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The challenge of measuring inflation… when business is *not* as usual

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Cecilia Frale and Jørgen Mortensen

Abstract

The recent surge in commodity prices and the European Central Bank's decision in June to raise interest rates to combat inflation have ignited a debate about the appropriateness of raising interest rates during a phase of weakening activity. In addition, it is relevant to examine the approaches to measuring the rate of inflation, to consider the advantages and drawbacks of these methods, and finally to throw new light on the possible influence of monetary policy on the fundamental trends in prices.

This paper presents a critical review of the methods of measuring inflation for the euro area and the US, analysing i) the adequacy of the consumer price index (CPI) weighting scheme, ii) the different definitions of inflation used on the two sides of the Atlantic, iii) the drawbacks of the current measures in the face of changing times and iv) some alternatives for the inflation computation.

As far as the weighting scheme is concerned, the main finding is that the weighting scheme applied by the US CPI exaggerates the weights of education, food and energy, while in Europe the weights in the CPI are closer to the expenditure weights with the exception of the weights of restaurants and hotels.

Furthermore, this paper asserts that substitution among different categories of spending – as consumers and producers shift e.g. towards cheaper energy or food sources or less energy-intensive goods and services – might bias standard measures of price increases. To the extent that the standard measurement of inflation fails to take account of the scope for substitution, this will also have an impact on the measurements of real income and output. The paper therefore argues in favour of calculating and publishing the results of alternative weighting schemes for measuring inflation.

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THE CHALLENGE OF MEASURING INFLATION… WHEN BUSINESS IS *NOT* AS USUAL

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CECILIA FRALE AND JØRGEN MORTENSEN*

1. Introduction

On Thursday, 4 June 2008, despite deepening gloom over the economic prospects and intense political pressure, the European Central Bank (ECB) raised interest rates to their highest level for almost seven years. The quarter-point increase to 4.25% came after ECB President Jean-Claude Trichet sounded a warning that eurozone inflation could "explode" without decisive action. The rise was the first for a year and took rates to a level last seen in September 2001, just before a series of cuts in the wake of the 11 September terrorist attacks on the United States.

Although Mr Trichet played down the significance of his choice of words, European stock markets took reassurance from his comments to end higher after their most volatile trading day in more than three months. Eurozone interest rate futures also rose, pricing in a reduced chance of further, early rate moves.

Yet, the ECB's move did little to dispel growing fears about the outlook for the eurozone economy, as the purchasing managers' survey published the previous day had been a grim catalogue for service companies across the eurozone. It had also indicated that business expectations among service companies had slumped to their lowest level since November 2001, as inflows of new orders fell and outstanding orders contracted at the fastest pace since mid-2003.

The ECB's decision to raise its interest rate by a quarter of a percentage point to 4.25% has been criticised by some politicians and economists as a measure likely to exert a dampening effect on growth in a situation in which activity is already slowing down. It has been greeted by others as appropriate, in view of the clear acceleration of inflation as regards consumer prices, and even more so, as regards producer and wholesale prices.

Beyond this dispute it seems, in the present context, particularly important to examine the way in which the rate of inflation is currently measured, to seriously consider the advantages and drawbacks of this and other methods, and finally to shed new light on the potential influence of monetary policy on the fundamental trends in prices in Europe.

It seems appropriate first to stress that the main factors driving recent trends in inflation, that is, the rise in the price of oil, raw materials and some categories of food and other agricultural products, may to some extent stem from an increase in demand from certain emerging economies, notably but not only China. Despite the increase, demand for oil from China and India still counts for a small part of the total. Even so, this rise in demand has been coupled with supply constraints, in some cases of a short-term nature, but in others, the constraints relate to the growing pressure to reduce carbon emissions and guide economic growth more towards sustainable development.

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Already newspaper articles point to the resulting changes in consumer behaviour in developed and developing countries. Consumers in the US are shifting to vehicles with significantly less fuel consumption per mile, as a result of engines that are more efficient and more modest size. Four-wheel driving is suddenly not as popular as before and wherever possible there is a switch in favour of the good old mass transport.

Undoubtedly but less spectacularly, consumers around the world are switching to food categories whose prices have shown little rise or even declines, and wherever possible growing more food themselves. Farmers are also switching to less energy-intensive methods of production and fishermen to methods of fishing using less fuel per tonne of catch. One example among many is the need for French fishermen to reduce the use of energy-guzzling trawling in favour of softer technology.

