" (former Ministry of Economic Affairs) for providing us with the very rich database underlying the Belgian CPI and for carefully explaining us how the data are collected and stored, in particular Gérard Lalau, Paul Vanosselaer and Patrick Vranken.

The views expressed in this paper are those of the authors and do not necessarily reflect the views of the National Bank of Belgium. All remaining errors are the authors'.

(*) NBB, Research Department, (e-mail: luc.aucremanne@nbb.be).
(**) NBB, Research Department, Université de Mons-Hainaut (e-mail: emmanuel.dhyne@nbb.be).

Imprint: Responsibility according to the Belgian law: Jean Hilgers, Member of the Board of Directors, National Bank of Belgium.

ISSN: 1375-680X

Abstract

This paper examines the degree of price rigidity in Belgian consumer prices, using a large database. As to the observed degree of rigidity, the results reveal a substantial amount of heterogeneity, not only across but also within product categories. While prices turn out to be perfectly flexible for some product categories, they tend to be very sticky for others. Each month, nearly 17 p.c. of the consumer prices change on average and the median duration of a price spell is close to 13 months. A substantial subset of our results is compatible with state-dependent pricing, while other results suggest that some time-dependency exists as well. The majority of price changes are price increases, but price decreases are not uncommon, except for services. The size of price changes is important. Price changes do not seem to be highly synchronised across price-setters within relatively homogenous product categories.

JEL-code : D21, D40, E31.

Keywords: consumer prices, price rigidity, state-dependent pricing, time-dependent pricing, staggered pricing.

Non technical summary

This paper examines how frequently consumer prices change in Belgium, by exploiting the micro prices underlying the Belgian CPI. In so doing it tries to obtain a quantitative measure of the unconditional degree of price stickiness in the economy. Moreover, it tries to gain more insight into the qualitative nature of the price setting process and the typical pattern of price changes at the micro level, by addressing such questions as: (i) is the price setting process state-dependent or time-dependent, (ii) are price decreases uncommon, (iii) are price changes synchronised across price-setters which all sell relatively homogenous products? Answering these questions is important, as they have considerable implications for inflation dynamics.

The paper uses a large dataset which contains, for each month during the period January 1989 - January 2001, more than 100,000 individual price reports for 583 product categories covering nearly 70 p.c. of the CPI. The analysis presented in this paper is mainly of a descriptive nature. To the extent possible, we interpret our findings in terms of the existing pricing models and their macroeconomic implications. However, we leave the formal testing of alternative price setting models for future research. Results have been presented in the form of nine basic facts. Generally speaking, they tend to be in line with the four general features in Taylor's (1999) description of the price (and wage)-setting process.

In particular, we find that price setting is very heterogeneous, both across and within product categories. Hence, there is no simple answer to the question whether prices are flexible or sticky, as more than 12 p.c. of the CPI is characterised by an average price duration which is shorter than 2 months and 13 p.c. of the CPI is characterised by an average price duration of at least 2 years. The monthly frequency of price changes is the highest for energy products (close to 70 p.c.) and unprocessed food (more than 30 p.c.). Processed food occupies an intermediate position, with an average monthly frequency of price changes of 14 p.c., while non-energy industrial goods and services are characterised by a substantially lower frequency of price changes (respectively close to 7.5 and 6 p.c.).

On average, each month nearly 17 p.c. of the consumer prices are changed, while the median price duration amounts to 13 months. Although these results seem to be in line with Taylor (1999) and with the estimation made for the euro area by Galí et al. (2003), the observed frequency of price changes was somewhat lower and the implied duration of

price spells was longer than the figures obtained in some other recent studies which use similar datasets, for the US (Bils and Klenow (2002)) and for other EU countries (Baudry et al (2004) and Dias, Dias and Neves (2004)). Apparently, these differences are to some extent related to the way prices are recorded in the respective databases, but it is at this stage unclear what the precise contribution of these methodological differences is.

Obviously, the unconditional nature of our analysis does not allow us to draw conclusions on the importance or the specification of price adjustment costs. They are not necessarily lower for the product categories which are characterised by frequent price adjustment, as the latter can be due merely to the fact that these product categories are more frequently hit by shocks which have a substantial effect on their prices. However, this does not mean that our results are not valuable. They rather imply that the underlying price setting model must be sufficiently general to allow for a very flexible behaviour in some circumstances and a more sticky behaviour in others and, therefore, it presumably has state-dependent characteristics to a considerable extent. Also other characteristics of the price setting process are compatible with state-dependent pricing, e.g. the impact of changes in the VAT rate on the frequency of price adjustment and the fact that the frequency of price adjustment seems to depend on the aggregate inflation rate. The observed seasonality of the frequency of price changes suggests that some time dependency exists as well.

As to macroeconomic modelling, these results imply that it is preferable to incorporate at least two sectors, i.e. a flexible price sector and a sticky price sector, as is done in Aoki (2001). Over and above its impact on inflation dynamics, this will have implications for the conduct of monetary policy, more particularly for the type of inflation stabilisation which is optimal and the optimal reaction to relative price changes. Goodfriend and King (1997) argue in this respect that optimal monetary policy has to stabilise core inflation, which they define as the inflation rate in the sticky price sector of the economy. Taking into account our results in terms of the frequency of price changes for the 5 analytical components of the CPI, the traditional core inflation measure of the type HICP, excluding unprocessed food and energy, would make a lot of sense in this context. This inflation measure actually focuses on price developments in the more sticky sectors of the economy.

As to the size and the direction of price changes, our results indicate that there are more price increases than price decreases. However, price decreases are not uncommon, except for services. Our results also indicate that the size of price changes is substantial,

as the median size of price increases is close to 7 p.c., while the median size of price decreases is close to 8.5 p.c.

Finally, our results also indicate that there is a great variability in the degree of pricing synchronisation across product categories, but most categories seem to be characterised by a low degree of synchronisation. This seems to suggest that the staggered nature of price adjustment, which is assumed in macroeconomics, is verified to a considerable extent. Combining this last result with the relatively large size of price increases and price decreases leads to a substantial degree of relative price variability within relatively homogenous product categories.

TABLE OF CONTENTS

. INTRODUCTION

This paper examines how frequently consumer prices change in Belgium. In so doing it addresses the question whether prices are flexible or sticky and tries to obtain a quantitative measure of the unconditional degree of price stickiness or rigidity in the economy. Moreover, it tries to provide more insight into the qualitative nature of the price setting process and the typical pattern of price changes at the micro level. The paper therefore also addresses such questions as: (i) is the price setting process state-dependent or time-dependent, (ii) are price decreases uncommon, (iii) are price changes synchronised across price-setters which all sell relatively homogenous products?

The analysis has a clear micro nature, because these questions can only be answered using data at the very micro level, i.e. prices of individual products at the store or outlet level. However, the answers to these questions have important macro implications, and that is the main motivation for our research.

In modern macroeconomics, price rigidity is an important source of the short-run non-neutrality of money and it has important implications for inflation dynamics. The degree of nominal rigidity is one of the determinants of the slope of the so-called New-Keynesian Phillips curve (NKPC). The NKPC is micro-founded and incorporates a price setting rule of one form or another for individual firms in an environment of monopolistic competition, which implies that prices are sticky in the short-run. Often these rules are assumed to be time-dependent, which means that the timing of price adjustment is exogenous. This is, for instance, the case with the frequently used Calvo rule and with the so-called Taylor contracts[1]. With state-dependent price setting rules, the timing of price adjustment is endogenous and depends on the "state" of the economy. These rules seem to be more realistic, but are more difficult to incorporate in dynamic macro models. However, Dotsey, King and Wolman (1999) present a dynamic general equilibrium model with state-dependent pricing which stays relatively tractable[2].

[1] The first rule, originally proposed by Calvo (1983), assumes for each individual firm a fixed probability of price adjustment which is independent of the time that has elapsed since the firm's last price adjustment. The second rule, originally proposed by Taylor (1980) for the adjustment of wages, assumes that every n periods a fraction of 1/n firms adjusts prices.

[2] This tractability results from the hypothesis made for the cost of adjusting prices: Dotsey et al. (1999) assume that each firm faces a fixed cost of price adjustment, which is drawn independently over time from a continuous distribution.

It is also important to stress that many of these models typically assume a non-synchronised - or a staggered - price adjustment process, in an attempt to reconcile the discrete nature of price adjustment at the individual level with a more smooth and sluggish behaviour at the aggregate level. Staggering magnifies nominal inertia, as price adjusting firms take into account the non-adjustment of other firms when fixing their optimal re-set price. Shocks therefore tend to have more persistent effects.

Wolman (1999) shows that the inflation dynamics in response to a marginal cost shock depend heavily on the pricing rule used. The Calvo specification yields a relatively small, but fairly persistent response of inflation, whereas inflation reacts much more strongly with a state-dependent pricing rule. He also makes the point that the estimated results for nominal rigidity based on macro data are conditional on the assumptions made for real marginal costs. A comparison of the estimated degree of price stickiness in Galí et al. (2001 and 2003) with the result in Smets and Wouters (2003) also shows that the assumptions made with respect to the movement in marginal costs have a considerable impact on this estimate. In Galí et al. (2003) the baseline estimate for the average duration of a price spell lies somewhere around four to six quarters in the euro area, which is higher than their baseline estimate for the US (two to three quarters). However, Galí et al. (2001) show that in both cases the result depends crucially on certain parameter values, in particular those reflecting the curvature of the production function and the elasticity of demand. Indeed, assuming constant (instead of decreasing) returns to scale, their estimate for the average duration of a price spell increases substantially and is comparable to the estimated duration of two and a half years in Smets and Wouters (2003), who also assume constant returns to scale. Divergences in the movement in marginal costs underlie these differences in the estimated duration of price spells[3].

Therefore, as suggested by Wolman (1999), it is worthwhile to obtain direct and independent evidence on price stickiness. Taylor (1999) and Wolman (2000) review the existing empirical studies describing the degree of price rigidity. It is, however, a

[3] When a firm increases its (relative) price, demand and hence production decreases and the magnitude of this effect depends on the elasticity of demand. With a concave production function (decreasing returns to scale), this decrease in production reduces marginal cost (relative to the marginal cost of non-adjusting firms) and this counteracts to some extent the firm's desire to increase its (relative) price, whereas with constant returns to scale the firm's marginal cost is independent of its price. This leads, ceteris paribus, to smaller price increases in the case of a concave production function than with constant returns to scale and therefore results, for a given profile of inflation and aggregate marginal cost, in a shorter estimated duration of price spells.

characteristic of the research in this field that it lacks evidence based on European data. Against this background, it is the aim of this paper to provide direct insights into the degree of price rigidity by exploiting the micro prices underlying the Belgian CPI. This dataset is unique in several respects: (i) its coverage - in the cross-section, as well as in the time dimension -; (ii) the presence of all the necessary information which allows us to monitor a particular product at the very individual level, i.e. product xxx of brand yyy sold in store zzz; (iii) the fact that the dataset relates to a European country[4].

The analysis presented in this paper is mainly of a descriptive nature. To the extent possible, we interpret our findings in terms of the existing pricing models and their macroeconomic implications. However, we leave the formal testing of alternative price setting models for future research. Our results tend to be in line with the general features in Taylor's (1999) description of the price (and wage)-setting process. In particular, we find that (i) there is a great deal of heterogeneity in price setting, (ii) the median price duration is close to one year, (iii) price changes do not seem to be highly synchronised and (iv) there are some indications that the frequency of price changes depends on the aggregate inflation rate.

The rest of the paper is structured as follows. Section 2 describes the dataset used. Section 3 stresses how the raw dataset has been re-organised in order to construct an unbalanced panel, and highlights how a particular product is identified in the dataset. Section 4 discusses the problems related to censoring and presents an unbiased estimator of the frequency of price changes. Section 5 presents 9 basic results describing price adjustment in Belgium and section 6 summarises our main conclusions and indicates some directions for future research.

[4] In the recent past, a part of this dataset has already been used at the NBB to analyse the implications of the euro cash changeover on consumer prices. See Aucremanne and Cornille (2001), Cornille (2003).

2. THE DATASET

Following the work of Bils and Klenow (2002), Konieczny and Skrzypacz (2002, 2003), Kackmeister (2001), Ratfai (2003) or Lach and Tsiddon (1992, 1996), we want to investigate the individual price dynamics using the micro data underlying the Belgian CPI.

2.1. The micro data underlying the Belgian CPI

We have at our disposal monthly reports of individual prices used by the Federal Public Service "Economy, SMEs, Self-employed and Energy" (former Ministry of Economic Affairs) for the computation of the Belgian National and Harmonised Index of Consumer Prices, covering the January 1989 - January 2001 period[5]. The period covered by our dataset is substantially longer than in other research papers on this issue. For instance, the evidence presented by Bils and Klenow (2002) is based on the 1995-1997 period only.

For each record in the dataset (a record is a particular individual price report), we observe the following information:

- the date of the report (month and year) ;
- a location code (65 cities) ;
- a store code (26.809 stores) ;
- a product category code (583 product categories) ;
- the brand of the item (this code can also indicate promotions or changes in the packaging) ;
- the packaging of the item (weight, number of items, ...) ;
- the price of the item.

Considering the whole sample, 18,910,857 records are observed in the raw database, which corresponds to 130,419 records per month on average.

[5] In fact, we also have access to price reports for the Jan-88 / Dec-88 period and for the Feb-01 / Sep-03 period, but we decided not to consider these two periods. The records that relate to the first period are not used because the store identification is not reliable. The records that relate to the second period are not used because of the impact of the introduction of the euro on price changes. Indeed, the conversion of prices to euro has affected the frequency of price changes in Belgium, as is shown in Cornille (2003). From July 2001 onwards, an increase in the frequency of price changes has been observed. In order to compute frequencies of price changes which are not affected by this exogenous event, we decided to end our estimation period in January 2001. The latter month was included in order to have a balanced structure in our dataset in terms of seasonality.

2.2. The coverage of the dataset

The dataset covers only the product categories for which the prices are recorded in a decentralised way, i.e. 68.1 p.c. of the Belgian CPI in December 2000. The remaining 31.9 p.c. relate to product categories that are monitored centrally by the Federal Public Services, such as housing rents, electricity, gas, telecommunications, newspapers and insurance services. All in all, this means that a wide range of product categories can be analysed, whereas many other papers on this issue only examine a limited number of products. For instance, Lach and Tsiddon (1992, 1996) analyse the prices of meat and wine and Cecchetti (1985, 1986) focuses on the prices of magazines.

Table 1 illustrates the coverage of our database. For COICOP[6] classes 01 "Food and non-alcoholic beverages", 02 "Alcoholic beverages and tobacco", 03 "Clothing and footwear", 05 "Furnishing and maintenance of housing" and 11 "Hotels, cafés and restaurants", (almost) all the product categories belonging to those classes are in the dataset used. COICOP classes 09 "Leisure and culture" and 12 "Miscellaneous goods and services" occupy intermediate positions in terms of coverage.

Table 1 - Coverage of the dataset (December 2000)

COICOP classification	Denomination	CPI Weight (p.c.)	Number of observations	Coverage of the dataset	
				per category (p.c)	total (p.c)
01	Food and non-alcoholic beverages	21.4	60,980	99.8	21.4
02	Alcoholic beverages and tobacco	1.3	1,089	100.0	1.3
03	Clothing and footwear	8.2	10,912	100.0	8.2
04	Housing, water, gas and electricity	14.7	2,058	28.1	4.1
05	Furnishing & maintenance of housing	8.6	11,669	100.0	8.6
06	Health care expenses	4.0	431	21.5	0.9
07	Transport	13.8	2,755	47.2	6.5
08	Communications	2.2	86	2.8	0.1
09	Leisure and culture	11.7	7,757	54.5	6.4
10	Education	4.0	0	0.0	0.0
11	Hotels, cafés and restaurants	6.6	3,035	96.3	6.4
12	Miscellaneous goods and services	7.0	5,387	60.6	4.3
00	Total	100	106,159	68.1	68.1

Sources: FPS, NBB.

[6] Classification Of Individual COnsumption by Purpose (COICOP).

COICOP class 07 "Transport" is only partially covered, as we mainly observe prices for fuels. In COICOP class 04 "Housing, water, gas and electricity", we essentially observe prices for heating oil and for water, while housing rents, electricity prices and the bulk of the gas prices are not covered. COICOP class 06 "Health care expenses" is also poorly covered, especially at the end of the observation period where we no longer observe the price of a medical consultation or of dental surgery. In COICOP class 08 "Communications", only fax machines are observed over a relatively long period. Finally, products of COICOP class 10 "Education" are not covered in our dataset.

It should also be noted that COICOP class 01 "Food and non-alcoholic beverages" is over-represented in terms of observations in our dataset. In fact, it represents 57.4 p.c. of the data available in December 2000, whereas the actual weight of these products in the CPI amounts to only 21.4 p.c.

2.3. Price reporting of specific products

The price of almost every product is monitored on a monthly basis throughout the entire year, with the sole exception of seasonal product categories.

Seasonal product categories are observed in COICOP class 01 "Food and non-alcoholic beverages" (for example, some specific fruits only available in summer or winter, some specific fishes and seafood) and 09 "Leisure and culture" (for example, some specific fresh flowers, the rental fee in a tennis club). For these seasonal products, we have cleaned the dataset by removing the (automatically replicated) price reports which relate to months during which these specific products are not taken into consideration for the computation of the CPI (and are not observed in reality).

Another important characteristic of the price reports is that the prices take into account all types of rebates and promotions[7], except those relating to the winter and summer sales period, which typically take place in January and July. Compared to databases which also take on board these seasonal rebates, this can lead to a downward bias in the estimated frequency of price changes, particularly for the product categories where seasonal rebates are common (for instance in COICOP class 03 "Clothing and footwear").

[7] See also below the discussion on quantity promotions.

Concerning COICOP class 03 "Clothing and footwear", we should also mention that the sample of products monitored by the Federal Public Services is not a typical seasonal basket. In many cases, the products monitored in this COICOP category are highly standardised products, which are usually available throughout the entire year (black socks, white shirt, ...). This methodology chosen by the statistical agency may also affect, presumably in a downward direction, the frequency of price changes observed for the clothing sector if the price setting process for highly standardised products differs from the price setting process for more seasonal clothes.

3. DEFINITION OF AN INDIVIDUAL PRODUCT AND OF A PRICE SPELL

The raw dataset of price reports underlying the Belgian CPI is not organised for ease of monitoring the evolution of the price of one specific product sold in one specific outlet over time. Therefore, in order to analyse individual price changes, we have to define how to monitor a particular product during the observation period and how to create an individual product code.

3.1. The definition of an individual product

An individual product is defined as a particular product belonging to a specific product category (for instance a 33-cl plastic bottle of diet coke in the product category "cola-based lemonade") which is sold in one particular outlet (one specific store in one specific city).

On the basis of the available information, we used a sequential procedure in order to monitor an individual product over time. We consider that, within a product category, we observe the same individual product in t and t-1 if it fulfils:

1. the 4 following conditions :

$$Location_t = Location_{t-1}$$
$$Store_t = Store_{t-1}$$
$$Packaging_t = Packaging_{t-1}$$
$$Brand_t = Brand_{t-1}$$

or 2. the following conditions (the case of a temporary quantity promotion in t)

$$Location_t = Location_{t-1} = Location_{t+1}$$
$$Store_t = Store_{t-1} = Store_{t+1}$$
$$Packaging_{t-1} = Packaging_{t+1}$$
$$Brand_t = Brand_{t-1} = Brand_{t+1}$$

or 3. the following conditions (the case of a temporary quantity promotion in t-1)

$$Location_t = Location_{t-1} = Location_{t-2}$$
$$Store_t = Store_{t-1} = Store_{t-2}$$
$$Packaging_t = Packaging_{t-2}$$
$$Brand_t = Brand_{t-1} = Brand_{t-2}$$

If one of the 3 sets of conditions presented above is not fulfilled, we consider that the individual product has changed between t and t-1.

The most restrictive definition is obtained by considering the first set of conditions only. However, such a strict definition would have introduced an asymmetry in the treatment of price promotions (which do not imply a product change) and quantity promotions (which would imply a product change, because of a change in the packaging). Therefore, the second and third sets of conditions are introduced in order to handle equivalently price promotions and quantity promotions, by relaxing the packaging constraint. The second set of conditions identifies the beginning of the temporary promotion. As the promotion is assumed to be temporary and to last only one month, the third set of conditions is needed in order to identify the end of the promotion.

These 3 sets of conditions can identify a product replacement in period t. Such a product replacement may be either temporary (that means that it lasts only during one month) or permanent. If the product replacement is temporary, the monitoring procedure of an individual product should be able to link two sequences of observations of an individual product in a particular store, interrupted during a single month because that particular product was temporarily not available at the time the store was surveyed. In order to do so, we consider that we observe the same individual product in t and t-2, even if we identify that the individual product observed in t is not the same as the one observed in t-1, if the following set of conditions is fulfilled:

$$\text{Location}_t = \text{Location}_{t-1} = \text{Location}_{t-2}$$
$$\text{Store}_t = \text{Store}_{t-1} = \text{Store}_{t-2}$$
$$\text{Packaging}_t = \text{Packaging}_{t-2}$$
$$\text{Brand}_t = \text{Brand}_{t-2}$$

If such a temporary product replacement occurs, the unobserved price of the product that is temporarily replaced is assumed to be equal to the price of that product observed during the previous month[8].

[8] To be more precise, we impute that the price per unit is unchanged (see also section 3.2 for the definition of the price concept used).

In some cases these conditions were relaxed with the aim of making them more suitable for the specific characteristics of the data collection for some particular products[9].

Using these definitions and considering the January 1989 - January 2001 sample, we identify 661,443 individual products, observed on average during 24.4 months.

3.2. The price concept used

For all products, the price concept used corresponds to the price per unit[10]. In other words, if an unchanged price report corresponds to a changed quantity, the price per unit changes and hence we observe a price change (see also temporary quantity promotions).

3.3. The definition of a price spell

We define a price spell as an uninterrupted sequence of price reports associated with one individual product during which the price (per unit) remains constant. Considering the 661,443 individual products, we identify 3,278,526 price spells (4.96 price spells per individual product).