The question arising nowadays is whether actual inflation measures, namely the consumer price index (CPI), might catch these substitution effects. In other words, is the traditional inflation calculation still valid when business is not as usual, as is the case today, with increased risk premiums because of financial market stress, falls in house prices after the real estate boom and soaring food costs? And do the CPI weighting schemes appropriately reflect the share in the total expenditure of the components that should be taken into account when measuring the underlying rate of inflation?

2. Fixed or current expenditure weights?

A major general problem with the current universally applied measurement of price increases is that it is commonly based on the assumption of *unchanged behaviour*. Consumer and producer prices are most often calculated as the so-called 'Laspeyres' index, compiled by weighting price changes in the multitude of goods and services entering the index with their share in the 'basket' in a base year, most often a year in which the household budgets have been analysed through household surveys for which comprehensive data on production are available.

A Laspeyres index thus takes no account whatsoever of the phenomenon that, as already mentioned above, is and should be part of consumer and producer behaviour over the coming decades: the changes in behaviour and the scope for *substitution* of energy-intensive goods and services by goods and services consuming less energy – either by switching to older techniques or (more likely) to new energy-saving technology and alternative, renewable energy sources. There is broad scientific support for the view that the scope for such technological innovations is very large, if the incentives and price signals are appropriate. As recently documented by the *Economist* (4 September 2008), there are good signs for a near future with greener cars. General Motors and Honda are recruiting celebrities, journalists and businessmen to test a hydrogen fuel-cell version of the Chevrolet Equinox, while Renault-Nissan is ready for a mass production of its full electric cars for 2010. Volatile oil prices and the prospect of new penalties for carbon-spewing vehicles might have stimulated carmakers' research efforts more than environmental campaigns have done in the past.

Coming back to inflation, the problem with base-year weighted indices is one of the classical features of statistical methodology and early on statisticians designed essentially two other methods for measuring price increases: an index with *end-year* weights, named after Hermann Paasche, and an average of the two, named after Irving Fisher, who proposed the latter as the most appropriate formula. The difficulty with the Paasche index is first that it must be calculated for a recent period for which data on household budgets will not necessarily be available and for which, consequently, the design of the weighting scheme remains uncertain. What is conceptually certain, however, is that because of the scope for substitution the Laspeyres index always delivers a higher inflation estimate than the Paasche index does and the greater the

difference the larger is the degree to which agents escape the effect of the rise in prices of certain goods and services through switching to other categories.

Statistical offices have recently attempted to restrain this substitution bias by using a different procedure of aggregation for the basic price indices, the so-called 'chain link' approach. The new chained CPIs are based on a weighting scheme that compares each month to the previous month, weighting those changes by the importance of each good in both periods, and chaining back to the base period. This methodology does not entirely solve the problem of substitution bias and has its cost: the new series discounts an increased complexity of computation and interpretation and lacks additive properties. As a result, for example the series for GDP in constant prices is no longer the sum of its expenditure components (consumption, investments and external balance).

A compromise procedure avoiding the drawbacks of a chain weighting scheme could involve a weighted constant elasticity of substitution (CES) aggregator (as suggested in a Federal Reserve working paper),[1] assuming that utility takes a Cobb-Douglas form as a special case. In fact, according to this working paper, such a procedure is already employed by the US CPI to aggregate *individual prices* (that is, prices *within* item-area strata) with a geometric mean formula used for the majority of cases and a Laspeyres formula reserved for strata in which substitution is deemed unlikely a priori. With fuel substitution this would imply an assumption that consumers and producers keep the share in overall spending of a specific category of goods and services more or less constant and that consequently, they increase their use of other goods and services so as to maintain their overall 'utility' at the same level.

Once the substitution effect is considered, as for example by assuming an elasticity of substitution ranging from 0.6 to 1, the estimated overall price increase in December 2008 in the euro area is less than the classical CPI measure by as much as 11% (see Box 1 for a discussion of the CES utility function approach).

Box 1. Alternative calculation for the CPI

In 1996, Shapiro and Wilcox proposed a method for the calculation of the CPI in the US that accounts for the substitution effect without requiring current expenditure shares, which are normally not available in real time given the burden of collecting the household survey data. In order to catch the preferences of consumers, they propose to modify the aggregation formula in the CPI calculation by using a utility function, i.e. the CES function. Hence, they suggest the following formula to obtain an aggregate index for the month *m*:

$$\frac{P_{y,m}^{CES}}{P_{y-2,12}^{CES}} = \left[\sum_i w_{i,y-2} \left(\frac{p_{i,y,m}}{p_{i,y-2,12}} \right)^{1-\sigma} \right]^{1/(1-\sigma)}$$

where w is the expenditure shares available on the year (y-2) and $p_{i,y,m} / p_{i,y-2,12}$ are the sublevel price indices across which to aggregate. This formula could be that used to compute, for example, the overall index from the main 12 categories (food, housing, transport, communication, etc.) or at a lower level to compute a basic price index (e.g. food) from its sublevel categories.

[1] See Lebow & Rudd (2006).

The core element of the formula is the elasticity of substitution σ, which mainly measures the proportional change in the quantities demanded of a specific item, with respect to the proportional change in relative prices. It is useful to recall that the CES function encompasses other aggregation functions for different values of σ. For example, it reduces to the geometric mean, which supposes Cobb-Douglas preferences, if $\sigma=1$, while it collapses to the classical Laspeyres formula, based on Leontief preferences, when the substitution among items is supposed to be zero ($\sigma=0$).

As mentioned earlier, for the time being it is hard to accept a priori zero substitution, especially for those items that have experienced a strong surge in prices, e.g. food, or those that are involved in the process of sustainable development and energy diversification.

Actually, a first approximated calculation of a price index based on the CES aggregation scheme shows inflation in the euro area to be less than the official rate based on the Laspeyres formula.

We cannot assume that European consumers will be in position to compensate through the 'indexation' of their income the real loss resulting from a constraint on volume, not as much owing to supply constraints but to increased demand from other countries. This loss will be incurred through a terms-of-trade loss, implying that in national account terms real national income will rise less rapidly than GDP.

Consumers thus face a real budget constraint and are not in a position to increase their overall nominal expenditure to compensate for the effect of inflation. They must then reduce real spending somewhere, either on other products so as to maintain their real expenditure on the goods and services whose relative prices have increased or through substituting in one way or another to keep overall utility unchanged. It must be stressed that the scope for substitution of course only exists where there are large changes in relative prices and not when all prices change in more or less the same proportion.

We can distinguish between two types of substitution: within categories (i.e. among substitute goods such as rice and bread) or between categories (i.e. among items that are not substitutes, such as clothing and food). The second kind of substitution seems to have a greater effect on the inflation computation, as shown by Table B1.1. Our forecast for inflation in December 2008 using the CES calculation, with different degrees of substitution, ranges from 3.51% to 3.22%, with the lowest figure representing the extreme case of perfect substitute goods. In other words, adopting the CES methodology for inflation for the current year would result in a lower figure than the official number by up to a maximum of 11%.

The presence of the substitution effect within categories seems to be less influential. Assuming for example a substitution of 0.8 within food goods and services, the overall inflation in December 2008 would be 3.31% instead of 3.53%. A similar number comes up when transport goods are considered as well.

Although these numbers represent only an approximation of the rigorous calculation – which should be done at the item level and then it would involve more sophisticated algebra and confidential micro data – the direction of the measurement bias is as expected, with the CES-based inflation level being systematically lower than the official Harmonised Index of Consumer Prices (HICP) measure.

A rigorous calculation is beyond the scope of this paper and presents several critical points. First is the estimation of σ. According to the theory, one should estimate the substitution elasticity among all pairs of items, which is a cumbersome approach given the high number of goods and services involved in the HICP computation. Second, the substitution elasticity is likely to vary over time, as consumers are supposed to change their behaviour according to price dynamics. This requires a model for regularly updating σ, or even better, to anchor its estimation to the recent price dynamic. Some investigations from the Bureau of Labor Statistics (BLS) in the US in the direction of the CES function have shown that σ is markedly variable over time, with a range of a minimum of 0.06 to a maximum of 2.78 for the period 1986–2000 (see Cage et al., 2003).