[9] Because the packaging of some fresh fruits and vegetables sold per unit is expressed in grams, which implies that it changes every month, the conditions on packaging are relaxed for these product categories. Moreover, for some product categories, the identification of the outlet is sufficient to identify the brand of a particular product. This is the case for unprocessed food, some services (such as haircuts, a plumber's hourly rate, etc.) and oil products. For this kind of product categories, we also relaxed the brand constraints because the brand information, which may be affected by typos, is no longer needed to identify a particular product.

[10] This is also the case for the products for which the packaging code is not used when defining the individual product, for instance for fruits and vegetables sold per unit.

4. THE ESTIMATION OF THE FREQUENCY OF PRICE CHANGES

In order to measure the degree of price rigidity in an economy using price reports observed at the micro level, the analysis can be based on the duration of the typical price spells, T, or on the frequency of the occurrence of a price change, F.

Assuming that price changes occur at discrete time intervals, the two concepts are linked by the following expression:

$$T = \frac{1}{F} \qquad (1)$$

Therefore, computing one statistic is in principle equivalent to computing the other.

Bils and Klenow(2002), for instance, use the "frequency approach". They first compute the frequency of price changes and then infer the implied average duration of a price spell for each product category used in the US CPI.

Alternatively, the "duration approach" is based on the direct computation of the average duration of a price spell, the implied frequency of price changes being inferred in a second step. However, such a direct computation of the average duration of a price spell can be done on the basis of uncensored price spells only (for instance, price spells that start and end with a price change)[11]. This technical requirement is a major drawback of the "duration approach". If only uncensored price spells are considered, a possible selection bias may affect the estimation of the average duration of a price spell, as the longest price spells are the most likely to be censored.

Conversely, the "frequency approach" is a way to solve this selection bias as it uses all the relevant statistical information available. However, it only allows us to analyse the variability of price durations across product categories. Moreover, when putting this approach into practice, it proved difficult to come up with an appropriate operational definition of censoring, whereas this definition has a considerable impact on some of the results obtained. In order to illustrate the latter factor, this section shows how the frequency approach deals with censoring. We also experiment with alternative definitions

[11] See below for a more complete definition and discussion of censored and uncensored price spells.

of censored and uncensored price spells and state the reasons for our preferred definition, given the particular characteristics of the database used[12].

4.1. An unbiased estimator of the frequency of price changes

The frequency of price changes is typically calculated by dividing the number of price changes in the month considered by the number of observations for which a price change was possible during that particular month, i.e. the number of products for which there are two consecutive price observations in the database. Averaging these monthly frequencies over time for a particular product category j yields the average frequency of price changes for that product category:

$$F_j = \frac{\sum_{i=1}^{n_j}\sum_{t=2}^{\tau} NUM_{ijt}}{\sum_{i=1}^{n_j}\sum_{t=2}^{\tau} DEN_{ijt}} \qquad (2)$$

where : NUM is a dummy variable indicating that the price of product i has changed in t
DEN is a dummy variable indicating that the product i observed in t was also observed in t-1
n_j is the number of individual products observed in product category j
τ is the time span during which the prices of product category j are reported

How does this measure deal with censoring?

The most intuitive but also the most restrictive definition of censoring is the following. A price spell is said to be uncensored if it starts and ends because of a price change. A price spell is left (right) censored if it ends (starts) because of a price change but its starting (ending) date is not precisely known. A price spell is double censored if both its starting and ending dates are not the result of a price change. Below we will use the following notation: product category j is composed of $n_{j,nc}$ uncensored price spells, $n_{j,lc}$ left censored price spells, $n_{j,rc}$ right censored price spells and $n_{j,dc}$ double censored price spells. For each type of price spells, one can compute the observed average length of the price spells. $T_{j,nc}$,

[12] For other databases, other operational definitions of censoring may be more appropriate.

$T_{j,lc}$, $T_{j,rc}$ and $T_{j,dc}$ are respectively the average (observed) lengths of uncensored[13], left censored, right censored and double censored price spells[14].

Using this strong definition of censoring, the numbers of left and right censored price spells are equal, by construction. Applied to our database, this gives the following structure: 66.6 p.c. uncensored price spells, 13.1 p.c. left censored price spells, 13.1 p.c. right censored price spells and 7.1 p.c. double censored price spells.

Assuming that product category j is characterised by the structure presented above, expression (2) is equivalent to:

$$F_j = \frac{n_{j,nc} + n_{j,lc}}{n_{j,nc}T_{j,nc} + n_{j,lc}T_{j,lc} + n_{j,rc}T_{j,rc} + n_{j,dc}T_{j,dc}} \qquad (2)'$$

Expression (2)' is useful as it clearly emphasises the role of the different types of price spells. First of all, from a comparison of expression (2)' with expression (1), it becomes clear that the frequency approach and the duration approach are equivalent only if all the price spells are uncensored. Second, expression (2)' shows what is needed in order to compute the frequency of price changes: a number of price changes (the numerator of expression (2)') and the length of the related price spells (the denominator of expression (2)'). Therefore, only uncensored and left censored price spells are used in the numerator (as the only price changes observed are the price changes that end the uncensored and the left censored price spells), while all types of spells and their corresponding durations are used in the denominator. Below, we dig deeper into the rationale behind expression (2)' and show under what conditions it is an unbiased estimator of the frequency of price changes.

From a theoretical viewpoint, an unbiased estimator of the frequency of price changes is given by:

$$\frac{n_{j,nc} + n_{j,lc}}{n_{j,nc}T_{j,nc} + n_{j,lc}E\left[\tilde{T}_{j,lc}\right]} \qquad (3)$$

where $E\left[\tilde{T}_{j,lc}\right]$ is the expected duration of the left censored price spells.

[13] $T_{j,nc}$ is the average price duration computed using the "duration approach".

[14] The average length of left censored and of double censored price spells is computed without taking into account the first observation of each spell.

This expected duration not only depends on the average length of the observed part of the left censored price spells but also on the expected length of the unobserved part of these spells. As a result, to obtain an unbiased estimator of the frequency of price changes, an estimation of this expected duration is needed.

Under the assumption that the hazard function[15] underlying the price setting process is stable over time, an unbiased estimation of the duration of the unobserved part of the left censored prices spells can be obtained by using the (observed) durations of all the spells which have been truncated to the right. These are the right censored price spells properly speaking, but also the double censored price spells. Therefore, the unobserved part of the left censored price spells can be either a right censored price spell, with a probability of $\frac{n_{j,rc}}{n_{j,rc}+n_{j,dc}}$, or a double censored price spell, with a probability of $\frac{n_{j,dc}}{n_{j,rc}+n_{j,dc}}$, which in turn has to be completed by a right censored price spell or a double censored price spell, and so on.

An unbiased estimator of the expected complete duration of left censored price spells is then given by:

$$E\left[\tilde{T}_{j,lc}\right] = T_{j,lc} + \frac{n_{j,rc}}{n_{j,rc}+n_{j,dc}} T_{j,rc} + \frac{n_{j,dc}}{n_{j,rc}+n_{j,dc}} \left(T_{j,dc} + \frac{n_{j,rc}}{n_{j,rc}+n_{j,dc}} T_{j,rc} + \frac{n_{j,dc}}{n_{j,rc}+n_{j,dc}} (...) \right)$$

or

$$E\left[\tilde{T}_{j,lc}\right] = T_{j,lc} + \frac{n_{j,rc}}{n_{j,rc}+n_{j,dc}} T_{j,rc} \sum_{i=0}^{\infty} \left(\frac{n_{j,dc}}{n_{j,rc}+n_{j,dc}} \right)^i + T_{j,dc} \sum_{i=1}^{\infty} \left(\frac{n_{j,dc}}{n_{j,rc}+n_{j,dc}} \right)^i$$

$$E\left[\tilde{T}_{j,lc}\right] = T_{j,lc} + T_{j,rc} + \frac{n_{j,dc}}{n_{j,rc}} T_{j,dc} \qquad (4)$$

[15] The hazard function $\lambda(t)$ is a function describing how the probability of observing a price change is affected by the duration of the price spell. $\lambda(t) = \lim_{h \to 0} \frac{P\left[T \in [t, t+h] | T \geq t\right]}{h}$ where T is the duration of the price spell.

Combining (3) and (4), an unbiased estimator of the frequency of price changes is given by:

$$\frac{n_{j,nc} + n_{j,lc}}{n_{j,nc}T_{j,nc} + n_{j,lc}T_{j,lc} + n_{j,lc}T_{j,rc} + n_{j,lc}\frac{n_{j,dc}}{n_{j,rc}}T_{j,dc}} \qquad (5)$$

With the above-mentioned definition of censoring, $n_{j,lc}$ equals $n_{j,rc,}$, by construction. As a result, expressions (2)' and (2) are equivalent to expression (5) and are therefore unbiased.

4.2. Alternative definitions of censoring: their rationale and their impact

The definition of censoring presented above treats all price spells which do not start/end with a price change equally, i.e. as censored spells. However, when analysing the database we clearly identified different reasons why price spells are truncated, and below we propose a specific treatment for each type. In so doing, we modify the above-mentioned definition in several respects.

4.2.1. Sample-inherent censoring

A considerable proportion of the price spells which do not start/end with a price change may be associated with the sampling strategy. First of all, our decision about the sample period implies automatically that price spells which start in January 1989 are left censored, while price spells that end in January 2001 are right censored. Second, during the period considered the Federal Public Service has rebased the CPI on several occasions, and on these occasions representativity considerations led CPI compilers to introduce some (new) product categories, while others were no longer monitored. This phenomenon typically also gives rise to left or right censored data. Some of these cases even correspond to double censored price spells, i.e. price spells which are characterised by a length equal to the observation period for the product category to which they belong.

This is the purest form of censoring and therefore these spells form the core of our definition of censoring.

4.2.2. Other sources of truncation

However, there are also many cases for which the truncation of price spells is not the result of a deliberate re-sampling based on representativity considerations, but merely reflects the attrition of the existing sample because individual products or stores simply disappear. The statistical agency deals with attrition by automatically replacing a product or a store that leaves the sample. This type of replacement of products or stores in our dataset is always forced. That means that a product or a store leaves the sample only because the product is no longer available in the store or because the outlet has disappeared. It is precisely this forced nature of the replacement that is the main reason why we prefer not to treat these spells as censored price spells.

a. The case of product replacement due to attrition

For some product categories (e.g. certain clothing articles or small electronic devices), individual products are only available for relatively short time periods at a constant price, and are frequently replaced. For those products, the setting of the new price typically coincides with the introduction of the product, while the withdrawal of the product automatically implies the end of the price spell, not only in the database but also in economic terms. According to the strong definition of censoring presented above these spells would have been double censored, which implies a zero frequency of price changes for these products. This is clearly at odds with reality. Therefore, we decided that price spells which both start and end because an individual product is replaced should be considered as uncensored price spells, rather than as double censored spells.

This argument can be extended to all the spells for which individual product replacement led to left or right truncation. Also, in these cases, the setting of the (first) new price may coincide with the introduction of the product, while the withdrawal of the product automatically implies the end of the price spell (also in economic terms). While the latter argument is straightforward and clearly justifies not treating the last price spell as right censored, the first argument is more debatable. Indeed, it may be the case that the product which enters the database was already available at the reported price, and in that case the first price spell should be considered as left censored. Considering all the first price spells following a product replacement as left censored is, however, not correct either and would have introduced a severe asymmetry between the number of left and right censored price spells. Therefore, we decided that product replacement should not be considered as a

source of censoring and we have considered all price spells affected by this phenomenon as uncensored price spells. In other words, product replacement has been considered as being equivalent to observing a price change.

When this (softer) definition of censoring is applied to our dataset, the following structure is obtained: 80.4 p.c. uncensored price spells, 8.6 p.c. left censored price spells, 8.6 p.c. right censored price spells and 2.3 p.c. double censored price spells. This new definition does not introduce an asymmetry in terms of left and right censoring in the dataset.

b. The case of store replacement due to attrition

All the store replacements in our database are also always forced; for the reasons explained in the previous section, this justifies the view that a price spell that ends because of a store replacement should not be considered as right censored. However, contrary to what we did in the case of product replacement, we decided that these spells should not be considered as uncensored spells either. The fact that a price spell ends because the outlet disappears has indeed nothing to do with the outlet's pricing policy. Given their atypical nature, these spells have been disregarded.

Simply disregarding price spells that end because of a store replacement reduces the number of double censored and right censored price spells, and will therefore introduce a strong asymmetry in favour of left censored price spells. In order to reduce this asymmetry, the price spells that start because of a store replacement have also been disregarded. As a result of this step, the structure of our dataset was further modified, leading to the following composition: 80.4 p.c. uncensored price spells, 5.0 p.c. left censored price spells, 5.1 p.c. right censored price spells, 0.4 p.c. double censored price spells and 9.1 p.c. disregarded spells. In this final structure, all censored price spells are of the first type (sample inherent censoring).

Although we were concerned about the symmetry between left and right censored price spells, removing all spells affected by store replacement created a small difference in favour of the right censored price spells[16]. In that event, expressions (2) and (2)' are no longer unbiased estimators of the frequency of price changes, and we have therefore used expression (5).

[16] This asymmetry is created when a store closes down at the end of the first price spell observed for that specific store.

For the reasons explained above and given the particular characteristics of our database, we clearly prefer the modified (and softer) definition of censoring. Results presented in the next section are based on this treatment. However, as some of the results are sensitive to the methodological choices made, we also give a brief presentation of two alternative sets of results in Annex 2. The first alternative no longer disregards price spells affected by store replacement and treats them as censored spells, but continues to consider price spells affected by product replacement as uncensored spells. The second set also treats price spells affected by product replacement as censored spells.

5. PRICE ADJUSTMENT IN BELGIUM: BASIC FACTS

This section describes the price setting process for Belgian consumer prices during the January 1989 - January 2001 period. It is structured in the form of a set of 9 results, which are addressed in three subsections. Where possible, we interpret these results in terms of their implications for the underlying price setting model, for macro-economic modelling and for monetary policy.

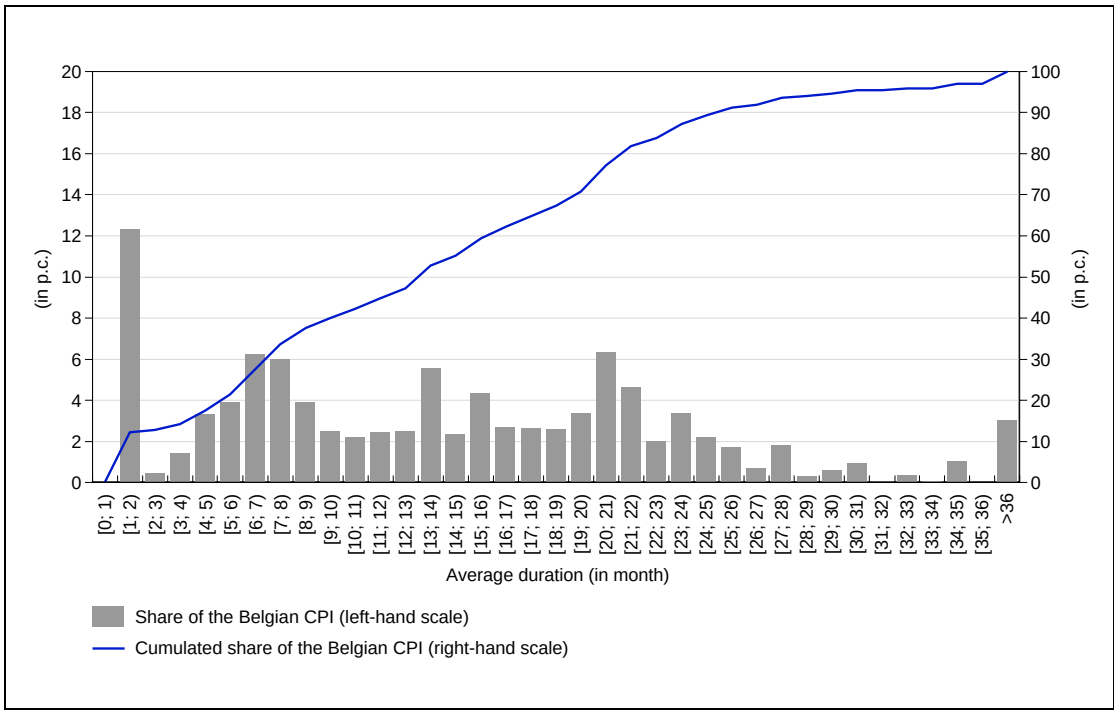
5.1. The frequency of price changes and the duration of price spells

The first set of results relates to the observed frequency of price changes and the observed duration of price spells. Detailed results for each product category in the database are presented in Annex 1. They are summarised in Figures 1 and 2.

First result - Price setting is very heterogeneous across product categories. Hence, there is no simple answer to the question whether prices are flexible or sticky.

As can be seen from columns 6 and 7 of Annex 1, the observed pricing behaviour covers a broad spectrum, ranging from perfect price flexibility for some product categories to a high degree of price stickiness for other categories. Indeed, according to the frequency approach, the average monthly frequency of price changes, F, equals 100 p.c. for some fresh fruits and vegetables, while it is slightly less than 1.5 p.c. for some recreational and cultural services (for instance, videotape renting). This implies that the average price duration per product category, T, ranges from 1 month to more than 60 months.

Figure 1 - The distribution of average price duration in the Belgian CPI - Frequency approach



Source: FPS, NBB.

Figure 1 gives the weighted distribution of average price durations per product category, based on the frequency approach.

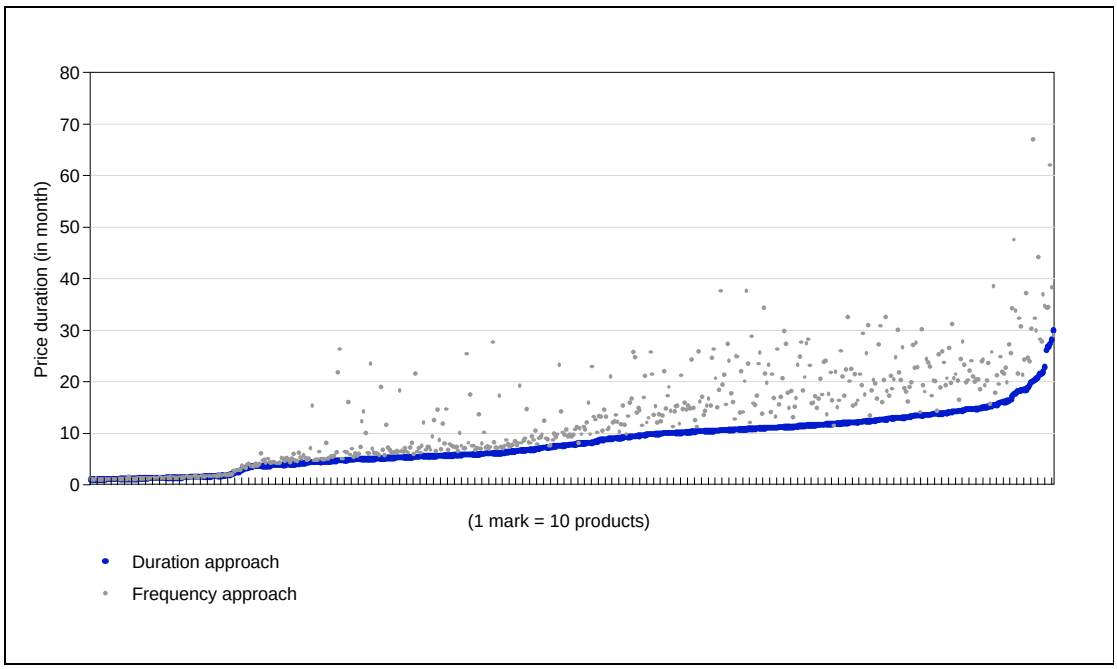
This distribution indicates that a significant proportion of the CPI is characterised by fully flexible prices, as more than 12 p.c. of the CPI has an average price duration of less than 2 months. However, 13 p.c. of the CPI features an average price duration of at least 2 years. The intermediate durations - between 2 months and 2 years - are more uniformly distributed.

Other recent studies based on similar datasets, such as Bils and Klenow (2002), Dias, Dias and Neves (2004), Baudry et al. (2004), came to similar conclusions in terms of heterogeneity across product categories. This characteristic was also highlighted in Taylor's (1999) survey. These results illustrate that there is no simple answer to the question whether prices are flexible or sticky.

Obviously, the unconditional nature of our analysis does not allow us to draw conclusions on the importance or the specification of price adjustment costs. They are not necessarily

lower for the product categories which are characterised by frequent price adjustment, as the latter can be due merely to the fact that these product categories are more frequently hit by shocks which have a substantial effect on their prices. However, this does not mean that our results are not valuable. Instead, they imply that the underlying price setting model must be sufficiently general to allow for a very flexible behaviour in some circumstances and a more sticky behaviour in others and, therefore, presumably has state-dependent characteristics to a considerable extent. This issue also relates to another debate in the literature, namely the relative importance of nominal and real rigidities[17].

Figure 2 - Average price duration - Comparison of the "Duration" and the "Frequency" approaches



Sources: FPS, NBB.

A similar heterogeneous picture is obtained when using uncensored price spells only. Although this treatment leads, by definition, to a loss of data, the number of uncensored price spells in the database, n_{nc} in Annex 1, is still considerable for most of the product categories. The average duration of uncensored price spells, T_{nc}, ranges from 1 month for some fresh fruits and vegetables to 30 months for the price of a taxi. Although still quite large, this range is substantially smaller than the range obtained on the basis of the frequency approach (from 1 to more than 60 months). This difference is due to the (downward) selection bias induced by the use of uncensored price spells only. As shown in

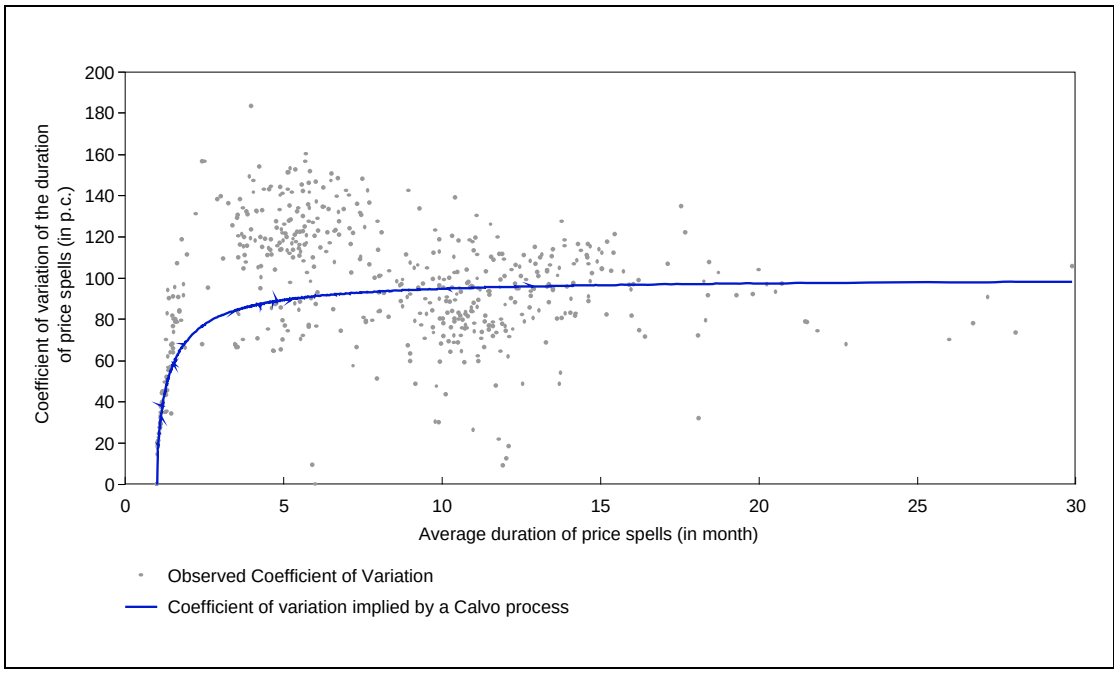
[17] See Romer (1996) on this issue.

Figure 2, this bias is relatively small for most product categories characterised by an average price duration of less than one year. However, the bias can be quite large for product categories with a more sticky pricing behaviour. These differences between the two approaches indicate that the measurement issues discussed in Section 4 do matter, and that obtaining measures of the degree of price stickiness in the economy is not a trivial issue.

Second result - *The pricing behaviour is also characterised by a substantial degree of heterogeneity within relatively homogenous product categories.*

Although affected by a selection bias, the analysis of uncensored price spells makes sense because it allows us to gain insights into the distribution of durations of price spells within each product category. To that end, Annex 1 presents not only the average durations of uncensored price spells, but also the standard deviation of these durations (s_{nc}), measured within product categories. However, these standard deviations should be interpreted with caution for two reasons. First, since the data are collected monthly, our observed durations do not correspond exactly with the true durations. This induces a downward bias in the standard deviation, which can be severe for product categories with very short durations. For instance, if the true durations are all shorter than one month and have a non-zero standard deviation, all observed durations will be equal to one month and have a zero standard deviation. Second, the uncensored nature of the data on which this analysis is based is another source of a downward (selection) bias, not only for the average duration - as was illustrated in the previous result - but also for the standard deviation. This bias will typically be more pronounced for product categories with longer price durations. As this bias is greater for the standard deviation of durations than for the average durations, the coefficient of variation will also be biased in the downward direction.

Figure 3 - Variability and average duration of price spells per product category



Sources: FPS, NBB

Despite these downward biases, the standard deviations are often large, relative to the average. Figure 3 summarises this phenomenon by plotting for each product category the (within) coefficient of variation on the vertical axis against the average price duration on the horizontal axis. This coefficient of variation is close to zero for product categories characterised by a very short average duration of price spells - probably as a result of the first type of bias -, while it tends to oscillate around unity for product categories for which the average duration exceeds 12 months. The picture is less clear-cut for product categories with intermediate average durations. Some of these product categories have a coefficient of variation which is well in excess of unity. As price durations have a zero lower bound, these relatively high standard deviations suggest that some price spells can have very long durations, compared to the average duration characterising the product category considered.

Observing non-zero standard deviations for the distribution of price durations within product categories is at odds with a time-dependent pricing rule of the Taylor-contract type in its purest form, in which case every period a fraction of $\frac{1}{n}$ firms set their price for n periods. In that case, all price durations equal n periods, implying that their standard

deviation is zero. This does not imply, however, that such a behaviour - adjusting prices every n periods - does not exist at all. It may well be the case that firms do apply this type of rule, but that the fixed time interval between price adjustment varies across firms or that this rule, applied by a fraction of firms only, coexists with other types of price setting behaviour.

The observed coefficient of variation of the uncensored price spells is not only non-zero, for a substantial fraction of product categories it is also in excess of what is implied by Calvo's price setting rule[18]. This is particularly the case for product categories with an intermediate average duration of price spells. This is striking, as the Calvo model is sometimes criticised for generating an unrealistically high degree of heterogeneity. State-dependent pricing models could also generate this high variability of the observed durations within product categories. In that event the economic conditions prevailing for the product category considered determine the timing of price changes. As a consequence, it is possible that the variability of durations within product categories is the result of the temporal variability of these economic conditions.

Third result - The breakdown of the CPI by 5 analytical product types, which is frequently used in the Eurosystem, gives a reasonable summary of the degree of heterogeneity in terms of pricing behaviour across product categories. The frequency of price changes is highest for energy products and unprocessed food; processed food occupies an intermediate position, while the frequency is lowest for non-energy industrial goods and services.

Breakdowns at intermediate levels of aggregation - at the first level of the COICOP classification, as well as the breakdown in 5 analytical product types - are presented in Table 2. These figures are weighted values computed using the average weights of the different product categories in the CPI over the period 1989-2000.

[18] For a Calvo process characterised by a fraction θ of firms not adjusting their price, the average duration is $\frac{1}{1-\theta}$ and the standard deviation of durations is $\frac{\sqrt{\theta}}{1-\theta}$. Hence, the coefficient of variation equals $\sqrt{\theta}$. Using these theoretical results, the relation between the average duration and the coefficient of variation, as implied by a Calvo process, is drawn in Figure 3.

Table 2 - Frequency of price changes and median price duration - breakdown by COICOP category and by analytical product type

	# of product categories	Frequency of price changes		Weighted median price duration
		Average	Standard deviation	
By COICOP				
01 "Food and non-alcoholic beverages"	205	23.10	23.19	7.04
02 "Alcoholic beverages and tobacco"	22	14.89	4.51	7.46
03 "Clothing and footwear"	84	4.75	0.87	20.29
04 "Housing, water, gas and electricity"	25	33.47	34.73	10.75
05 "Furnishing & maintenance of housing"	81	6.50	3.72	18.67
06 "Health care expenses"	15	9.41	7.62	14.14
07 "Transport"	24	41.15	30.58	1.65
08 "Communications"	1	14.30	-	6.99
09 "Leisure and culture"	71	10.29	13.16	14.90
11 "Hotels, cafés and restaurants"	20	4.34	1.24	23.89
12 "Miscellaneous goods and services"	35	7.51	4.89	19.27
By analytical product type				
Unprocessed food	123	31.82	28.85	6.59
Processed food	104	14.06	6.76	7.54
Energy	16	68.14	17.02	1.37
Non energy industrial goods	260	7.42	7.66	18.67
Services	80	5.91	3.62	20.27
CPI	**583**	**16.85**	**22.18**	**13.25**

Sources: FPS, NBB.

A relatively flexible behaviour is observed in COICOP categories 01 "Food and non alcoholic beverages", 04 "Housing, water, gas and electricity" and 07 "Transport". In these cases, the average frequency of price changes exceeds 20 p.c. However, the fact that the standard deviation of the frequency of price changes within these three broad categories is relatively high indicates that these categories are not very homogenous in terms of pricing behaviour. Indeed, COICOP category 01 "Food and non alcoholic beverages" is a mixture of flexible unprocessed products and less flexible processed food products, while both COICOP categories 04 "Housing, water, gas and electricity" and 07 "Transport" consist of very flexible energy products and more rigid categories.

The other, less flexible COICOP categories are more homogenous. COICOP categories 02 "Alcoholic beverages and tobacco", 08 "Communications" and 09 "Leisure and culture" occupy intermediate positions in terms of frequency of price changes. The more rigid categories are COICOP categories 03 "Clothing and footwear", 05 "Furnishing and maintenance of housing", 06 "Health care", 11 "Hotels, cafés and restaurants" and 12 "Miscellaneous goods and services".

The relatively low frequency of price changes and the relatively long median price duration observed for COICOP category 03 "Clothing and footwear" is probably related to the methodological options selected by the statistical agency. As mentioned above, the products which are sampled for this broad category are in many cases highly standardised, and in principle available throughout the year. Moreover, the seasonal rebates relating to the winter and summer sales are ignored in the dataset used. These two factors presumably contribute to the observation of relatively long price spells for this product category.

The breakdown of the CPI into 5 analytical product types, which is often used in the Eurosystem when analysing inflation developments[19], gives a more useful summary of the degree of heterogeneity in terms of pricing behaviour across product categories than the breakdown by product category. This is the case, not only because it is a more compact breakdown, but also because the frequencies of price changes are relatively homogenous within these 5 groups.

The monthly frequency of price changes is highest for energy products, at close to 70 p.c. The median price duration for these products is close to 1 month. For unprocessed food, the frequency of price changes exceeds 30 p.c., while at the same time a substantial degree of heterogeneity within this product type persists. In this group, very flexible fresh fruits and vegetables are in fact combined with less flexible meat prices. In this category, the median price duration is close to 7 months. Processed food occupies an intermediate position, with an average frequency of price changes of 14 p.c. and a median price duration of nearly 8 months. For non-energy industrial goods, the frequency of price changes is substantially lower and the median price duration substantially higher. To some extent, these results seem to be affected by the sampling strategy in the case of clothing and footwear, as mentioned above. Finally, the highest degree of price rigidity is observed for services prices, for which the median price duration amounts to 20 months.

As to macroeconomic modelling, these results imply that it is preferable to incorporate at least two sectors, i.e. a flexible price sector and a sticky price sector, as is done in Aoki (2001). Over and above its impact on inflation dynamics, this will have implications for the conduct of monetary policy, more particularly for the type of inflation stabilisation which is optimal and the optimal reaction to relative price changes. Goodfriend and King (1997)

[19] See for instance the section "Price Developments" in the Monthly Bulletin of the ECB or the chapter "Prices" in the Annual Report of the NBB.

argue in this respect that optimal monetary policy has to stabilise core inflation, which they define as the inflation rate in the sticky price sector of the economy. Taking into account our results in terms of the frequency of price changes for the 5 analytical components of the CPI, the traditional core inflation measure of the type HICP, excluding unprocessed food and energy, would make a lot of sense in this context[20]. This inflation measure actually focuses on price developments in the more sticky sectors of the economy.

Fourth result - Each month, nearly 17 p.c. of consumer prices are changed on average. The median price duration is equal to 13.25 months.

On average, the observed frequency of price changes in Belgium during the period February 1989 - January 2001 amounted to 16.85 p.c., while the median price duration is equal to 13.25 months. This last result is in the range estimated by Galí et al. (2003) for the euro area (an average price duration of around four to six quarters) or the conclusion reached by Taylor (1999) regarding the duration of prices (on average equal to one year).

In order to draw conclusions in terms of the relative degree of price rigidity in the Belgian economy based on this aggregate measure, we have to compare our results with those obtained in other countries. However, direct international comparison can be quite difficult as the results obtained may be influenced by large differences in the coverage of the data analysed and by the methodological options selected by the statistical agencies. For instance, most studies focus either on a small sample of products (Lach and Tsiddon (1992, 1996), Cecchetti (1985, 1986), Ratfai (2003)), on catalogue prices (Kashyap (1995)) or on producer prices (Carlton (1986), Buckle and Carlson (2000)).

More comparable studies are the ones by Bils and Klenow (2002) for the US, Baudry et al. (2004), for France, Dias, Dias and Neves (2004) for Portugal, and Konieczny and Skrzypacz (2002, 2003) for Poland. Compared to the frequency of price changes presented in those articles, our aggregate estimation of the frequency of price changes lies in the lower range of available estimates.

[20] See Aucremanne (2000) for a discussion of alternative core inflation measures.

Table 3 - Frequency of price changes and price duration
International comparison

Aucremanne, Dhyne (2004)	Period covered: Jan 1989-Jan 2001 Full CPI - Belgium Average inflation rate: 2.2 p.c. Frequency of price changes: 16.85 p.c. Median price duration: 13.25 months
Baudry, Le Bihan, Sevestre, Tarrieu (2004)	Period covered : 1994-2003 Full CPI - France Average inflation rate: 1.5 p.c. Frequency of price changes: 18.9 p.c. Median price duration: 6.20 months
Bils and Klenow (2002)	Period covered : 1995-1997 Full CPI - USA Average inflation rate: 2.4 p.c. Frequency of price changes: 26.1 p.c. Median price duration: 4.3 months
Buckle and Carlson (2000)	Producer prices - New Zealand Average price duration : 6.7 months
Carlton (1986)	Period covered: 1957-1966 Producer price - USA Inflation rate: 1.6 p.c. Average price duration: 3.6 - 13.2 months
Cecchetti (1985)	Period covered: 1953-1979 Price of 38 U.S. magazines Annual frequency of price change : from 3 p.c. in low inflation period to 50 p.c. in high inflation period
Dias, Dias and Neves (2004)	Period covered: 1997-2001 Full CPI - Portugal Average inflation rate: 2.6 p.c. Frequency of price changes: 22.0 p.c. Median price duration: 8.5 months
Kashyap (1995)	Period covered: 1953-1987 Catalogue prices - USA Inflation rate: 4.3 p.c. Average price duration: 14.7 months
Konieczny and Skrzypacz (2002), (2003)	Period covered: 1990-1996 52 goods - Poland Inflation rate: 54.2 p.c. Frequency of price change: 37 p.c.
Lach and Tsiddon (1992), (1996)	Period covered - 1978-1979 / 1981-1982 26 products - Israel Inflation rate : 77 p.c. (78-79) 115 p.c. (81-82) Average price duration : 2.2 months (78-79) 1.5 months (81-82)
Ratfai (2003)	Period covered : 1993-1996 14 products, in 9 stores - Hungary Inflation rate: 15 - 35 p.c. Frequency of price changes: 39.3 - 42.5 p.c.

While the higher inflation rate that prevailed in Poland during the economic transition may explain the large difference observed in terms of the frequency of price changes between Belgium and that country, this factor does not seem to be a plausible explanation for the observed differences between our results and those presented in the other 4 studies mentioned above. As the inflation rate is relatively similar in those countries, one could argue that the observed difference could then reflect exogenous differences in the degree of price rigidity.

Focusing explicitly on the difference between the Belgian results and those obtained by Bils and Klenow (2002), such a conclusion would be in line with the results obtained by Galí et al. (2003). According to these authors, the degree of nominal rigidity is indeed higher in the euro area than in the US. However, one should be careful when comparing our results with those of Bils and Klenow, at least for two reasons. First, it should be clear that the average price duration obtained by Bils and Klenow is at the lower end of the available estimates. It is indeed slightly lower than the estimate for the US obtained by Galí et al. (2003) (3 quarters) and less than half of the benchmark duration put forward in Taylor's survey (one year). Second, methodological differences could also play a role and presumably they also affect the comparison with European countries. For instance, rebates relating to the winter and summer sales are not taken into account in Belgium, while they are in France and Portugal. This fact, as well as the sampling strategy for the Belgian CPI in the case of clothing and footwear, increases the median price duration observed in Belgium compared to the other two euro area countries.

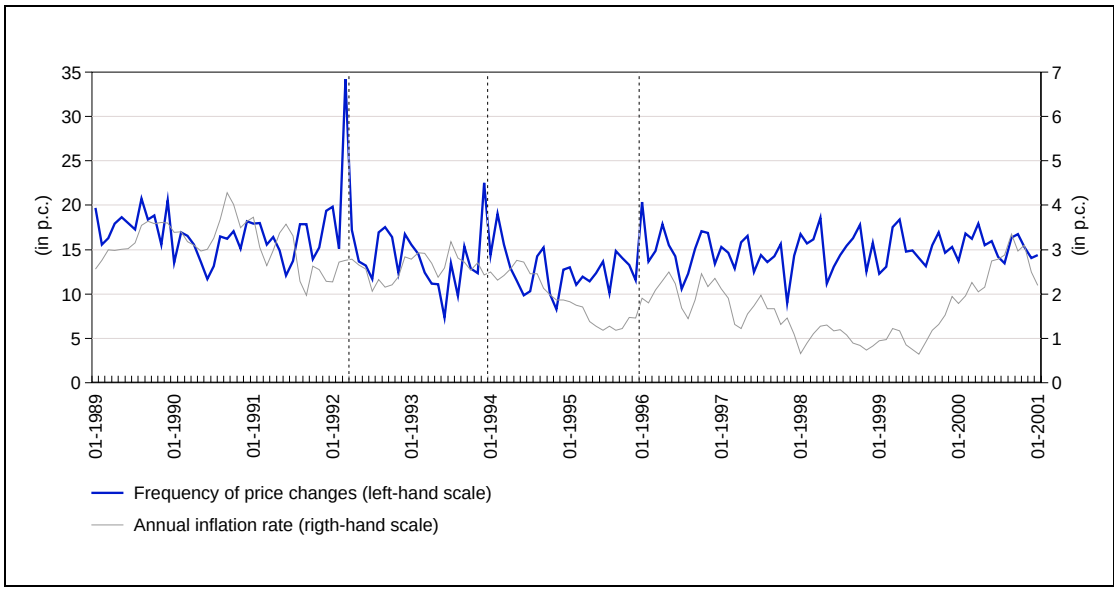
Although it is at this stage unclear what the precise contribution of these methodological differences is, one can get a rough idea by simply excluding all clothing and footwear from the Belgian sample. Doing so reduces the median duration of a price spell from 13.25 months to 11.7 months[21].

[21] For several reasons this gives only an underestimation of the impact of these methodological differences. For instance, other product categories, such as electronic devices, are also affected by winter and summer sales.

Fifth result - *There is some direct evidence of state-dependent features in the price setting behaviour. Indeed, the frequency of price changes was somewhat higher at the beginning of the sample, when aggregate inflation was higher, than at the end of the sample, and price changes are more likely when important shocks, such as VAT rate shocks, take place.*

The frequency approach also allows us to compute time series of the frequencies of price changes. Figures 4.a and 4.b show the weighted average monthly frequency of price changes over the February 1989 - January 2001 period. While Figure 4.a is computed using all the product categories available, Figure 4.b focuses on a basket of product categories observed without interruption during the entire observation period, and which all belong to one of the 3 analytical components of the CPI used for the computation of core inflation[22]. Relative to Figure 4.a, Figure 4.b has the advantage that it controls for composition effects and that it focuses on the more sticky product categories, for which it is more likely to find a link with the overall inflationary environment.

Figure 4.a - Monthly frequency of price changes - Total basket

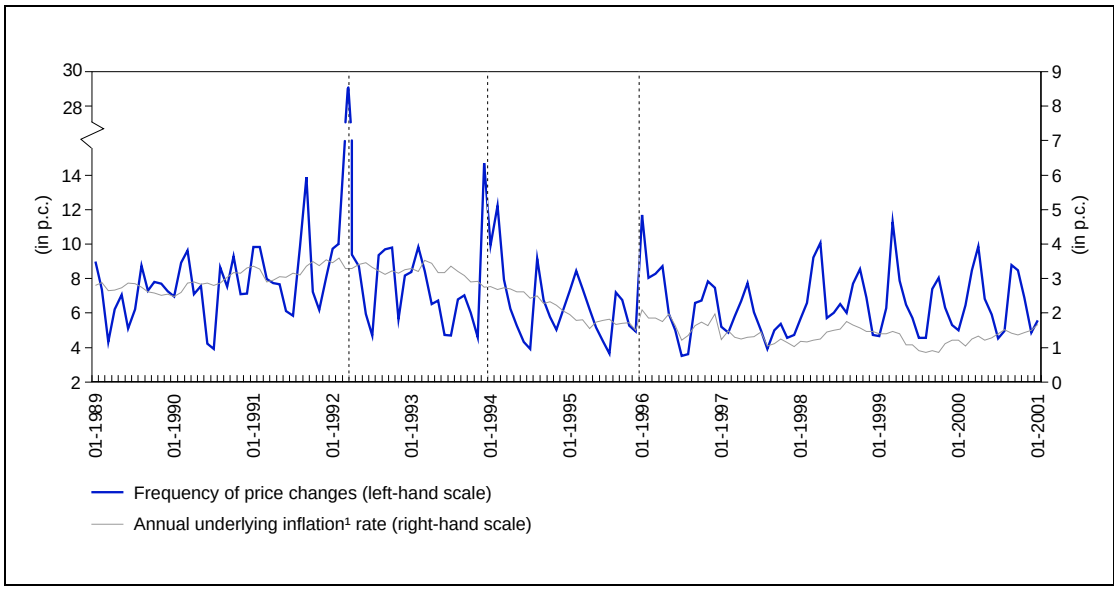


Sources: FPS, NBB.

[22] In other words, excluding unprocessed food and energy.

Figure 4.a shows that the frequency of price changes followed a downward trend as the inflation rate declined from 1989 until the beginning of 1995. The substantial change in the CPI basket that took place in January 1996 may explain the higher frequency of price changes observed after 1995. During the last five years considered, the frequency of price changes remained relatively stable, notwithstanding the acceleration of inflation in the course of 2000. As this acceleration of inflation concerned mostly the most flexible components of the CPI (unprocessed food and energy), it did not imply a significant increase in the aggregate frequency of price changes.

Figure 4.b - Monthly frequency of price changes - Constant basket, excluding energy and unprocessed food



Sources: FPS, NBB.
[1] HICP, excluding unprocessed food and energy.

The link between the frequency of price changes and inflation seems to be even stronger in Figure 4.b, where a measure of core inflation is used for obvious reasons.

The increase in underlying inflation observed until the first quarter of 1992 seems to have led to an increase in the frequency of price changes. Indeed, during the first 12 months of observation (from February 1989 to January 1990), the average frequency of price changes was equal to 7.01 p.c. while underlying inflation averaged 2.71 p.c. On the other hand, during the April 1991 - March 1992 period, the average frequency of price changes was equal to 8.36 p.c. with an average underlying inflation of 3.26 p.c. Similarly, the

decrease in underlying inflation observed from April 1992 to December 1997 seems to have led to a decrease in the frequency of price changes. During the May 1992 - March 1993 period[23], the average frequency of price changes and the average underlying inflation rate were respectively equal to 8.17 p.c. and 3.30 p.c., while those two measures were respectively equal to 5.41 and 1.24 p.c. during the January 1997 - December 1997 period.

As Figure 4.b. controls for composition effects, we no longer observe an increase in the frequency of price changes after January 1996; this clearly indicates that the increase observed in Figure 4.a. results from the change in the CPI basket.

The sudden increase in the frequency of price changes observed in both figures in April 1992 coincides with changes in the VAT rates. Similar but somewhat less pronounced spikes were observed in January 1994 and January 1996, which were also characterised by (less widespread and less pronounced) changes in VAT rates.

Such a sharp increase in the frequency of price changes could also be expected in January 2002 with the introduction of the euro. However, as presented in Cornille (2003), this is only so to some extent. Since prices were quoted both in Belgian francs and in euro before and after January 2002, firms were in fact encouraged to gradually convert their prices to the euro before its physical introduction, and the frequency of price changes increased over a longer time period, which had already started in July 2001[24].

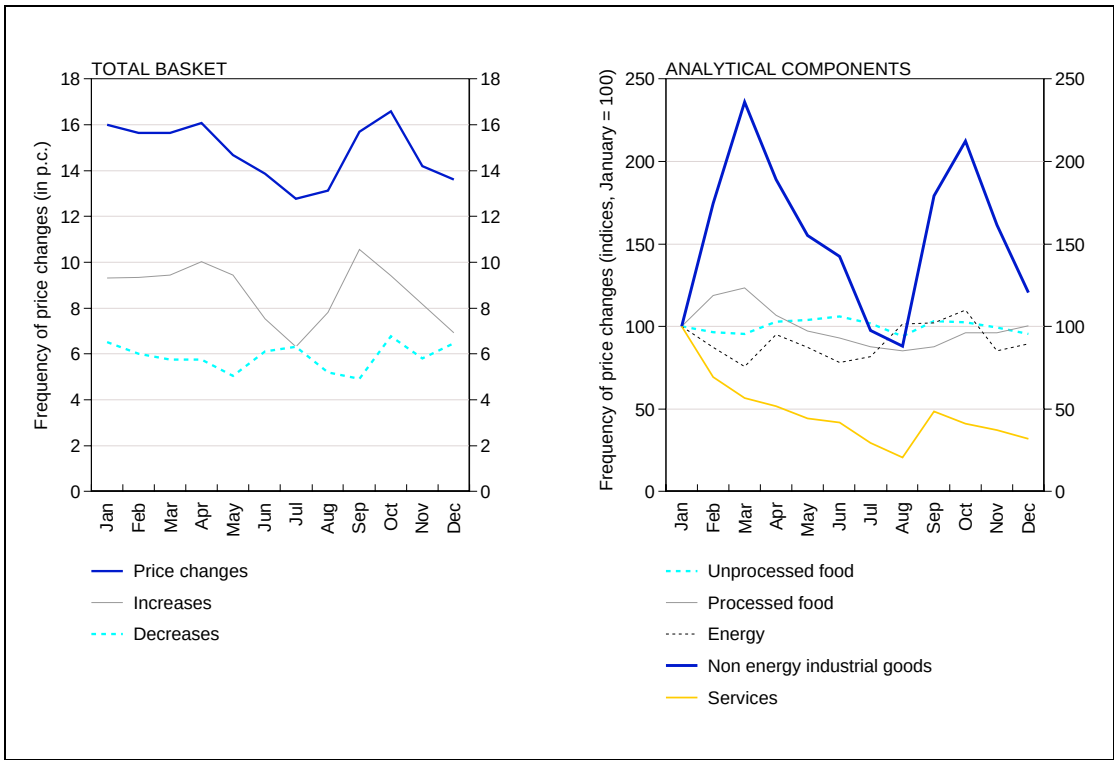
Both phenomena - the link between aggregate inflation and the frequency of price changes, and the spikes in the frequency of price changes when large VAT rate changes occur - are symptomatic for state-dependent characteristics in price setting behaviour.

Sixth result - *There also seems to be evidence of time-dependent aspects in the price setting behaviour: price changes are more likely at the beginning of the year and in September and October, while they are less frequent in the summer and in December.*

[23] We prefer not to consider April 1992 because of the change in the VAT rate that occurred at that date (see below).

[24] See Cornille (2003) for more details about the influence of the introduction of the euro on pricing in Belgium.

Figure 5 - Seasonal pattern of the frequency of price changes[1]



Sources: FPS, NBB.

[1] The seasonal patterns are computed as simple averages, excluding the months affected by VAT rate changes (April 1992, January 1994 and January 1996).

A time series representation of the frequency of price changes also allows us to tackle questions concerning seasonality. Figures 5 presents the seasonal patterns of price changes over the observation period for the total basket considered as a whole and for the 5 analytical components separately. In the first case a distinction is made between price increases and price decreases.

This figure seems to indicate that price changes are more frequent during the first 4 months of the year and in September and October, while they are less frequent during the summer holidays and at the end of the year. This seasonal pattern mostly affects the frequency of price increases, while there is less evidence of a seasonal pattern in the frequency of price decreases. Of course, the latter is due partly to the fact that rebates relating to the winter and summer sales are not recorded in our dataset.

Considering the seasonal patterns of the 5 analytical components of the CPI, it seems that, while such a pattern is not pronounced for the flexible components unprocessed food and energy and the relatively flexible component processed food, it is more marked for the more rigid categories non-energy industrial goods and services. The prices of services mostly change in January. As far as non-energy industrial goods are concerned, price changes mostly occur during the period February-April and during the period September-November.

This seasonality seems to be symptomatic for the existence of some time-dependent characteristics in the price setting process. However, the unconditional nature of our analysis does not allow us to exclude unambiguously the possibility that this seasonality is compatible with state-dependent pricing, as it may result from a seasonal profile in the cost components, e.g. in the wage formation process.

5.2. The direction and the size of price changes

Annex 1 not only presents statistics describing the frequency of price changes, it also presents some information about the direction of price changes and about their size.

Columns 8, 9 and 10 of Annex 1 present respectively the share of price increases in the total number of price changes observed, the average size of price increases in p.c. and the average size of price decreases in p.c. These detailed results are summarised in Table 4.

Seventh result - *There are more price increases than price decreases. However, price decreases are not uncommon, except for services.*

The share of price increases in the total number of price changes per product category ranges from less than 10 p.c. for video recorders to more than 95 p.c. for some health care and transport services. The unweighted and weighted averages of these shares amount to 63 and 69 p.c. respectively. This indicates that, even if price increases are generally more common, price decreases are not rare events for most products. In fact, for some non-energy industrial goods, such as electronic devices, price decreases are commonly observed. Price decreases are particularly uncommon for services, for which 90 p.c. of the price changes are price increases. The share of price increases is substantially lower for the four other analytical components of the CPI.

Table 4 - Direction and size of price changes - breakdown by COICOP category and by analytical product type

	# of product categories	Weighted median		Share of price increases
		Size of price increases	Size of price decreases	
By COICOP				
01 "Food and non-alcoholic beverages"	205	10.03	12.58	59.37
02 "Alcoholic beverages and tobacco"	22	4.74	6.96	73.48
03 "Clothing and footwear"	84	5.70	9.13	74.98
04 "Housing, water, gas and electricity"	25	5.52	6.30	73.82
05 "Furnishing & maintenance of housing"	81	5.68	8.34	70.32
06 "Health care expenses"	15	3.98	4.32	92.86
07 "Transport"	24	3.30	2.72	68.29
08 "Communications"	1	13.80	12.64	30.08
09 "Leisure and culture"	71	9.03	9.80	58.49
11 "Hotels, cafés and restaurants"	20	7.55	8.52	89.26
12 "Miscellaneous goods and services"	35	8.40	6.78	69.26
By analytical product type				
Unprocessed food	123	12.10	14.85	56.09
Processed food	104	7.87	9.44	65.64
Energy	16	3.28	2.72	54.50
Non energy industrial goods	260	6.18	8.51	66.31
Services	80	6.25	6.94	89.26
CPI	**583**	**6.79**	**8.65**	**69.30**

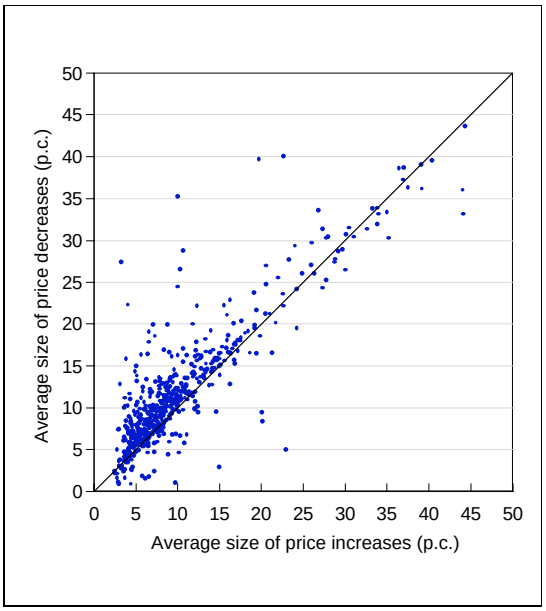
Sources: FPS, NBB

These results are in line with those obtained in other studies using similar datasets, e.g. Baudry et al. (2004) for France (an average share of price increases around 60 p.c.) and Dias, Dias and Neves (2004) for Portugal (a share of price increases around 62 p.c.). They are also in line with results for Finland using more aggregated data (Suvanto and Hukinnen (2002)). Using a similar type of data, Aucremanne et al. (2003) examines whether the chronic right skewness of the cross-sectional distribution of Belgian consumer price changes is exogenous or not. They find that the asymmetry is linked to the overall inflationary environment and therefore mainly appears as endogenous.

Eight result - *The size of price changes is substantial. The median size of price increases is close to 7 p.c., while the median size of price decreases is close to 8.5 p.c. Combined with the staggered nature of the price adjustment (see next result), this leads to a substantial degree of relative price variability within relatively homogenous product categories.*

While price increases are on average slightly more frequent than price decreases, the comparison of columns 9 and 10 of Annex 1 reveals that the average size of price increases per product category is in most cases smaller than the average size of price decreases. This particular result is illustrated by Figure 6.

Figure 6 - Average sizes of price increases and price decreases per product category



Sources: FPS, NBB.

What is even more clearly shown by Figure 6 is the relatively large size of both price increases and price decreases, compared to the average inflation rate of 2.2 p.c. observed during the January 1989 - January 2001 period. According to Table 4, the median size of price increases during the February 1989 - January 2001 period is equal to 6.8 p.c., while the median size of price decreases is equal to 8.7 p.c. Both figures are of comparable orders of magnitude as in other EU countries (Baudry et al. (2004), Dias, Dias and Neves (2004)). Another important fact to mention is that these large price changes also reveal large relative price changes, as the following sub-section shows that most of the price changes are staggered. They therefore lead to a substantial degree of relative price variability within relatively homogenous product categories.

These findings seem to be related to the commercial practices at the retail level. On the one hand, if price decreases mostly indicate promotions, their average size does not depend on inflation and should be relatively large. On the other hand, price increases

reflect two different phenomena. The first phenomenon is the end of promotions. Such price increases should be comparable in size to the price decreases. The second phenomenon is that price increases also reflect price adjustment associated with economic shocks (e.g. positive inflation). The latter type of adjustment presumably results in smaller price increases and explains why the median price increase is lower than the median price decrease.

5.3. The synchronisation of price changes

This section presents some results with respect to the synchronisation of price changes. Perfect synchronisation of price changes occurs when either all outlets change their price simultaneously or no outlets change prices. On the basis of this assumption, Fisher and Konieczny (2000) propose a statistical measure of price synchronisation. This measure is the ratio between the observed standard deviation of the monthly frequencies of price changes at the product category level and the theoretical standard deviation, implied by the average frequency of price changes computed at the product category level, that would be observed under perfect synchronisation[25]. The ratio is one, in the case of perfect synchronisation. Conversely, it is zero in the case of complete absence of synchronisation, i.e. with perfect staggering, for instance with Taylor-contracts or with the Calvo rule.

Ninth result - *There is a great variability in the degree of pricing synchronisation across product categories, but most categories are characterised by a low degree of synchronisation.*

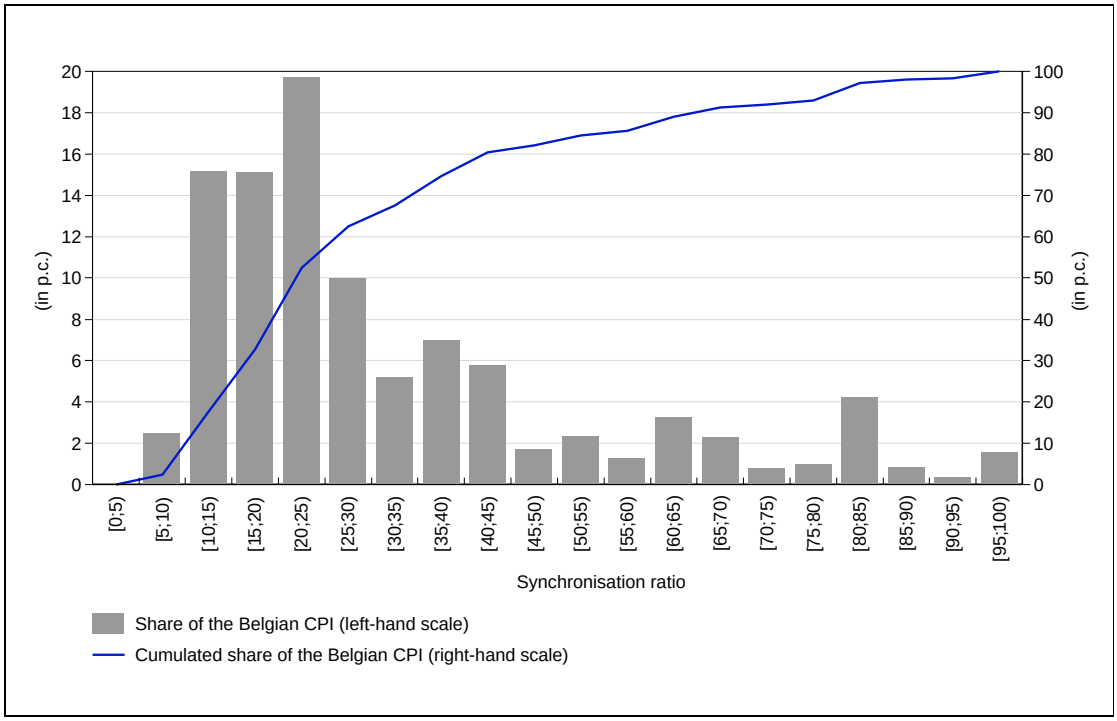
As can be seen from column 11 in Annex 1, the synchronisation of price changes per product category ranges from 7.21 to 98 p.c., revealing a broad spectrum of pricing

[25] The synchronisation ratio proposed by Fisher and Konieczny (2000) is based on the monthly estimation of the frequency of price changes. In case of perfect synchronisation, the proportion of price changes at time t is either equal to 1 or to 0. If the average frequency of price changes for product category j is equal to F_j, it means, in the case of perfect synchronisation, that all the firms change their price simultaneously in F_j p.c. of the cases and do not change their price in 1-F_j p.c. of the cases. Using the probability of price changes, it is then possible to compute the theoretical value of the standard deviation of the proportion of price changes over time in case of perfect synchronisation, which is equal to $SDMAX_j = \sqrt{F_j(1-F_j)}$. This theoretical value is an upper limit for the standard deviation of the proportion of price changes. Similarly, in the case of perfect staggering, a constant proportion F_j of firms changes its price each month and the standard deviation of the proportion of price changes over time is equal to 0. Obviously, the observed standard deviation of price changes for product classification j, given by $SD_j = \sqrt{\frac{1}{\tau-1}\sum_{t=2}^{\tau}(F_{jt}-F_j)^2}$ where τ is the length of the observation period of product category j, belongs to the interval [0, SDMAX]. Therefore, the synchronisation ratio of product category j is given by $SYNC_j = \frac{SD_j}{SDMAX_j}$.

behaviour ranging from quasi-perfect staggering to quasi-perfect synchronisation of price changes.

Figure 7 illustrates this phenomenon. It also illustrates the fact that, while some product categories are characterised by a high degree of synchronisation of price changes, their share is relatively small. Indeed, only 18 p.c. of the CPI has a synchronisation ratio higher than 50 p.c., and only 8 p.c. has a synchronisation ratio higher than 75 p.c. The median value of the synchronisation ratio is relatively low and equals 24 p.c., which is lower than the figure obtained by Konieczny and Skrzypacz (2002) for Poland. All in all, this indicates that price changes do not seem to be highly synchronised, except for some product categories.

Figure 7 - The distribution of the degree of synchronisation of price changes in the Belgian CPI



Sources: FPS, NBB.

The product categories that can be considered as featuring a high degree of synchronisation belong to two classes. The first class is a group of products characterised by very flexible pricing behaviour, such as fresh fruits and vegetables and oil products. For this type of products, the high value of the ratio is merely the reflection of their high degree of price flexibility. For a second class of products, the high value of the ratio more strongly

reflects synchronisation. In that class, one can observe "exogenous" or "forced" price synchronisation associated with goods for which the prices are administered, such as some types of bread, tobacco, health care services or public services, or for which the prices are set by the producers instead of the retailers (for instance, newspapers). Only for certain product categories, such as recreational goods and services, is a more endogenous type of pricing synchronisation observed.

These results are to a considerable extent in line with the staggered nature of price adjustment which is often assumed in macroeconomics.

6. CONCLUSIONS AND DIRECTIONS FOR FURTHER RESEARCH

This paper examines how frequently consumer prices change in Belgium, by exploiting the micro prices underlying the Belgian CPI. In so doing, it tries to obtain a quantitative measure of the unconditional degree of price stickiness in the economy. Moreover, it tries to gain more insight into the qualitative nature of the price setting process and the typical pattern of price changes at the micro level, by addressing such questions as: (i) is the price setting process state-dependent or time-dependent, (ii) are price decreases uncommon, (iii) are price changes synchronised across price-setters which all sell relatively homogenous products? Answering these questions is important as they have considerable implications for inflation dynamics.

On the basis of a large dataset which contains, for each month during the period January 1989 - January 2001, more than 100,000 individual price reports for 583 product categories covering nearly 70 p.c. of the CPI, the paper describes the nature of price adjustment for Belgian consumer prices. Results have been presented in the form of nine basic facts.

Generally speaking, they tend to be in line with the four general features in Taylor's (1999) description of the price (and wage)-setting process. In particular, we find that (i) there is a great deal of heterogeneity in price setting, (ii) the median price duration is close to one year, (iii) price changes do not seem to be highly synchronised, and (iv) there are some indications that the frequency of price changes depends on the aggregate inflation rate. Not only the latter result, but also other characteristics of the price setting process are compatible with state-dependent pricing, e.g. the impact of changes in the VAT rate on the frequency of price adjustment and the observed heterogeneity of the durations, both across and within product categories. The observed seasonality of the frequency of price changes suggests that some time dependency exists as well. We also found that there are more price increases than price decreases. However, price decreases are not uncommon, except for services.

Although the average degree of rigidity in Belgian consumer prices seems to be in line with Taylor (1999) and with the estimation made for the euro area by Galí et al. (2003), the observed frequency of price changes was somewhat lower and the implied duration of price spells was longer than the results obtained in some other recent studies which use similar datasets, for the US (Bils and Klenow (2002)) and for other euro area countries

(Baudry et al (2004) and Dias, Dias and Neves (2004)). Apparently, these differences are to some extent related to the way prices are recorded in the respective databases, but it is at this stage unclear what the precise contribution of these methodological differences is.

In order to obtain a first indication as to the validity of the specifications which are most frequently assumed in macro models, we have exploited the cross-sectional dimension of individual products within homogenous categories. The substantial heterogeneity of durations which we found within product categories is, in principle, at odds with the Taylor contracts in their purest form, while it seems to be more compatible with the Calvo rule or with state-dependent pricing. It is our view that future research should try to gain more insights into the specific characteristics of the observed degree of nominal rigidity, as well as its determinants. Therefore, more direct tests of alternative price setting models should be performed, for instance by using duration models that allow one to compute conditional probabilities of price changes.

If any firm conclusion should be drawn from this paper, then it is that a pricing rule which is in line with the empirical observations at the micro level must be sufficiently general to allow for a very flexible behaviour in some circumstances and a more sticky behaviour in others. Such a rule must inevitably balance the costs of price adjustment with those of non-adjustment and therefore presumably has state-dependent characteristics.

Annex 1 - Price duration, frequency and size of price changes

Product	COICOP	Duration approach			Frequency approach			Average size of price		Synchro ratio
		n_{nc}	T_{nc}	s_{nc}	F	T=1/F	Share of price increase	increase	decrease	
Rice	01.1.1.1	5925	5.66	7.08	13.52	7.40	51.68	7.72	7.96	0.15
Rice in kitchen bags	01.1.1.1	3990	4.17	5.51	17.50	5.72	48.33	8.64	8.50	0.12
Baking flour	01.1.1.2	6522	5.82	7.79	13.34	7.50	45.80	14.06	14.24	0.15
Self raising flour	01.1.1.2	302	4.77	4.18	6.24	16.03	49.03	9.04	8.95	0.09
Spaghetti	01.1.1.3	10440	4.60	6.64	17.64	5.67	51.38	12.37	13.40	0.19
Bread roll	01.1.1.4	470	18.73	19.18	4.06	24.64	80.64	12.35	22.15	0.26
Fancy bread	01.1.1.4	686	12.56	6.11	6.25	16.00	97.41	2.82	1.59	0.83
Grey bread	01.1.1.4	988	15.20	12.52	6.40	15.63	93.03	3.00	7.40	0.80
Homemade bread	01.1.1.4	213	11.80	2.56	8.75	11.43	99.12	3.78	1.60	0.79
Raisin bread	01.1.1.4	802	14.73	15.06	5.42	18.45	83.19	6.74	11.86	0.32
Special bread (400 g)	01.1.1.4	1424	13.37	11.78	7.14	14.00	86.43	4.43	8.12	0.82
Special bread 800 g	01.1.1.4	1376	10.71	6.33	7.14	14.00	85.75	2.84	5.00	0.80
Special bread 800 g (sliced)	01.1.1.4	70	10.49	10.78	2.67	37.51	84.02	5.10	14.95	0.80
Belgian Waffle	01.1.1.5	1809	5.93	7.52	9.94	10.06	56.88	11.20	13.54	0.09
Biscuits	01.1.1.5	8230	5.73	6.92	15.32	6.53	58.25	7.83	9.04	0.19
Carré glacé	01.1.1.5	725	15.04	15.74	5.17	19.33	83.39	9.44	13.63	0.20
Coffee cake	01.1.1.5	550	15.97	15.09	4.57	21.87	84.48	9.13	9.15	0.20
Couque au beurre	01.1.1.5	468	15.99	13.08	4.64	21.55	87.90	9.80	12.29	0.24
Eclair	01.1.1.5	662	15.05	15.68	4.96	20.16	77.34	10.71	15.50	0.21
Rice pudding	01.1.1.5	655	12.65	12.54	5.50	18.17	77.70	12.29	17.87	0.19
Rice pudding (1 kg)	01.1.1.5	421	9.26	8.82	6.28	15.93	73.53	10.07	16.24	0.17
Speculoos	01.1.1.5	7063	6.39	7.80	13.05	7.66	59.43	7.53	8.75	0.15
Swiss cake	01.1.1.5	162	11.46	10.71	3.65	27.43	80.61	9.10	13.39	0.15
Cornflakes	01.1.1.6	4384	4.14	5.48	19.69	5.08	49.57	9.32	9.30	0.12
Fresh pizza	01.1.1.6	1436	5.74	6.70	9.99	10.01	51.75	11.82	11.37	0.15
Instant cream	01.1.1.6	4709	5.27	7.45	13.98	7.15	57.37	12.75	13.64	0.16
Instant cream (100 g)	01.1.1.6	2723	4.34	5.76	15.73	6.36	58.91	11.91	14.25	0.14
Beefsteak	01.1.2.1	6143	5.79	8.46	14.06	7.11	53.42	8.56	9.71	0.14
Boiled meat	01.1.2.1	4987	7.42	9.76	10.78	9.27	58.24	9.89	11.20	0.13
Carbonnade	01.1.2.1	7487	5.22	8.00	15.17	6.59	54.72	11.08	12.73	0.13
Ribsteak	01.1.2.1	5157	6.26	9.01	11.63	8.60	52.30	4.68	5.24	0.14
Roast beef	01.1.2.1	6866	5.57	8.10	14.66	6.82	56.40	6.08	7.39	0.13
Sirloin	01.1.2.1	3535	3.57	3.93	20.57	4.86	54.89	8.30	9.56	0.12
Roast veal	01.1.2.2	4821	6.51	9.80	12.49	8.01	63.73	6.62	8.18	0.15
Pork chop (filet)	01.1.2.3	13989	3.93	5.86	22.70	4.41	55.43	9.09	10.05	0.23
Pork rib	01.1.2.3	12074	4.04	5.94	21.82	4.58	56.53	10.82	11.83	0.22
Roast ham	01.1.2.3	10639	4.37	6.24	20.02	4.99	55.47	10.14	10.72	0.22
Leg of lamb	01.1.2.4	2840	3.96	4.73	19.78	5.06	55.14	17.65	20.40	0.12
Chicken to be roasted	01.1.2.5	8112	4.23	6.52	19.82	5.05	52.71	15.31	17.24	0.10
Turkey fillet	01.1.2.5	3469	3.57	4.30	21.50	4.65	54.19	14.47	15.90	0.08
Rabbit	01.1.2.6	9758	3.02	4.22	28.88	3.46	53.18	13.14	13.87	0.14
Black pudding	01.1.2.7	4048	7.07	9.90	10.85	9.21	64.10	13.34	18.18	0.11
Boiled ham	01.1.2.7	8491	5.38	8.20	15.82	6.32	63.61	9.85	13.94	0.13
Coarse pâté made with pork	01.1.2.7	4106	6.97	9.91	11.14	8.98	63.97	12.10	16.11	0.09
Ham	01.1.2.7	6199	6.01	8.82	13.71	7.29	64.26	9.65	13.86	0.13
Ham sausage	01.1.2.7	3961	7.66	10.92	10.28	9.72	62.21	15.60	22.23	0.11
Liver pâté	01.1.2.7	319	5.54	3.90	6.89	14.52	83.02	8.06	9.42	0.09
Pork and beef sausage	01.1.2.7	4457	7.71	10.53	10.63	9.41	67.58	9.63	14.56	0.12
Smoked and salted bacon	01.1.2.7	5273	6.72	9.96	12.23	8.17	64.43	12.18	16.82	0.14
Streaky bacon	01.1.2.7	1459	3.56	2.97	16.44	6.08	69.76	9.43	9.70	0.15
Frankfurters	01.1.2.8	7149	4.98	6.06	16.57	6.04	60.28	7.21	8.95	0.20
Ground meat	01.1.2.8	7017	5.83	8.86	14.71	6.80	61.46	12.45	16.30	0.17
Hamburger	01.1.2.8	1976	4.79	5.95	14.47	6.91	56.31	11.86	13.66	0.07
Meat salad	01.1.2.8	2348	8.93	12.71	8.16	12.26	64.83	14.04	19.21	0.09
Sausage	01.1.2.8	6369	6.50	9.56	13.11	7.63	62.26	11.69	15.15	0.18
Steak tartare	01.1.2.8	5727	5.68	8.89	13.57	7.37	57.64	12.04	14.85	0.13

Product	COICOP	Duration approach			Frequency approach			Average size of price		Synchro ratio
		n_{nc}	T_{nc}	s_{nc}	F	T=1/F	Share of price increase	increase	decrease	
TV sausage	01.1.2.8	8015	3.98	4.91	21.04	4.75	62.59	8.31	9.96	0.21
Fillet of fish	01.1.3.1	20542	1.36	1.28	72.77	1.37	52.06	11.38	11.87	0.13
Fresh cod	01.1.3.1	21196	1.34	1.11	73.91	1.35	53.27	11.09	11.71	0.15
Mussels	01.1.3.1	2982	2.62	2.50	34.86	2.87	53.05	17.26	16.79	0.54
Pink salmon	01.1.3.1	5635	1.79	2.13	49.80	2.01	52.77	15.16	16.50	0.13
Plaice	01.1.3.1	6949	1.52	1.38	62.04	1.61	54.23	14.15	14.67	0.16
Prawns	01.1.3.1	3042	2.91	4.02	27.29	3.66	57.25	14.05	15.21	0.14
Rainbow trout	01.1.3.1	4004	2.23	2.92	36.51	2.74	50.94	16.59	17.01	0.16
Shrimps	01.1.3.1	6262	1.96	2.18	49.52	2.02	54.16	14.21	14.39	0.25
Skate (wing)	01.1.3.1	7729	1.38	1.24	69.40	1.44	52.88	13.23	13.55	0.19
Sole	01.1.3.1	22049	1.29	0.90	76.72	1.30	51.81	12.64	13.02	0.16
Whiting	01.1.3.1	1948	1.26	0.57	76.32	1.31	56.26	19.84	18.55	0.44
Cod fillet (frozen)	01.1.3.2	1299	5.12	5.81	8.57	11.67	72.24	10.81	12.02	0.35
Fish stakes	01.1.3.2	4390	5.30	5.82	13.92	7.18	55.71	9.16	13.62	0.33
Fishcakes ()	01.1.3.2	2499	4.28	5.13	14.22	7.03	56.68	12.07	14.05	0.21
Smoked salmon	01.1.3.3	2518	3.62	5.00	19.99	5.00	49.44	15.65	15.57	0.13
Tinned salmon	01.1.3.4	7023	5.35	6.47	16.67	6.00	41.97	16.75	15.72	0.15
Tinned sardines	01.1.3.4	3619	7.71	8.22	10.32	9.69	58.72	10.48	12.86	0.15
Tinned sardines	01.1.3.4	1489	7.88	7.88	8.95	11.17	61.09	9.59	10.94	0.14
Tinned tuna	01.1.3.4	4732	3.80	4.09	19.76	5.06	54.40	10.93	11.11	0.12
Condensed milk	01.1.4.1	477	5.60	4.03	8.41	11.88	79.59	6.88	7.84	0.17
Fruit yoghurt	01.1.4.1	6139	5.27	6.16	15.77	6.34	55.56	7.87	11.64	0.17
Half-skimmed milk	01.1.4.1	6467	6.90	9.20	12.74	7.85	52.88	8.76	10.65	0.17
Low-fat yoghurt	01.1.4.1	9261	5.02	6.32	17.49	5.72	57.80	8.09	10.59	0.19
Sterilised milk (shop)	01.1.4.1	6750	7.32	9.95	11.67	8.57	56.00	7.40	8.81	0.17
Unskimmed fruit yoghurt 150 g	01.1.4.1	2673	5.48	6.28	13.69	7.30	53.15	8.26	10.51	0.15
Whipped cream	01.1.4.1	6384	6.23	8.38	13.37	7.48	54.66	8.91	11.13	0.13
Brie	01.1.4.2	5498	6.27	8.42	12.62	7.93	54.71	12.85	16.22	0.10
Camembert	01.1.4.2	5450	5.22	6.70	15.51	6.45	52.26	9.30	11.34	0.12
Camembert (250 g)	01.1.4.2	3882	4.11	4.86	18.82	5.31	48.78	9.17	10.20	0.09
Cheese (type Edam)	01.1.4.2	4415	6.74	8.90	12.40	8.06	62.23	8.74	11.99	0.11
Cheese (type Gouda)	01.1.4.2	8351	5.62	7.99	14.82	6.75	56.92	12.83	16.06	0.10
Emmentaler	01.1.4.2	5477	5.82	8.24	13.40	7.46	59.20	10.03	12.32	0.11
Low-fat white cheese	01.1.4.2	10115	4.55	6.51	19.17	5.22	53.88	10.73	12.44	0.14
Processed Gruyere (150 g)	01.1.4.2	2782	5.39	6.33	14.20	7.04	55.29	6.28	7.33	0.12
Processed Gruyère cheese	01.1.4.2	5413	5.48	6.25	14.90	6.71	61.43	6.72	9.12	0.17
Eggs	01.1.4.3	25853	2.44	3.82	36.27	2.76	51.59	10.00	10.17	0.13
Commercial butter	01.1.5.1	832	4.51	3.39	12.31	8.12	59.49	3.14	3.76	0.16
Dairy butter	01.1.5.1	7957	6.04	8.29	13.92	7.18	56.27	5.86	6.83	0.12
Diet margarine	01.1.5.2	14744	3.74	4.32	24.43	4.09	56.97	5.05	6.04	0.27
Margarine (standard)	01.1.5.2	18681	3.73	3.90	24.65	4.06	62.62	5.43	7.11	0.26
Margarine (super)	01.1.5.2	12241	4.29	4.30	20.63	4.85	64.45	4.52	6.47	0.30
Minarine	01.1.5.2	13665	3.55	4.64	25.05	3.99	57.23	5.71	6.81	0.24
Corn oil	01.1.5.3	13098	4.32	4.98	20.92	4.78	55.42	6.85	7.86	0.16
Groundnut oil	01.1.5.3	12209	4.49	4.99	20.33	4.92	54.20	7.58	7.69	0.19
Appels : Cox's orange type	01.1.6.1	7586	1.32	0.60	72.96	1.37	55.08	20.58	26.91	0.43
Apples: imported golden	01.1.6.1	28708	1.71	1.44	57.59	1.74	55.15	16.71	20.06	0.29
Apples: American type	01.1.6.1	6799	1.90	1.26	50.76	1.97	45.56	15.85	17.15	0.52
Apples: Belgian golden	01.1.6.1	12350	1.77	1.40	55.23	1.81	52.61	19.44	21.63	0.45
Apples: Boskoop type	01.1.6.1	17927	1.51	1.00	65.20	1.53	53.25	22.02	25.49	0.40
Apples: Gloucester type	01.1.6.1	3595	2.42	1.64	38.30	2.61	43.15	18.08	18.89	0.66
Apples: Granny Smith type	01.1.6.1	38467	1.58	1.27	62.14	1.61	53.71	15.96	18.05	0.25
Apples: James Grieve type	01.1.6.1	2040	1.00	0.00	100.00	1.00	29.70	42.15	53.28	
Apples: Jonagold type	01.1.6.1	37904	1.50	1.15	66.00	1.52	54.14	20.60	24.75	0.25

Product	COICOP	Duration approach			Frequency approach			Average size of price		Synchro ratio
		n_{nc}	T_{nc}	s_{nc}	F	T=1/F	Share of price increase	increase	decrease	
Apples: starking type	01.1.6.1	305	1.12	0.32	61.62	1.62	58.76	14.11	12.71	0.43
Apricots	01.1.6.1	8259	1.10	0.30	90.09	1.11	46.55	29.21	28.70	0.35
Bananas	01.1.6.1	41925	1.49	1.22	65.85	1.52	52.20	17.46	17.96	0.29
Cherries	01.1.6.1	7666	1.06	0.24	92.83	1.08	46.17	28.76	27.37	0.29
Clementines	01.1.6.1	2227	1.08	0.30	89.83	1.11	49.98	23.31	27.69	0.29
Grapes: Lavallée	01.1.6.1	566	1.00	0.00	83.12	1.20	53.86	19.44	16.48	0.32
Grapes: Italia	01.1.6.1	17021	1.17	0.45	85.23	1.17	56.73	26.84	33.58	0.32
Grapes: Regina	01.1.6.1	3831	1.46	0.50	67.38	1.48	34.47	39.22	36.12	0.72
Grapes: Royal Belgian	01.1.6.1	3252	1.31	0.46	75.69	1.32	35.00	26.34	26.01	0.59
Kiwis	01.1.6.1	34193	1.65	1.29	59.78	1.67	51.17	25.96	27.01	0.20
Lemons	01.1.6.1	36614	1.65	1.76	58.98	1.70	51.65	14.41	14.70	0.18
Melons	01.1.6.1	24410	1.04	0.22	95.68	1.05	47.66	37.53	36.32	0.22
Nectarines	01.1.6.1	12148	1.10	0.33	89.74	1.11	48.11	29.71	28.91	0.28
Nuts	01.1.6.1	3264	1.00	0.00	100.00	1.00	42.60	28.81	27.72	
Oranges	01.1.6.1	43638	1.46	0.99	68.10	1.47	51.80	17.22	18.06	0.23
Peaches	01.1.6.1	17829	1.11	0.36	89.15	1.12	49.32	31.04	30.37	0.25
Pears: Triumph of Vienna type	01.1.6.1	2945	1.00	0.00	100.00	1.00	35.41	24.07	29.33	
Pears: Conference type	01.1.6.1	26238	1.50	0.96	65.99	1.52	53.87	15.93	21.06	0.42
Pears: Doyenné du Commice type	01.1.6.1	12307	1.35	0.69	72.94	1.37	52.51	16.29	22.89	0.43
Pears: Durondeau type	01.1.6.1	6783	1.25	0.44	77.99	1.28	48.31	19.12	23.75	0.53
Pears: Guyot type	01.1.6.1	3832	1.00	0.00	100.00	1.00	47.64	27.97	30.42	
Pears: Packham	01.1.6.1	9691	1.29	0.59	75.38	1.33	49.06	16.87	17.73	0.43
Pears: passe crassanne type	01.1.6.1	-	-	-	100.00	1.00	73.75	21.27	16.58	
Plums	01.1.6.1	7446	1.12	0.33	87.19	1.15	47.33	27.78	30.25	0.39
Redcurrants	01.1.6.1	2229	1.00	0.00	100.00	1.00	34.70	35.06	33.38	
Strawberries	01.1.6.1	18871	1.07	0.26	93.61	1.07	49.50	44.37	43.64	0.32
Tangerine	01.1.6.1	21833	1.25	0.62	77.38	1.29	53.26	26.03	29.68	0.49
White grapefruit	01.1.6.1	39085	1.57	1.50	62.93	1.59	51.65	17.60	18.36	0.16
Apricot halves (425g can)	01.1.6.3	2406	5.62	6.09	12.73	7.86	58.13	10.31	10.87	0.11
Tinned pineapple	01.1.6.3	4525	6.60	8.10	12.48	8.02	47.29	13.27	14.45	0.12
Tinned apricot halves	01.1.6.3	3395	7.57	9.43	10.33	9.68	53.60	12.38	13.42	0.11
Tinned pineapple slices (570g)	01.1.6.3	3584	4.61	5.14	15.95	6.27	60.99	10.64	11.86	0.11
Asparagus	01.1.7.1	10765	1.16	0.44	85.37	1.17	48.16	33.88	33.86	0.38
Beans for cutting	01.1.7.1	3193	1.26	0.44	76.84	1.30	43.04	36.90	37.23	0.55
Belgian Endives	01.1.7.1	43397	1.13	0.42	87.97	1.14	47.75	27.77	25.23	0.22
Brussels sprouts	01.1.7.1	18027	1.12	0.39	88.66	1.13	48.89	34.02	33.14	0.26
Carrots	01.1.7.1	38794	1.59	1.24	62.14	1.61	51.33	22.57	23.57	0.28
Cauliflower	01.1.7.1	62791	1.02	0.15	98.21	1.02	50.06	33.28	33.81	0.12
Celery	01.1.7.1	25194	1.03	0.22	96.54	1.04	50.29	37.02	38.68	0.18
Corn salad	01.1.7.1	15888	1.14	0.45	86.36	1.16	49.06	39.06	39.05	0.31
Cucumbers	01.1.7.1	30222	1.03	0.19	97.17	1.03	48.86	32.63	31.32	0.15
Cultivated mushrooms	01.1.7.1	21101	2.50	3.91	36.76	2.72	51.10	17.02	17.54	0.25
Endive	01.1.7.1	17573	1.10	0.42	90.16	1.11	49.69	30.14	30.69	0.37
Green beans	01.1.7.1	35348	1.17	0.51	85.48	1.17	48.60	40.40	39.55	0.27
Greenhouse tomatoes	01.1.7.1	57304	1.11	0.37	89.85	1.11	50.73	30.46	31.47	0.19
Leeks	01.1.7.1	62106	1.03	0.21	97.22	1.03	45.36	44.10	35.98	0.13
Lettuce	01.1.7.1	62737	1.02	0.14	98.14	1.02	51.51	36.49	38.61	0.12
Onions	01.1.7.1	32621	1.85	1.70	52.78	1.89	51.27	24.92	26.05	0.32
Paprika peppers	01.1.7.1	49158	1.17	0.53	84.69	1.18	53.26	27.31	31.37	0.17
Radishes	01.1.7.1	10129	1.04	0.20	96.04	1.04	47.27	33.86	31.96	0.27
Spinach	01.1.7.1	436	1.00	0.00	86.92	1.15	27.94	22.65	40.05	0.27
Peas	01.1.7.3	5359	6.45	7.55	11.86	8.43	54.17	9.90	11.60	0.14
Peas (tinned)	01.1.7.3	2581	5.61	7.30	12.50	8.00	56.37	13.45	15.20	0.12
Peeled tinned tomatoes	01.1.7.3	3345	7.97	10.14	9.15	10.93	43.55	16.27	16.55	0.11

Product	COICOP	Duration approach			Frequency approach			Average size of price		Synchro ratio
		n_{nc}	T_{nc}	s_{nc}	F	T=1/F	Share of price increase	increase	decrease	
Peeled tinned tomatoes -- 400 g	01.1.7.3	2556	5.31	6.31	12.37	8.08	62.41	12.32	15.56	0.19
White beans in tomato sauce	01.1.7.3	4277	6.63	8.18	11.16	8.96	56.42	10.88	13.52	0.14
White beans with tomato sauce -- 400 g	01.1.7.3	2520	5.80	7.38	12.41	8.06	54.10	11.52	11.54	0.14
Frozen spinach	01.1.7.4	1767	4.91	6.87	8.15	12.27	49.21	21.05	21.19	0.27
Frozen spinach (450 g)	01.1.7.4	808	6.68	9.31	6.81	14.68	56.00	16.82	17.54	0.16
Vegetables for soup (frozen)	01.1.7.4	1049	5.47	7.33	8.30	12.05	49.81	15.01	16.47	0.12
Chips potatoes frozen	01.1.7.5	2546	5.75	5.89	13.39	7.47	55.25	12.00	13.84	0.21
Potato chips	01.1.7.5	1647	9.30	12.42	5.98	16.74	48.93	15.14	15.13	0.09
Potato chips	01.1.7.5	2239	5.12	7.75	13.91	7.19	49.50	11.76	14.09	0.17
Potatoes	01.1.7.5	6812	1.50	1.02	59.12	1.69	50.21	27.32	24.30	0.35
Potatoes	01.1.7.5	35381	1.60	1.26	61.69	1.62	42.99	44.11	33.14	0.43
Crystallised sugar	01.1.8.1	4584	8.87	9.88	9.11	10.98	51.30	3.64	4.09	0.19
Lump sugar	01.1.8.1	6150	8.06	8.15	10.28	9.73	63.75	3.19	2.90	0.27
Four fruits jam	01.1.8.2	9876	5.13	7.33	16.13	6.20	56.09	9.28	11.19	0.15
Redcurrant jam	01.1.8.2	7171	5.19	7.01	15.19	6.58	57.29	9.53	11.98	0.15
Black chocolate (bar)	01.1.8.3	144	6.57	5.57	5.21	19.21	78.86	5.85	5.77	0.37
Black chocolate bar	01.1.8.3	13088	3.72	4.97	22.76	4.39	53.29	5.48	5.95	0.22
Candy bar	01.1.8.3	2006	5.51	6.39	10.68	9.37	59.29	8.85	11.08	0.14
Chocolate delight	01.1.8.3	5182	5.43	7.19	13.26	7.54	55.72	11.16	12.60	0.17
Chocolate paste	01.1.8.3	4447	5.97	7.19	13.47	7.43	54.15	9.98	11.08	0.15
Ice cream	01.1.8.3	4161	6.76	8.62	11.62	8.60	52.63	14.95	15.78	0.21
Milk chocolate (bar)	01.1.8.3	8727	4.97	7.00	16.03	6.24	54.95	10.38	11.94	0.24
Nut chocolate pasta	01.1.8.3	2273	5.55	6.26	11.51	8.69	52.85	6.69	7.60	0.10
Toffees	01.1.8.3	5241	7.19	8.77	11.44	8.74	63.08	7.50	9.10	0.14
Mayonnaise	01.1.9.0	7600	4.59	5.45	18.35	5.45	50.95	10.42	11.37	0.12
Mayonnaise (l)	01.1.9.0	5439	3.62	4.21	22.92	4.36	50.43	13.45	14.28	0.13
Mustard	01.1.9.0	6961	6.42	8.56	12.92	7.74	55.21	10.07	12.10	0.15
Tomato soup	01.1.9.0	6997	4.77	6.08	17.19	5.82	60.06	8.77	10.12	0.15
Tomato soup can -- 500 g)	01.1.9.0	4815	3.82	5.05	21.84	4.58	55.91	8.05	8.85	0.13
Coffee beans or ground coffee	01.2.1.0	22837	3.08	3.38	30.88	3.24	49.85	7.97	7.21	0.29
Instant coffee	01.2.1.0	5441	6.07	7.81	14.24	7.02	48.80	8.17	7.16	0.20
Instant coffee (kg)	01.2.1.0	3761	4.58	5.20	17.91	5.58	43.36	6.39	5.91	0.17
Mineral water	01.2.2.1	5087	7.08	8.79	10.32	9.69	53.60	14.85	104.28	0.32
Still water	01.2.2.1	7660	5.78	7.84	14.45	6.92	56.55	8.44	60.70	0.26
Cola	01.2.2.2	2912	7.41	8.09	10.04	9.96	62.33	7.79	12.58	0.19
Cola soda (1.5 l)	01.2.2.2	3415	5.19	5.80	15.66	6.39	62.20	4.47	5.88	0.22
Fruit juice	01.2.2.2	10025	4.89	6.49	17.72	5.64	49.72	11.04	11.87	0.11
Lemon tea (33 cl)	01.2.2.2	3354	4.05	5.74	16.09	6.21	55.90	9.30	10.62	0.10
Lemonade	01.2.2.2.	154	4.92	3.21	10.00	10.00	48.07	4.67	428.22	0.67
White soda (1 litre)	01.2.2.2	952	7.12	8.30	8.06	12.40	59.10	9.91	13.77	0.14
White soda (1.5 l)	01.2.2.2	3276	6.75	8.16	10.73	9.32	54.91	9.36	11.02	0.14
Lager	02.1.1.0	9404	5.10	6.11	17.50	5.71	60.96	6.41	7.10	0.24
Pils for home drinking	02.1.1.0	739	9.70	8.18	8.33	12.00	94.37	4.61	2.52	0.52
Table beer	02.1.1.0	6560	6.34	7.14	13.76	7.27	66.29	7.96	10.77	0.25
Beaujolais Village (most recent) wine	02.1.2.0	1871	5.86	5.76	14.09	7.10	60.69	8.21	9.73	0.19
Beaujolais Village wine	02.1.2.0	3494	6.61	7.12	11.68	8.56	55.05	8.74	12.97	0.27
Loire Valley wine	02.1.2.0	4872	5.96	6.29	13.96	7.16	52.42	9.61	12.05	0.27
Porto wine (l)	02.1.2.0	5823	3.39	4.26	24.87	4.02	57.31	6.49	6.96	0.16
Red wine	02.1.2.0	4531	8.32	8.60	9.94	10.06	60.47	6.45	9.44	0.29
Val de Loire wine (Muscadet)	02.1.2.0	2495	5.50	6.09	14.95	6.69	59.99	8.88	12.41	0.21
Vermouth	02.1.2.0	9361	4.21	4.42	21.44	4.67	61.42	5.52	6.02	0.26
Vermouth (l)	02.1.2.0	5743	3.54	4.57	24.27	4.12	57.62	4.30	3.89	0.23

Product	COICOP	Duration approach			Frequency approach			Average size of price		Synchro ratio
		n_{nc}	T_{nc}	s_{nc}	F	T=1/F	Share of price increase	increase	decrease	
Gin	02.1.3.0	7630	4.80	5.55	18.44	5.42	59.52	4.17	5.02	0.28
Gin (minimum 32 degrees)	02.1.3.0	4236	3.86	5.06	20.33	4.92	57.83	3.61	3.69	0.22
Liqueur	02.1.3.0	7146	4.54	5.19	19.69	5.08	59.23	3.81	4.29	0.31
Liqueur (i)	02.1.3.0	4408	3.76	4.51	23.55	4.25	61.90	3.07	3.04	0.25
Scotch whisky	02.1.3.0	10330	3.69	4.47	24.44	4.09	52.69	4.74	5.18	0.27
Whisky	02.1.3.0	5944	3.25	4.43	25.62	3.90	52.36	4.04	4.33	0.19
King-size cigarettes	02.2.1.0	5200	7.20	4.12	13.40	7.46	90.39	3.59	2.51	0.59
Standard cigarettes	02.2.1.0	4585	7.94	4.07	12.27	8.15	97.54	3.94	4.28	0.62
Cigarillos	02.2.2.0	2719	10.27	6.59	8.93	11.20	92.19	3.89	15.84	0.34
Tobacco	02.2.2.0	3141	7.31	4.86	13.13	7.62	95.99	5.49	51.10	0.56
Tobacco (50 g)	02.2.2.0	1182	9.16	4.46	10.25	9.76	97.65	3.32	27.44	0.55
Fabric for dress	03.1.1.0	412	10.97	12.89	4.31	23.21	80.68	3.77	6.18	0.18
Petticoat	03.1.1.0	109	4.63	3.95	4.58	21.83	93.49	6.07	6.92	0.12
Jogging suit (ladies)	03.1.2.1	166	10.40	8.20	3.81	26.23	57.35	7.94	7.32	0.19
Jogging suit (men)	03.1.2.1	169	10.52	8.40	3.66	27.29	57.86	8.31	7.62	0.18
Jogging wear	03.1.2.1	368	12.48	12.60	3.69	27.13	71.00	8.05	9.36	0.17
Swimsuit	03.1.2.1	312	17.12	18.31	2.92	34.20	65.52	7.31	8.95	0.17
Blazer	03.1.2.2	1022	10.04	9.56	6.51	15.37	88.74	4.34	7.06	0.25
Children jacket (six years)	03.1.2.2	786	14.62	15.59	4.77	20.95	69.22	6.95	9.13	0.25
Children's jeans	03.1.2.2	560	13.50	12.70	4.22	23.69	72.73	5.61	9.07	0.20
Coat (ladies)	03.1.2.2	833	13.86	16.00	5.19	19.28	74.20	4.54	8.03	0.28
Jaket for men	03.1.2.2	1209	12.46	13.14	5.98	16.72	80.83	4.21	8.91	0.25
Jeans	03.1.2.2	403	13.94	13.35	3.77	26.50	79.42	6.73	8.70	0.20
Jeans size 38-40	03.1.2.2	211	10.58	8.66	4.16	24.04	53.47	8.49	9.74	0.23
Jeans, size 50	03.1.2.2	211	11.03	8.16	3.81	26.22	52.00	8.02	9.08	0.22
Ladies anorak	03.1.2.2	208	10.93	9.17	3.91	25.58	51.48	8.43	9.06	0.25
Ladies dress (Jersey)	03.1.2.2	453	12.95	13.84	3.76	26.58	76.94	4.40	10.98	0.20
Ladies dress (short sleeves)	03.1.2.2	348	13.37	12.96	3.32	30.11	73.81	3.79	10.20	0.21
Ladies raincoat	03.1.2.2	939	13.09	14.38	5.27	18.98	74.55	4.75	7.20	0.23
Ladies skirt	03.1.2.2	731	11.98	12.10	4.98	20.07	75.45	5.12	10.28	0.21
Ladies trousers	03.1.2.2	704	12.36	11.74	4.92	20.34	81.23	5.25	10.63	0.22
Lady's suit	03.1.2.2	969	12.32	13.11	5.47	18.29	72.74	4.47	8.09	0.24
Leather jacket	03.1.2.2	299	10.79	11.24	4.26	23.48	67.80	4.12	4.80	0.40
Leather jacket -- Lady	03.1.2.2	106	11.47	8.61	3.55	28.13	46.24	5.67	8.56	0.22
Leather jacket -- man	03.1.2.2	134	9.72	7.41	3.90	25.65	46.79	8.23	7.74	0.25
Long sleeves dress	03.1.2.2	146	12.53	10.29	3.25	30.74	52.36	6.18	8.24	0.22
Men anorak	03.1.2.2	205	10.28	7.83	3.88	25.79	51.93	9.13	8.85	0.25
Men's jeans	03.1.2.2	689	12.92	12.24	4.59	21.81	79.65	5.70	9.16	0.22
Men's trousers	03.1.2.2	756	12.81	11.98	4.88	20.49	82.14	4.96	9.14	0.22
Minimum 30 percent wool blazer	03.1.2.2	267	11.48	8.82	4.33	23.07	64.18	5.38	7.39	0.25
Minimum 30 percent wool suit	03.1.2.2	202	12.24	9.19	3.91	25.57	55.99	5.40	7.21	0.25
Pullover (ladies)	03.1.2.2	1148	12.20	12.67	5.72	17.50	81.00	7.44	10.07	0.25
Pullover (men)	03.1.2.2	1106	13.04	13.16	5.54	18.05	78.42	6.21	10.18	0.25
Raincoat (men)	03.1.2.2	676	10.97	10.53	5.07	19.72	85.95	4.62	7.92	0.24
Raincoat, minimum 30% wool	03.1.2.2	150	11.11	9.55	3.35	29.87	54.74	6.12	6.24	0.24
Shirt for small girl (six years)	03.1.2.2	604	13.50	15.39	4.36	22.96	58.31	7.88	11.61	0.20
Short-sleeves dress	03.1.2.2	145	12.61	9.95	3.07	32.53	42.70	6.04	10.62	0.23
Skirt minimum 30% wool	03.1.2.2	246	10.64	8.06	4.00	25.00	55.75	6.81	8.15	0.24
Smart trousers, minimum 30% wool	03.1.2.2	197	11.35	8.96	3.63	27.59	51.16	6.64	7.64	0.25
Sweater (six years)	03.1.2.2	208	10.65	8.50	4.04	24.76	49.11	12.39	10.19	0.25
Synthetic suit	03.1.2.2	811	10.60	9.90	5.64	17.72	87.92	3.86	8.43	0.24
Trousers for boys (six years)	03.1.2.2	605	15.06	16.89	4.24	23.60	60.89	8.04	9.93	0.22

Product	COICOP	Duration approach			Frequency approach			Average size of price		Synchro ratio
		n_{nc}	T_{nc}	s_{nc}	F	T=1/F	Share of price increase	increase	decrease	
Trousers minimum 30% wool	03.1.2.2	257	11.26	8.32	4.31	23.22	52.13	7.50	8.57	0.26
Trousers, casual, velours	03.1.2.2	198	11.86	9.47	3.86	25.90	51.94	8.31	9.25	0.27
Winter anorak	03.1.2.2	303	14.08	12.67	3.21	31.16	74.32	5.84	8.63	0.25
Woollen suit	03.1.2.2	1089	13.46	14.88	5.56	18.00	81.35	3.83	7.77	0.26
Bra	03.1.2.3	901	9.54	9.99	5.94	16.83	84.25	6.51	9.27	0.20
Corselet	03.1.2.3	112	5.04	3.88	5.26	19.01	92.48	6.85	9.67	0.14
Ladies panties	03.1.2.3	902	9.92	11.19	5.81	17.22	90.25	8.71	10.25	0.21
Ladies pyjama	03.1.2.3	80	4.96	3.48	4.26	23.48	94.79	6.47	16.41	0.13
Ladies thin sweater	03.1.2.3	-	-	-	2.10	47.64	93.26	4.83	9.57	0.12
Ladies tights	03.1.2.3	747	11.00	12.48	4.69	21.34	81.06	8.08	12.68	0.19
Ladies T-shirt	03.1.2.3	106	10.75	9.00	2.66	37.62	52.02	16.06	16.60	0.20
Lycra tights	03.1.2.3	229	10.05	7.85	4.73	21.15	58.57	9.52	11.59	0.20
Men shirt	03.1.2.3	1176	13.17	14.69	5.03	19.89	75.07	7.89	12.19	0.22
Men socks	03.1.2.3	960	12.93	14.88	4.93	20.29	76.14	7.55	9.45	0.19
Men T-shirt	03.1.2.3	124	10.94	9.37	2.91	34.39	47.03	15.00	14.97	0.21
Men underwear	03.1.2.3	673	13.33	13.75	4.38	22.81	70.81	6.75	10.13	0.17
Nightdress	03.1.2.3	317	11.95	13.03	3.08	32.52	73.54	6.79	11.74	0.19
Nightdress with sleeves	03.1.2.3	134	9.30	7.69	3.88	25.75	56.19	8.48	11.22	0.19
Panties mini/midi-medium	03.1.2.3	197	10.73	8.10	4.55	21.98	73.33	10.05	24.43	0.25
Pyjama, large	03.1.2.3	127	10.80	8.18	3.48	28.72	54.30	9.23	10.17	0.20
Pyjamas	03.1.2.3	333	12.31	11.95	3.24	30.88	66.19	7.89	13.13	0.17
Pyjamas (mens)	03.1.2.3	74	5.80	4.43	3.94	25.35	89.12	6.88	8.25	0.10
Singlet	03.1.2.3	674	13.31	13.83	4.41	22.67	70.87	6.73	10.16	0.17
Singlet -- size 51	03.1.2.3	131	13.31	12.75	3.63	27.51	63.39	8.46	10.93	0.17
Underwear size 51	03.1.2.3	139	11.12	11.09	3.66	27.33	63.97	11.83	19.98	0.18
Underwired bra	03.1.2.3	216	10.51	7.23	5.16	19.40	64.96	6.52	8.59	0.24
Woman shirt	03.1.2.3	1372	11.74	14.07	6.11	16.36	81.56	7.01	9.83	0.25
Small anorak (nine-month)	03.1.2.4	526	14.27	15.50	4.10	24.37	58.53	9.26	10.75	0.22
Knitting wool	03.1.3.0	626	14.62	12.97	4.16	24.01	73.33	6.57	17.82	0.27
Zip fastener	03.1.3.0	1077	15.41	17.30	5.60	17.86	87.32	6.43	6.90	0.34
Dry-cleaning for a suit	03.1.4.0	1024	13.63	10.94	5.80	17.23	93.27	5.84	7.06	0.29
Dry-cleaning for raincoat	03.1.4.0	865	13.79	11.11	5.30	18.87	92.09	5.59	6.86	0.29
Dry-cleaning for shirt	03.1.4.0	752	14.63	13.31	5.01	19.96	95.42	7.40	13.09	0.30
Gym shoes	03.2.1.1	498	8.10	9.90	4.37	22.88	49.85	7.82	13.61	0.20
Tennis shoes	03.2.1.1	145	12.89	10.40	3.32	30.08	49.61	7.41	8.39	0.20
Men shoes	03.2.1.2	946	13.71	14.38	4.97	20.14	82.09	4.12	7.13	0.25
Ladies boots	03.2.1.3	376	20.26	19.66	3.10	32.25	62.98	3.98	7.48	0.24
Ladies shoes	03.2.1.3	913	14.15	13.79	4.84	20.67	78.34	4.16	6.93	0.25
Young boy shoes	03.2.1.4	926	13.66	13.80	4.96	20.15	83.57	5.04	6.68	0.23
Resoling of ladies shoes	03.2.2.0	537	14.04	11.65	5.06	19.75	91.79	7.21	5.67	0.46
Resoling of men's shoes	03.2.2.0	524	14.20	11.62	4.95	20.21	92.99	6.47	5.46	0.46
Resoling of ladies shoes	03.2.2.0	145	11.14	6.66	6.72	14.89	82.46	5.03	7.91	0.23
Resoling of men's shoes	03.2.2.0	116	12.09	7.49	6.13	16.32	83.00	5.36	8.86	0.22
Parking spot in a garage	04.1.2.0	496	14.61	17.02	4.51	22.18	96.49	7.95	10.76	0.20
Acrylate painting	04.3.1.0	456	11.84	7.62	6.66	15.02	79.24	5.51	9.85	0.26
Cement	04.3.1.0	744	13.07	11.01	6.19	16.16	80.97	3.35	3.04	0.26
Enamel painting	04.3.1.0	1969	9.94	7.97	8.90	11.24	84.17	5.15	6.32	0.41
Glass 4 mm (in sq m)	04.3.1.0	58	13.90	11.52	4.85	20.63	83.19	5.63	6.97	0.20
Latex painting	04.3.1.0	491	5.13	3.81	14.81	6.75	59.38	3.73	11.12	0.62
Latex painting	04.3.1.0	1196	9.52	7.85	8.75	11.43	82.84	5.18	13.79	0.43
Window glass	04.3.1.0	406	11.55	12.74	5.99	16.69	81.19	5.52	6.64	0.29

Product	COICOP	Duration approach			Frequency approach			Average size of price		Synchro ratio
		n_{nc}	T_{nc}	s_{nc}	F	T=1/F	Share of price increase	increase	decrease	
Hourly wage for electrician	04.3.2.0	202	10.60	7.63	6.25	16.00	68.25	5.79	1.84	0.63
Hourly wage for painter	04.3.2.0	229	9.93	5.90	6.98	14.32	75.00	4.50	0.86	0.62
Hourly wage for plumber	04.3.2.0	186	10.63	6.86	7.86	12.72	64.05	6.57	1.75	0.63
Hourly wage of electrician	04.3.2.0	1199	7.99	6.69	8.92	11.21	98.81	3.73	2.62	0.42
Hourly wage of painter	04.3.2.0	1221	7.59	5.97	9.31	10.75	97.67	3.69	3.60	0.43
Hourly wage of plumber	04.3.2.0	1254	7.80	6.19	9.38	10.66	97.99	3.77	4.08	0.44
Consumption of water	04.4.3.0				2.60	38.52	73.53	11.16	6.78	0.21
Consumption of water	04.4.3.0	457	10.80	10.53	8.36	11.97	86.72	9.09	80.67	0.49
Butane	04.5.2.2	13059	1.42	0.91	70.34	1.42	56.22	3.28	2.96	0.76
Propane	04.5.2.2	13970	1.37	0.75	73.03	1.37	59.77	3.73	4.08	0.77
Gasoline (+ 2000 litres)	04.5.3.0	18284	1.18	0.47	84.44	1.18	53.04	6.76	6.56	0.65
Gasoline (-1000 litres)	04.5.3.0	12919	1.26	0.54	79.56	1.26	53.49	5.99	6.13	0.69
Gasoline 1000-2000 litres	04.5.3.0	18365	1.18	0.47	84.74	1.18	53.09	6.54	6.30	0.64
Anthracite 12/22	04.5.4.0	3493	4.67	3.03	19.99	5.00	59.47	4.76	6.90	0.53
Anthracite 20/30	04.5.4.0	3491	4.68	3.01	19.94	5.02	60.15	4.52	6.23	0.53
Anthracite 6/12 or 7/14	04.5.4.0	526	3.71	2.60	22.99	4.35	58.08	4.26	5.75	0.52
Balls	04.5.4.0	420	4.18	2.95	19.46	5.14	58.21	3.82	6.15	0.48
Saloon	05.1.1.0	525	14.91	16.10	4.18	23.92	86.32	2.92	7.32	0.25
Suspended cupboard for lavatory	05.1.1.0	814	12.42	11.81	5.09	19.65	75.05	5.23	9.41	0.44
Bedroom furniture	05.1.1.1	375	10.96	9.15	4.65	21.49	94.19	4.11	22.28	0.26
Bedroom oak furniture	05.1.1.1	87	6.08	5.65	5.79	17.28	97.24	2.95	1.13	0.25
Dining room oak furniture	05.1.1.1	663	12.79	13.86	4.75	21.07	90.07	3.71	4.67	0.27
Kitchen element 200x50	05.1.1.1	467	14.29	16.64	3.61	27.72	80.40	4.19	5.83	0.19
Modern bedroom furniture	05.1.1.1	120	13.28	9.14	3.69	27.10	70.73	4.69	5.16	0.25
Slatted base	05.1.1.1	744	12.76	10.93	5.80	17.25	75.38	5.15	7.88	0.34
Desklamp	05.1.1.2	348	7.46	9.73	4.31	23.18	32.01	8.13	10.78	0.15
Fluorescent light	05.1.1.2	610	11.10	12.35	4.84	20.64	60.21	6.35	8.51	0.13
Halogen desklamp	05.1.1.2	105	12.17	10.96	3.41	29.31	43.48	9.80	10.72	0.15
Floorcovering	05.1.2.0	87	5.80	4.48	5.71	17.50	94.05	4.01	4.16	0.26
PVC covering	05.1.2.0	675	12.00	10.45	6.52	15.34	68.88	4.45	7.18	0.24
Awning fabrics	05.2.1.0	480	11.80	13.17	4.57	21.90	78.43	6.04	7.36	0.15
Bathroom set	05.2.1.0	482	9.73	10.91	4.67	21.40	80.56	7.52	10.22	0.16
Bathroom set	05.2.1.0	181	8.91	8.10	4.75	21.04	59.38	8.38	6.83	0.15
Bedclothes and linen	05.2.1.0	452	11.63	12.66	4.15	24.07	73.05	6.45	8.34	0.15
Blanket	05.2.1.0	387	13.49	12.81	4.11	24.32	79.46	3.93	4.00	0.32
Curtain fabrics	05.2.1.0	552	11.90	13.28	4.77	20.95	81.59	6.32	13.37	0.16
Curtain material (in square dl)	05.2.1.0	188	8.04	6.75	6.31	15.84	80.37	8.00	7.48	0.15
Curtain materials (sq dm)	05.2.1.0	114	10.52	8.76	4.69	21.33	68.72	8.28	9.98	0.16
Mattress	05.2.1.0	807	11.90	9.27	5.79	17.27	78.65	5.14	7.96	0.35
PU soft mattress	05.2.1.0	167	11.32	7.53	4.03	24.82	66.43	5.54	8.13	0.23
Quiltsheets	05.2.1.0	133	10.21	7.08	4.12	24.29	60.78	7.07	19.94	0.17
Sheet	05.2.1.0	126	10.40	8.34	4.07	24.59	60.96	9.89	9.68	0.16
Synthetic quilt	05.2.1.0	132	9.62	8.46	4.73	21.13	60.63	8.63	11.43	0.13
Towel	05.2.1.0	624	11.38	11.75	4.81	20.79	76.01	8.14	9.65	0.15
Towel (2 dl)	05.2.1.0	162	9.35	7.21	4.05	24.68	62.50	11.30	11.58	0.17
Electric cooker	05.3.1.1	1325	10.83	10.62	6.46	15.48	46.73	4.22	6.89	0.36
Electric radiator	05.3.1.1	248	12.00	9.22	4.46	22.44	43.32	9.45	10.83	0.19
Gas cooker	05.3.1.1	1173	11.50	10.57	6.29	15.89	53.19	5.09	6.06	0.36
Natural gas convector	05.3.1.1	1816	8.70	7.72	9.61	10.41	78.80	4.69	5.65	0.41
Oil convector heater	05.3.1.1	1793	8.77	7.56	9.40	10.63	75.60	4.28	4.08	0.42

Product	COICOP	Duration approach			Frequency approach			Average size of price		Synchro ratio
		n_{nc}	T_{nc}	s_{nc}	F	T=1/F	Share of price increase	increase	decrease	
Chest freezer	05.3.1.2	1046	9.39	9.13	7.17	13.94	50.76	4.44	8.34	0.39
Duo thermal fridge	05.3.1.2	1473	10.32	9.85	7.37	13.57	48.31	4.87	6.25	0.36
Electric washing machine	05.3.1.2	1144	8.76	8.69	7.58	13.18	55.04	4.23	5.23	0.38
Microwave oven	05.3.1.2	439	10.38	7.49	5.99	16.68	32.85	7.80	11.77	0.22
Tumble dryer	05.3.1.2	391	11.60	8.32	5.73	17.46	37.72	7.39	8.65	0.20
Upright freezer	05.3.1.2	1072	8.67	8.37	7.60	13.16	60.40	4.45	5.35	0.39
Upright freezer 250-300 l	05.3.1.2	388	11.12	6.90	5.60	17.87	38.77	7.32	7.28	0.21
Cylinder vacuum cleaner	05.3.2.0	1111	8.99	8.28	7.41	13.50	46.86	6.15	6.44	0.38
Cylinder vacuum cleaner 1300 W	05.3.2.0	442	11.50	8.85	5.83	17.15	30.14	7.48	9.82	0.21
Electric coffee grinder	05.3.2.0	163	4.28	4.06	6.53	15.30	89.27	5.26	7.64	0.08
Electric coffee machine 900 W	05.3.2.0	377	12.13	8.67	5.16	19.36	37.46	8.04	9.40	0.21
Electric fryer	05.3.2.0	1342	11.21	10.60	6.63	15.08	46.40	7.10	7.75	0.35
Electric iron (steam)	05.3.2.0	981	9.92	8.93	6.78	14.74	49.62	5.70	6.34	0.40
Electric washing machine 1100T	05.3.2.0	434	11.24	7.93	5.96	16.79	33.06	5.52	6.89	0.21
Electrical machine	05.3.2.0	993	10.42	9.29	6.64	15.06	45.22	5.79	6.96	0.40
Food processor	05.3.2.0	296	11.59	8.89	4.87	20.55	31.02	6.73	10.10	0.18
Mixer	05.3.2.0	774	10.31	8.66	6.19	16.16	45.74	7.11	6.84	0.44
Steam iron 1200 W	05.3.2.0	417	11.71	8.59	5.67	17.62	42.46	7.25	7.90	0.20
Toaster	05.3.2.0	989	10.06	9.97	6.80	14.70	54.40	6.64	6.74	0.39
Toaster 800 W	05.3.2.0	301	11.73	8.60	4.60	21.72	38.08	8.60	9.46	0.19
Heating repair tariff	05.3.3.0	872	8.31	6.75	7.96	12.56	97.19	4.09	3.44	0.40
Tariff for repair of central heating	05.3.3.0	187	9.16	7.24	8.67	11.53	73.03	7.24	4.72	0.60
Cup and saucer	05.4.1.0	987	10.87	12.87	5.79	17.26	78.77	7.10	8.41	0.16
Enameled steel pot	05.4.1.0	600	9.92	11.77	4.54	22.03	55.88	6.19	9.79	0.12
Frying pan	05.4.1.0	291	10.75	8.29	4.99	20.04	54.24	8.33	11.50	0.15
Glass cooking dish (2 l)	05.4.1.0	830	13.00	13.39	5.36	18.67	73.50	5.39	8.18	0.21
Plastic rubbish bin (12 l)	05.4.1.0	806	10.41	14.49	4.85	20.61	62.46	7.95	9.72	0.10
Stainless steel pan	05.4.1.0	1027	11.85	11.76	6.15	16.26	69.09	6.12	8.50	0.16
Electric drill	05.5.1.0	1074	10.22	10.22	6.72	14.87	45.01	5.67	7.37	0.29
Dry battery	05.5.2.0	1531	10.38	11.45	6.51	15.37	68.88	10.47	10.99	0.13
Economical lamp	05.5.2.0	420	8.71	8.44	6.87	14.57	23.92	13.40	16.64	0.14
Electric bulb	05.5.2.0	1125	12.57	13.97	4.92	20.34	49.86	9.10	12.54	0.12
Hammer	05.5.2.0	859	10.32	12.44	5.87	17.02	71.54	7.11	9.85	0.12
Secateurs	05.5.2.0	168	11.60	9.10	4.21	23.77	48.74	7.65	11.38	0.13
Cloth	05.6.1.0	2199	10.52	12.42	6.45	15.51	47.82	8.58	12.47	0.11
Coffee filters	05.6.1.0	5591	6.16	7.06	14.17	7.06	61.37	7.59	8.35	0.16
Liquid general cleaner	05.6.1.1	6145	6.09	7.48	13.67	7.31	52.31	8.98	10.79	0.25
Phosphate free liquid detergent	05.6.1.1	6054	5.29	6.02	16.27	6.15	55.91	10.31	6.65	0.34
Powder detergent A	05.6.1.1	247	5.87	5.30	7.36	13.59	56.94	5.02	5.47	0.16
Powder detergent B	05.6.1.1	226	4.91	4.21	7.04	14.20	31.53	4.63	7.72	0.14
Powder detergent C	05.6.1.1	262	5.52	4.89	7.99	12.51	63.86	6.43	4.57	0.17
Powder detergents	05.6.1.1	18197	4.28	4.53	21.40	4.67	49.77	7.98	13.41	0.34
Washing-up liquid soap	05.6.1.1	7907	5.52	6.76	15.27	6.55	52.37	8.03	8.87	0.25
Polish	05.6.1.2	3120	7.98	9.07	10.25	9.76	66.18	6.18	8.44	0.18
Washhouse	05.6.2.1	321	18.27	17.95	3.26	30.67	78.91	8.99	16.62	0.27
Domestic service	05.6.2.2	461	14.17	15.11	4.68	21.38	98.34	5.68	16.34	0.15
Central heating tariff	05.6.2.3	393	10.48	9.64	5.43	18.40	94.47	4.97	14.33	0.35
Maintenance of central heating system	05.6.2.3	109	11.01	8.58	7.58	13.19	59.70	6.13	1.52	0.69
Hernia bandage	06.1.2.0	613	11.70	5.60	7.33	13.64	79.54	7.25	2.37	0.64
Spherical glasses	06.2.1.0	605	16.40	11.75	3.93	25.45	91.44	4.11	10.24	0.38
Torus glasses	06.2.1.0	558	16.23	12.10	3.68	27.14	91.58	5.68	11.19	0.37

Product	COICOP	Duration approach			Frequency approach			Average size of price		Synchro ratio
		n_{nc}	T_{nc}	s_{nc}	F	T=1/F	Share of price increase	increase	decrease	
Non recycled medical consultation	06.3.1.0	492	11.92	1.09	4.47	22.39	99.53	3.20	12.80	0.98
Non recycled medical home visit	06.3.1.0	533	12.11	2.23	4.68	21.35	98.97	2.98	0.92	0.97
Recycled medical consultation	06.3.1.0	1071	9.79	2.98	8.28	12.08	99.92	3.87	3.47	0.97
Recycled medical visit	06.3.1.0	1038	9.90	2.97	8.15	12.27	99.58	2.50	2.43	0.98
Visit to a specialized doctor	06.3.2.0	914	12.02	1.51	6.37	15.70	98.07	3.68	9.99	0.98
Dental filling	06.3.3.0	1052	11.00	2.89	7.07	14.14	97.76	4.48	2.58	0.89
Surgical extraction	06.3.3.0	1079	9.83	4.67	7.31	13.68	98.21	14.98	2.87	0.92
Maternity room for one person	06.4.1.0	3127	3.47	2.35	28.11	3.56	70.87	4.53	4.32	0.39
Shared maternity room	06.4.1.0	2997	3.51	2.33	27.74	3.60	70.17	5.39	4.89	0.40
Shared room in the surgery department of a hospital	06.4.1.0	3210	3.54	2.35	27.48	3.64	70.39	5.11	4.87	0.40
Single bedroom	06.4.1.0	294	6.81	5.07	9.59	10.43	98.24	3.98	7.58	0.90
Single room in the surgery department of a hospital	06.4.1.0	3256	3.48	2.35	28.05	3.57	71.20	4.79	4.25	0.39
Lightweight motorcycle	07.1.2.0	1034	10.05	7.21	8.47	11.80	76.31	3.97	4.05	0.52
Children's bicycle	07.1.3.0	755	10.15	9.21	6.52	15.33	86.20	4.76	5.71	0.31
Children's bicycle ("24")	07.1.3.0	246	10.37	7.12	6.99	14.30	71.26	7.09	10.34	0.37
Ladies bicycle	07.1.3.0	737	10.82	8.81	6.35	15.75	85.38	4.28	4.69	0.32
Ladies bicycle (City)	07.1.3.0	238	9.97	6.79	7.05	14.19	69.65	4.89	5.67	0.33
Candle	07.2.1.0	1327	10.93	10.50	7.29	13.72	79.84	6.12	7.20	0.32
Car tyre	07.2.1.0	2001	7.60	6.03	10.71	9.33	54.89	5.48	6.87	0.36
Tyre for car 175/70/13	07.2.1.0	694	9.00	5.37	9.75	10.26	47.82	5.33	7.21	0.16
Diesel for cars	07.2.2.1	26094	1.31	0.68	76.50	1.31	53.40	3.30	2.72	0.69
Eurosuper (RON 95)	07.2.2.1	22319	1.37	0.77	72.89	1.37	54.87	2.52	2.23	0.74
LPGA	07.2.2.1	10296	1.35	0.84	73.83	1.35	53.00	7.00	7.00	0.73
Regular petrol	07.2.2.1	4867	1.17	0.47	84.60	1.18	55.24	4.52	3.73	0.52
Super petrol (leaded)	07.2.2.1	23335	1.43	0.80	60.49	1.65	54.18	2.61	2.08	0.80
Superplus (RON 98)	07.2.2.1	9273	1.26	0.57	77.46	1.29	52.59	2.78	2.05	0.80
Engine oil	07.2.2.2	1540	10.24	9.07	7.99	12.51	80.55	6.49	5.30	0.32
Balancing of wheels	07.2.3.0	617	12.81	11.69	5.39	18.55	75.00	5.90	11.93	0.38
Car breakdown service (annual subscription)	07.2.3.0	70	10.11	4.41	6.31	15.84	97.09	4.64	6.42	0.50
Car wash	07.2.3.0	346	15.90	15.38	4.04	24.73	94.47	9.49	12.99	0.13
Hourly wage for a garage mechanic	07.2.3.0	1252	11.15	9.97	7.66	13.06	97.46	4.93	4.59	0.42
Monthly inner-city subscription	07.3.2.1	-	-	-	5.77	17.33	33.33	6.22	6.46	0.86
Tram or bus ticket	07.3.2.1	-	-	-	1.13	88.41	100.00	10.54	.	0.94
Tram-bus (card)	07.3.2.1	-	-	-	4.20	23.82	92.96	6.63	19.07	0.93
Taxi	07.3.2.2	-	-	-	2.28	43.87	77.78	10.16	4.57	0.27
Taxi	07.3.2.2	107	29.89	31.58	3.45	29.02	85.53	8.84	19.95	0.26
Fax machine	08.1.2.0	436	4.97	3.95	14.30	6.99	30.08	13.80	12.64	0.23
CD player	09.1.1.0	1018	9.91	9.57	7.44	13.44	20.84	6.96	11.89	0.38
Colour television	09.1.1.0	1036	8.58	8.45	7.51	13.32	29.51	3.62	6.51	0.39
Colour TV -- 70 cm	09.1.1.0	609	8.92	6.01	8.28	12.08	15.03	5.61	8.47	0.22
Compact hi-fi rack	09.1.1.0	1152	9.72	9.66	7.77	12.88	22.51	7.32	9.72	0.37
Hi-fi rack	09.1.1.0				3.35	29.89	26.27	3.56	6.06	0.10
Portable radio/cassette player	09.1.1.0	678	9.13	9.58	6.51	15.36	23.95	6.76	11.32	0.44
Radio cassette CD player	09.1.1.0	409	10.03	8.07	6.57	15.23	17.16	9.14	13.26	0.19
Radio cassette player	09.1.1.0	82	5.37	4.71	4.63	21.59	28.16	6.34	7.94	0.09

Product	COICOP	Duration approach			Frequency approach			Average size of price		Synchro ratio
		n_{nc}	T_{nc}	s_{nc}	F	T=1/F	Share of price increase	increase	decrease	
VCR	09.1.1.0	879	8.02	8.09	8.31	12.03	17.45	4.48	8.66	0.40
VCR 4 heads	09.1.1.0	579	8.99	5.70	8.25	12.12	9.81	5.85	12.42	0.21
Camera	09.1.2.0	681	10.13	9.00	6.87	14.55	30.26	5.99	9.80	0.41
Camera	09.1.2.0	-	-	-	2.71	36.90	37.08	4.32	11.61	0.09
Camera zoom 35-70	09.1.2.0	226	9.45	6.67	6.72	14.87	19.32	12.84	14.68	0.16
Calculator	09.1.3.0	692	11.06	13.23	6.41	15.61	34.01	13.52	14.57	0.21
Inkjet printer	09.1.3.0	867	3.59	2.95	23.24	4.30	22.88	16.26	12.85	0.20
LaserJet printer	09.1.3.0	444	4.74	4.12	15.85	6.31	35.32	10.66	9.71	0.22
Software	09.1.3.0	601	4.73	4.92	15.73	6.36	43.38	12.66	15.81	0.22
Table tennis set	09.1.4.0	103	11.37	9.28	5.48	18.24	39.24	5.98	7.99	0.39
Checkers	09.1.5.0				3.59	27.85	81.19	6.71	12.21	0.16
Computer game	09.1.5.0	234	6.03	4.61	12.13	8.24	51.19	16.03	18.61	0.24
Construction game (Lego)	09.1.5.0	1198	10.74	8.87	7.14	14.01	46.96	10.05	11.32	0.54
Electric locomotive	09.1.5.0	138	7.52	6.08	9.90	10.10	95.77	4.67	2.91	0.55
Football ball	09.1.5.0	253	17.68	21.58	2.96	33.80	39.78	10.46	11.86	0.14
Scrabble	09.1.5.0	983	9.01	9.68	8.54	11.71	66.23	13.95	16.60	0.25
Tennis balls	09.1.5.0	651	13.86	16.40	4.23	23.63	54.61	7.26	9.73	0.13
Toy car	09.1.5.0	410	14.97	17.05	4.12	24.26	53.56	7.91	9.55	0.13
Blank videotape	09.1.6.0	1336	9.24	9.81	7.55	13.25	25.37	9.03	11.75	0.30
Camera roll	09.1.6.0	53	4.66	4.09	3.81	26.25	71.92	5.03	4.71	0.14
Chromium tape	09.1.6.0	1106	9.79	12.04	6.55	15.26	19.95	8.85	11.97	0.31
Colour film (135-24)	09.1.6.0	63	13.75	7.42	3.96	25.23	47.79	6.64	7.84	0.11
Compact disc	09.1.6.0	3221	3.97	7.28	16.70	5.99	53.13	20.16	8.33	0.35
Educational CD-ROM	09.1.6.0	334	5.49	4.64	13.62	7.34	37.81	18.68	16.54	0.24
Film roll	09.1.6.0	800	11.00	9.68	5.95	16.80	49.28	3.68	4.71	0.37
Carnation	09.1.7.1	8627	1.84	1.79	53.23	1.88	49.21	16.34	16.47	0.18
Chrysanthemums	09.1.7.1	5217	1.54	1.14	62.93	1.59	51.51	18.45	19.16	0.16
Freesia	09.1.7.1	4571	1.72	1.44	55.96	1.79	50.48	19.22	19.47	0.16
Gerbera	09.1.7.1	3133	1.32	0.68	74.31	1.35	46.39	30.06	26.45	0.34
Gladioli	09.1.7.1	1151	1.29	0.56	69.69	1.43	45.52	24.25	24.21	0.47
Lilies	09.1.7.1	1844	1.32	0.68	70.48	1.42	47.60	22.68	22.14	0.36
Nice carnations	09.1.7.1	4548	1.68	1.53	56.76	1.76	50.82	20.51	21.24	0.13
Roses	09.1.7.1	12688	1.53	1.22	64.69	1.55	50.57	19.23	19.85	0.18
Tulips	09.1.7.1	2181	1.44	0.82	66.46	1.50	44.82	24.27	19.53	0.39
Azalea	09.1.7.2	1107	3.85	4.45	19.49	5.13	52.82	14.89	15.87	0.21
Cyclamen	09.1.7.2	1113	3.76	4.18	19.42	5.15	51.46	14.78	15.90	0.22
Dracaena	09.1.7.2	168	5.62	6.90	6.84	14.61	58.60	9.09	8.61	0.15
Ficcus	09.1.7.2	624	7.49	11.11	7.01	14.26	62.93	7.80	6.62	0.16
Kalanchoe	09.1.7.2	1667	5.69	9.12	13.69	7.30	51.02	14.25	15.53	0.13
Flower bulbs	09.1.7.3	386	19.81	18.26	3.31	30.24	67.29	11.12	16.23	0.28
Catfood	09.1.8.0	6350	5.15	7.78	15.93	6.28	48.50	9.48	10.66	0.14
Dogfood	09.1.8.0	6651	5.17	6.61	15.94	6.27	49.82	8.20	8.53	0.18
Hourly wage for electric technician	09.1.9.0	632	11.14	10.57	5.50	18.20	93.11	5.31	6.84	0.32
Football match	09.2.1.0	151	22.76	15.47	2.89	34.65	80.36	21.79	20.11	0.53
Movie	09.2.1.0	161	21.85	16.22	2.71	36.92	97.35	9.90	11.28	0.16
Movie	09.2.1.0				5.71	17.50	75.00	14.67	9.53	0.86
Swimming pool	09.2.1.0	86	27.23	24.74	1.61	61.93	87.58	19.76	39.72	0.19
Tennis subscription (winter)	09.2.1.0	249	5.90	0.55	14.37	6.96	30.70	57.70	49.82	0.98
Tennis subscription (summer)	09.2.1.0	184	6.00	0.00	14.29	7.00	23.10	20.09	9.43	1.00
Annual cable subscription	09.2.2.0	522	9.74	7.15	7.39	13.54	83.07	3.05	3.61	0.67
Cable television connection	09.2.2.0	-	-	-	1.69	59.22	89.47	22.95	4.99	0.31
Developing (10 x 15) (24)	09.2.2.0	87	12.01	8.93	4.66	21.47	52.98	6.29	8.09	0.11
Videotape renting	09.2.2.0	61	20.00	20.78	1.49	66.97	34.75	15.10	13.93	0.11
Comic strip (album)	09.3.1.0	709	18.33	14.58	4.69	21.32	92.95	7.78	8.09	0.34
Dictionary	09.3.1.0	1070	12.31	10.85	7.45	13.41	62.80	8.37	16.93	0.51

Product	COICOP	Duration approach			Frequency approach			Average size of price		Synchro ratio
		n_{nc}	T_{nc}	s_{nc}	F	T=1/F	Share of price increase	increase	decrease	
Dictionary French-Dutch, Dutch-French	09.3.1.0	393	13.79	17.55	3.87	25.81	56.35	16.83	15.25	0.29
Novel	09.3.1.0	751	14.58	16.20	5.03	19.90	89.57	9.80	6.87	0.20
Magazines for children	09.3.2.0	-	-	-	2.64	37.84	88.31	11.73	11.78	0.45
Newspaper	09.3.2.0	-	-	-	4.52	22.12	96.19	4.63	.	0.97
Weekly magazine	09.3.2.0	-	-	-	2.07	48.41	90.35	10.72	28.77	0.39
Loose sheet notebook	09.3.4.0	1053	11.54	14.53	6.71	14.90	58.67	14.27	16.86	0.22
Notebook	09.3.4.0	-	-	-	2.71	36.91	81.48	5.47	5.92	0.19
Pen	09.3.4.0	485	14.69	14.46	4.89	20.45	68.20	8.29	12.88	0.26
Lunch	11.1.1.1	478	15.22	17.89	3.89	25.71	78.34	6.25	8.52	0.20
Pepper steak	11.1.1.1	664	14.69	16.96	4.89	20.47	88.05	6.19	5.59	0.22
Self-service meal	11.1.1.1	518	10.40	10.65	6.53	15.31	88.89	4.77	7.05	0.31
Sole meunière	11.1.1.1	526	15.45	18.74	4.71	21.23	81.70	7.55	6.94	0.21
Steak and French fries	11.1.1.1	723	14.59	16.04	4.93	20.27	90.20	7.25	5.76	0.22
Cheeseburger	11.1.1.2	-	-	-	1.48	67.78	76.54	9.34	16.10	0.14
French fries cone	11.1.1.2	333	26.76	20.91	2.91	34.42	97.21	10.34	26.51	0.27
Frenchbread sandwich	11.1.1.2	-	-	-	2.06	48.59	88.00	10.15	9.54	0.10
Hot dog	11.1.1.2	125	20.73	20.13	2.27	44.13	95.33	12.15	10.71	0.12
Sandwich	11.1.1.2	231	15.35	15.89	2.59	38.55	89.12	12.08	9.80	0.10
Aperitive	11.1.1.3	624	20.53	19.14	3.34	29.90	87.27	12.09	11.91	0.23
Cola soda	11.1.1.3	662	21.52	16.92	3.60	27.77	96.80	12.06	9.86	0.27
Espresso	11.1.1.3	370	28.11	20.65	2.61	38.30	95.24	11.19	10.92	0.19
Glass of beer	11.1.1.3	885	19.29	17.70	4.19	23.89	96.38	10.05	35.24	0.38
Mineral water	11.1.1.3	645	21.47	16.96	3.56	28.12	96.64	12.42	10.04	0.28
Special beer	11.1.1.3	792	18.41	16.88	4.12	24.30	85.12	10.68	17.06	0.29
School lunch	11.1.2.0	346	26.02	18.20	2.92	34.30	93.60	9.35	11.58	0.55
Hotel room	11.2.1.0	-	-	-	4.09	24.47	93.55	12.46	9.44	0.19
Hotel room	11.2.1.0	434	15.74	16.25	5.14	19.45	93.77	9.25	9.29	0.18
School boarding fees	11.2.1.0	1112	13.71	6.69	6.99	14.30	97.19	3.47	2.69	0.87
Haircut	12.1.1.1	658	16.20	16.05	5.04	19.84	85.45	9.41	6.78	0.40
Haircut (men's)	12.1.1.1	59	6.02	5.26	3.62	27.61	96.22	8.88	4.40	0.14
Ladies hairdressing	12.1.1.2	718	16.03	15.55	4.40	22.75	85.86	8.99	5.89	0.36
Permanent wave	12.1.1.2	888	13.40	14.23	5.19	19.27	85.00	10.85	5.76	0.38
Aftershave	12.1.2.1	3079	5.66	6.57	13.42	7.45	52.62	7.97	9.75	0.28
Aftershave 100 ml	12.1.2.1	1729	5.93	6.52	12.59	7.94	58.79	7.64	7.32	0.16
Eau de cologne	12.1.2.1	926	9.47	8.51	6.90	14.48	85.66	7.33	18.53	0.48
Eau de Cologne 100 ml	12.1.2.1	132	10.89	10.41	4.27	23.43	57.08	10.06	10.26	0.22
Face cream	12.1.2.1	643	10.18	8.48	6.76	14.80	73.46	5.17	13.14	0.48
Face cream 30-50 ml	12.1.2.1	787	8.00	7.45	9.32	10.73	67.59	5.34	5.50	0.16
Hair spray	12.1.2.1	4673	4.93	5.61	16.22	6.17	55.43	7.72	10.09	0.24
Hair spray 400 ml	12.1.2.1	2791	4.94	6.11	16.40	6.10	55.28	6.06	6.81	0.12
Nail varnish	12.1.2.1	65	5.20	5.08	5.48	18.24	81.28	4.79	6.46	0.25
Nail varnish	12.1.2.1	1828	7.14	7.33	11.20	8.93	59.19	10.25	72.79	0.38
Nail varnish 10-15 ml	12.1.2.1	1051	7.44	8.21	10.28	9.73	68.31	7.06	7.68	0.14
Soap	12.1.2.1	4078	5.07	6.16	14.70	6.80	50.40	14.70	15.70	0.24
Soap 125 g	12.1.2.1	2282	4.90	5.56	13.66	7.32	50.36	10.83	12.10	0.11
Toothpaste	12.1.2.1	5136	5.00	5.91	16.77	5.96	58.71	9.45	9.77	0.23
Toothpaste 75 ml	12.1.2.1	3013	4.89	7.05	16.79	5.96	53.44	7.21	7.31	0.12
Diapers	12.1.2.2	6727	4.87	5.70	16.57	6.03	54.13	6.54	5.78	0.23
Tampon	12.1.2.2	7922	4.42	5.26	20.22	4.95	58.03	9.92	10.41	0.19
Toiletpaper	12.1.2.2	7221	5.42	6.63	16.30	6.14	54.49	9.53	10.51	0.13
Electric shaver	12.1.2.3	1018	11.50	10.76	6.33	15.80	46.88	6.22	8.37	0.36
Cleaning of wrist watch	12.2.1.0	-	-	-	2.77	36.15	94.57	6.28	7.07	0.13
Gold wedding-ring	12.2.1.0	672	9.92	9.92	5.29	18.89	21.14	7.43	7.49	0.49
Gold wedding-ring 3.5 g	12.2.1.0	142	8.17	7.57	7.63	13.11	64.29	5.34	7.48	0.15
Quartz watch	12.2.1.0	345	12.88	12.23	4.05	24.72	28.48	5.38	6.77	0.49

Product	COICOP	Duration approach			Frequency approach			Average size of price		Synchro ratio
		n_{nc}	T_{nc}	s_{nc}	F	T=1/F	Share of price increase	increase	decrease	
Replacement of watch battery	12.2.1.0	128	18.44	19.87	2.70	37.07	75.77	10.83	12.31	0.14
Suitcase	12.2.2.0	753	14.22	11.77	6.08	16.46	56.69	7.59	5.87	0.51
Wallet	12.2.2.0	614	14.38	16.28	4.30	23.26	77.88	5.81	5.42	0.40
Public health insurance premium	12.4.3.0	460	18.08	13.05	4.64	21.54	83.47	8.40	8.11	0.59
Cremation	12.6.1.0	59	18.10	5.80	3.10	32.22	93.33	5.96	5.32	0.35
Funerals	12.6.1.0	619	11.09	14.43	5.88	16.99	97.84	3.60	2.28	0.20
Passport stamp	12.6.1.0	-	-	-	3.65	27.41	50.00	9.76	1.03	0.84
Photocopy	12.6.1.0	112	17.54	23.68	2.11	47.47	37.56	35.24	30.25	0.12

Sources: FPS, NBB.

Annex 2 - Sensitivity analysis

As stated in section 4, we decided to treat product and store replacements in a specific way. In order to evaluate the impact of these treatments on our results, we conducted a sensitivity analysis. Three sets of results have been computed.

The first set of results is the one presented in section 5, which is our preferred set. It is referred to as "Sample-inherent censoring only", as this is the only source of censoring in this appoach. The second set of results no longer disregards price spells affected by store replacement and treats them as censored spells, but continues to consider price spells affected by product replacement as uncensored spells. This set of results is therefore referred to as "Sample-inherent censoring + store replacement". Finally, the third set also treats price spells affected by product replacement as censored spells. This set of results is referred to as "Sample-inherent censoring + store and product replacement". Those 3 sets of results are summarised in the following table.

	Sample-inherent censoring only		Sample-inherent censoring + store replacement		Sample-inherent censoring + store and product replacement	
	F	**T_{50}**	**F**	**T_{50}**	**F**	**T_{50}**
By COICOP						
01 "Food and non-alcoholic beverages"	23.10	7.04	21.19	8.59	20.43	9.00
02 "Alcoholic beverages and tobacco"	14.89	7.46	14.01	7.79	13.03	8.48
03 "Clothing and footwear"	4.75	20.29	3.98	24.94	3.18	30.35
04 "Housing, water, gas and electricity"	33.47	10.75	32.83	11.41	32.47	11.50
05 "Furnishing & maintenance of housing"	6.50	18.67	5.51	22.46	4.30	30.47
06 "Health care expenses"	9.41	14.14	9.17	14.86	9.13	14.90
07 "Transport"	41.15	1.65	40.51	1.66	40.22	1.66
08 "Communications"	14.30	6.99	12.87	7.77	7.69	13.01
09 "Leisure and culture"	10.29	14.90	9.23	18.40	7.99	25.67
11 "Hotels, cafés and restaurants"	4.34	23.89	3.66	26.70	3.54	27.62
12 "Miscellaneous goods and services"	7.51	19.27	6.36	23.23	5.56	27.88
By analytical product type						
Unprocessed food	31.82	6.59	29.51	8.00	28.81	8.41
Processed food	14.06	7.54	12.74	8.24	11.87	8.80
Energy	68.14	1.37	67.95	1.37	67.90	1.37
Non energy industrial goods	7.42	18.67	6.47	22.10	5.29	27.78
Services	5.91	20.27	5.07	24.10	4.91	24.96
CPI	16.85	13.25	15.73	15.89	15.02	17.23

Sources : FPS, NBB.

As can be seen, the special treatment of product and store replacement has implied a slight increase in the frequency of price change (F) for all product categories. At the CPI level, our choice of methodology reduced the median price duration (T_{50}) of 4 months compared to the most restrictive definition.

Focusing on the impacts observed at the more disaggregated level, it seems that product replacements mostly influenced the results obtained for non-energy industrial goods, especially the COICOP 03, 05 and 09 classes, while store replacement affected most categories in a relatively similar way.

The fact that product replacement has a great impact on the duration of price spells for COICOP classes 03, 05 and 09 seems to validate our assumption that, for some product categories, price

replacement may take place simultaneously with product replacements. Indeed, those COICOP classes are composed of products categories (e.g. clothes, small electric devices, electronic devices) for which the assumption that individual products are only available for relatively short time periods at a constant price is highly relevant. Not controlling for product replacement for these product categories therefore leads to abnormally long durations.

While our methodological assumptions have had an impact on our aggregated measure of the frequency of price changes (result 4), it must be said that the remaining results associated with the heterogeneity of price setting behaviour, both across and within product categories (results 1 and 2) and with the ranking of the main CPI components in terms of price rigidity (result 3) were not influenced by those assumptions. The arguments in favour of both state-dependency and time-dependency of the price setting (results 5 and 6) and the analysis of the size, direction and synchronisation of price changes (results 7, 8 and 9) are also not affected by our assumptions.

References

Aoki, K. (2001): "Optimal Monetary Policy Responses to Relative-Price Changes", Journal of Monetary Economics, Vol 48/1, pp. 55-80.

Aucremanne, L. (2000): "The use of robust estimators as measures of core inflation", National Bank of Belgium Working Paper Series, No 2.

Aucremanne, L. and D. Cornille (2001): "Attractive prices and euro-rounding effects on inflation", National Bank of Belgium Working Paper Series, No. 17.

Aucremanne, L., Brys, G., Hubert, M., Rousseeuw, P.J. and A. Struyf (2003): "Inflation, Relative Prices and Nominal Rigidities", in "Monetary policy in a changing environment", BIS Papers, No. 19.

Baudry, L., Le Bihan H., Sevestre, P. and S. Tarrieu (2004): "Price Rigidity in France - Evidence from Consumer Price Micro-Data", Banque de France, Mimeo.

Bils, M. and P. Klenow (2002): "Some Evidence on the Importance of Sticky Prices", NBER Working Paper, No. 9069.

Buckle, R. and Carlson J. (2000): "Menu Costs, Firm Size and Price Rigidity", Economic Letters, vol 66, pp 59-63.

Calvo, G. A. (1983): "Staggered Pricing in a Utility Maximizing Framework", Journal of Monetary Economics, 12, pp 383-398.

Carlton, D. (1986): "The Rigidity of Prices", American Economic Review, vol 76, pp 637-658.

Cecchetti, S. G. (1985): "Staggered Contracts and the Frequency of Price Adjustment", Quarterly Journal of Economics, vol 100, pp 935-959.

Cecchetti, S. G. (1986): "The Frequency of Price Ajustment: A Study of the Newsstand Prices of Magazines", Journal of Econometrics, vol 31, pp 255-274.

Cornille, D. (2003): "The adaptation of prices to the changeover to the euro", National Bank of Belgium Economic Review, 4th Trimester.

Dias, M., Dias, D. and P. Neves (2004): "Stylised Features of Price Setting Behaviour in Portugal: 1992-2001", ECB Working Paper Series, forthcoming.

Dotsey, M., King R. G. and A. L. Wolman (1999): "State-dependent Pricing and the General Equilibrium Dynamics of Money and Output", Quarterly Journal of Economics, Vol 114, pp 655-690.

Fisher,T. and J. Konieczny (2000): "Synchronization of Price Changes by Multiproduct Firms: Evidence from Canadian Newspaper Prices", Economic Letters, pp 271-277.

Galí, J., Gertler, M. and D. López-Salido (2001): "European Inflation Dynamics", European Economic Review, 45(7), 1237-1270.

Galí, J., Gertler, M. and D. López-Salido (2003): "Erratum to European Inflation Dynamics [European Economic Review 45 (2001), 1237-1270]", European Economic Review, 47(4), 759-760.

Goodfriend, M. and R. King (1997): "The New Neo-Classical Synthesis and the Role of Monetary Policy", NBER Macroeconomics Manual, pp. 231-283.

Kackmeister, A. (2001): "Has Retail Price Behavior Changed Since 1889 ? Evidence from Microdata", mimeo.

Kashyap, A. K. (1995): "Sticky Prices: New Evidence from Retail Catalogs", Quarterly Journal of Economics, pp 245-274.

Konieczny, J. D. and A. Skrzypacz (2002): "Inflation and Price Setting in a Natural Experiment", mimeo.

Konieczny, J. D. and A. Skrzypacz (2003): "A New Test of the Menu Cost Model", mimeo.

Lach S. and D. Tsiddon (1992): "The Behaviour of Prices and Inflation: An Empirical Analysis of Disaggregated Price Data", Journal of Political Economy 100, 349-389.

Lach S. and D. Tsiddon (1996): "Staggering and Synchronization in Price Setting: Evidence from Multiproduct Firms", American Economic Review 86, 1175-1196.

National Bank of Belgium (2002): "The adaptation of prices to the changeover to the euro", Economic Review, 4th Trimester.

Ratfai, A. (2003): "The Frequency and Size of Price Adjustment: Microeconomic Evidence", Central European University, Economics Working Paper n° 5-2003.

Romer, D. (1996): Advanced Macroeconomics, Mc Graw-Hill.

Smets, F. and R. Wouters (2003): "An Estimated DSGE Model for the euro-area", Journal of European Economists Association, Vol 1-5.

Suvanto, A. and J. Hukkinen (2002): "Stable Price Level and Changing Prices", mimeo, Bank of Finland.

Taylor, J. B. (1980): "Aggregate Dynamics and Staggered Contracts", Journal of Political Economy, N°88, pp 1-24.

Taylor, J. (1999): "Staggered Price and Wage Setting in Macroeconomics", in Taylor and Woodford (Editors), Handbook of Macroeconomics, vol 1b, North Holland.

Wolman, A. L. (1999): "Sticky Prices, Marginal Cost, and the Behavior of Inflation", Federal Reserve Bank of Richmond Economic Quarterly, vol 85/4, pp. 29-48.

Wolman, A. L. (2000): "The Frequency and Costs of Individual Price Adjustment", Federal Reserve Bank of Richmond Economic Quarterly, Volume 86/4, pp. 1-22.

NATIONAL BANK OF BELGIUM - WORKING PAPERS SERIES

1. "Model-based inflation forecasts and monetary policy rules" by M. Dombrecht and R. Wouters, *Research Series*, February 2000.
2. "The use of robust estimators as measures of core inflation" by L. Aucremanne, *Research Series*, February 2000.
3. "Performances économiques des Etats-Unis dans les années nonante" by A. Nyssens, P. Butzen, P. Bisciari, *Document Series*, March 2000.
4. "A model with explicit expectations for Belgium" by P. Jeanfils, *Research Series*, March 2000.
5. "Growth in an open economy: some recent developments" by S. Turnovsky, *Research Series*, May 2000.
6. "Knowledge, technology and economic growth: an OECD perspective" by I. Visco, A. Bassanini, S. Scarpetta, *Research Series*, May 2000.
7. "Fiscal policy and growth in the context of European integration" by P. Masson, *Research Series*, May 2000.
8. "Economic growth and the labour market: Europe's challenge" by C. Wyplosz, *Research Series*, May 2000.
9. "The role of the exchange rate in economic growth: a euro-zone perspective" by R. MacDonald, *Research Series*, May 2000.
10. "Monetary union and economic growth" by J. Vickers, *Research Series*, May 2000.
11. "Politique monétaire et prix des actifs: le cas des Etats-Unis" by Q. Wibaut, *Document Series*, August 2000.
12. "The Belgian industrial confidence indicator: leading indicator of economic activity in the euro area?" by J.J. Vanhaelen, L. Dresse, J. De Mulder, *Document Series*, November 2000.
13. "Le financement des entreprises par capital-risque" by C. Rigo, *Document Series,* February 2001.
14. "La nouvelle économie" by P. Bisciari, *Document Series*, March 2001.
15. "De kostprijs van bankkredieten" by A. Bruggeman and R. Wouters, *Document Series*, April 2001.
16. "A guided tour of the world of rational expectations models and optimal policies" by Ph. Jeanfils, *Research Series*, May 2001.
17. "Attractive Prices and Euro - Rounding effects on inflation" by L. Aucremanne and D. Cornille, *Documents Series*, November 2001.

18. "The interest rate and credit channels in Belgium: an investigation with micro-level firm data" by P. Butzen, C. Fuss and Ph. Vermeulen, *Research series*, December 2001.

19 "Openness, imperfect exchange rate pass-through and monetary policy" by F. Smets and R. Wouters, *Research series*, March 2002.

20. "Inflation, relative prices and nominal rigidities" by L. Aucremanne, G. Brys, M. Hubert, P. J. Rousseeuw and A. Struyf, *Research series*, April 2002.

21. "Lifting the burden: fundamental tax reform and economic growth" by D. Jorgenson, *Research series*, May 2002.

22. "What do we know about investment under uncertainty?" by L. Trigeorgis, *Research series*, May 2002.

23. "Investment, uncertainty and irreversibility: evidence from Belgian accounting data" by D. Cassimon, P.-J. Engelen, H. Meersman, M. Van Wouwe, *Research series*, May 2002.

24. "The impact of uncertainty on investment plans" by P. Butzen, C. Fuss, Ph. Vermeulen, *Research series*, May 2002.

25. "Investment, protection, ownership, and the cost of capital" by Ch. P. Himmelberg, R. G. Hubbard, I. Love, *Research series*, May 2002.

26. "Finance, uncertainty and investment: assessing the gains and losses of a generalised non-linear structural approach using Belgian panel data", by M. Gérard, F. Verschueren, *Research series*, May 2002.

27. "Capital structure, firm liquidity and growth" by R. Anderson, *Research series*, May 2002.

28. "Structural modelling of investment and financial constraints: where do we stand?" by J.- B. Chatelain, *Research series*, May 2002.

29. "Financing and investment interdependencies in unquoted Belgian companies: the role of venture capital" by S. Manigart, K. Baeyens, I. Verschueren, *Research series*, May 2002.

30. "Development path and capital structure of Belgian biotechnology firms" by V. Bastin, A. Corhay, G. Hübner, P.-A. Michel, *Research series*, May 2002.

31. "Governance as a source of managerial discipline" by J. Franks, *Research series*, May 2002.

32. "Financing constraints, fixed capital and R&D investment decisions of Belgian firms" by M. Cincera, *Research series*, May 2002.

33. "Investment, R&D and liquidity constraints: a corporate governance approach to the Belgian evidence" by P. Van Cayseele, *Research series*, May 2002.

34. "On the Origins of the Franco-German EMU Controversies" by I. Maes, *Research series*, July 2002.

35. "An estimated dynamic stochastic general equilibrium model of the Euro Area", by F. Smets and R. Wouters, *Research series*, October 2002.

36. "The labour market and fiscal impact of labour tax reductions: The case of reduction of employers' social security contributions under a wage norm regime with automatic price indexing of wages", by K. Burggraeve and Ph. Du Caju, *Research series*, March 2003.

37. "Scope of asymmetries in the Euro Area", by S. Ide and Ph. Moës, *Document series*, March 2003.

38. "De autonijverheid in België: Het belang van het toeleveringsnetwerk rond de assemblage van personenauto's", by F. Coppens and G. van Gastel, *Document series*, June 2003.

39. "La consommation privée en Belgique", by B. Eugène, Ph. Jeanfils and B. Robert, *Document series*, June 2003.

40. "The process of European monetary integration: a comparison of the Belgian and Italian approaches", by I. Maes and L. Quaglia, *Research series*, August 2003.

41. "Stock market valuation in the United States", by P. Bisciari, A. Durré and A. Nyssens, *Document series*, November 2003.

42. "Modeling the Term Structure of Interest Rates: Where Do We Stand?", by K. Maes, *Research series*, February 2004.

43. "Interbank Exposures: An Empirical Examination of Systemic Risk in the Belgian Banking System", by H. Degryse and G. Nguyen, *Research series*, March 2004.

44. "How Frequently do Prices change? Evidence Based on the Micro Data Underlying the Belgian CPI", by L. Aucremanne and E. Dhyne, *Research series*, April 2004.