Table B1.1 Alternative inflation computations (euro area)

Inflation measures	Yearly variation in December (unless otherwise specified)			
	2006	2007	2008 (partial up to August)	2008 (total estimated)*
HICP Laspeyres (σ=0)	1.970	3.160	2.12	3.53
HICP–CES with substitution (σ) *between* categories				
σ=0.6	1.899	3.094	2.006	3.515
σ=0.7	1.898	3.091	1.995	3.248
σ=0.8	1.896	3.087	1.984	3.238
Perfect substitution (σa=1)	1.894	3.080	1.962	3.220
HICP–CES with substitution (σ) *within* categories				
Food (σ=0.8)	1.913	3.14	2.07	3.32
Food and transport (σ=0.8)	1.890	3.11	2.05	3.31

* Notice that our forecast for the Laspeyres HICP is very close to the European Commission's interim forecast for annual inflation for 2008 (3.6%). For the sake of comparison with the other inflation measures we rely on our forecasts, which have been obtained by using the Unobservable Component Model and the Kalman filter as in Harvey (1991).

Source: Own calculation on data from the US Bureau of Labor Statistics.

The current US CPI is based on a mixed procedure, which uses the CES formula to aggregate individual prices (within item strata) in the majority of cases and a Laspeyres formula for the match where substitution could be excluded a priori.

The wide gap at present between perceived and real inflation adds fuel to the fire. According to a recent editorial by the French Conseil d'Analyse Economique (Moati and Rochefort, 2008), despite a measured increase of household purchasing power by 3.5% in 2007 in France, more than two-thirds of French citizens consider that their purchasing power has declined. Similar features emerge from a study by the European Commission at the end of 2007 (Friz, 2007), where the gap between the HICP and perceived inflation as obtained by consumers' surveys is a common phenomenon of all the European countries, with particular emphasis in Italy, Belgium, France and Finland. Several factors are at play, such as the high level of importance consumers attach to price developments for the goods and services they buy more frequently and the greater influence of upward movements on consumers than downward movements.

Another limitation of the current measure is that the aggregation scheme uses weights based on expenditure shares, which thus over-represent richer consumers and under-represent poorer agents. The alternative to the current 'plutocratic' method might be a 'democratic' weighting scheme, in which every household counts in equal measure in determining the population index. The difference between the two indices, called the 'plutocratic gap', would rise sharply if there were a high number of lower-income households having a basket skewed towards food and petrol, as we have seen over the last couple of years (see Lebow & Rudd, 2006, inflation measurement).

As a consequence, the appropriateness of the global CPI as a tool to measure real income inequalities should be carefully reconsidered. In a recent paper, Christian Broda and John Romalis (2008) have demonstrated that when appropriately measured, American income inequalities in the past "have been smaller than it appeared" and this essentially stems from a

very different composition of the consumption of the rich and the poor. The opposite might then be true, *mutatis mutandis*, for the recent period.

To obtain a concrete perception of the purchasing power of different groups of the population, the price dynamic could therefore be investigated for categories of households, rather than solely along the geographical dimension, as it is now. Following this idea, the French statistical office (INSEE) has proposed some specific price indices whose computations distinguish among age of the householder(s), class of income, status of lodgement, family size and quality of life level. They found that the index for households having a lower quality of life (measured by income per unit of consumption) is that which differs most from the general price index: the gap with the overall population index for the period 1996–2007 is around 1.5% for the lowest two quality of life classes (INSEE, 2007). Some differences also emerge for rural households, which are much more affected by the oil price surge than urban households are, given the intense consumption of domestic fuel and petrol in rural areas. Unfortunately, the INSEE initiative is isolated, and there is no price index for different household categories at the European level.

Another issue of some importance for the assessment of the fundamental trend in prices is, of course the choice of items to include in the 'core' price index. One such measure frequently included has been rent for housing. The inclusion of house prices, for example, in an inflation index would beyond doubt have yielded a rate of inflation well above the core index of consumer prices in countries such as the US, Spain or Ireland. Yet the inclusion of such items in the measurement of current rate of inflation would yield a lower rate than the core index.

The possibility of including asset prices in the inflation computation has been considered in the literature and the policy debate. Although the excess volatility of such items may discourage any concrete evolution in that direction, at issue is whether monetary policy aiming at overall financial stability should target not only inflation of the goods and services currently consumed but also the prices of certain assets such as, notably, shares or housing.

Furthermore, the price indices must be updated with the introduction of new items and new stores because they may have different price levels and changes than those already in the index. In introducing new items and stores to the index, statisticians would face the challenge of capturing a representative sample of new items and attaching appropriate weights to them. In addition, owing to globalisation, new products are increasingly exchanged across national frontiers, often with a price significantly lower than the internal one, especially when the country of origin is a low-labour-cost one. Hence, broadly speaking, which screwdriver, just to give a provocative example, should be included in the CPI – the local one, at double/triple the price or the one from Taiwan or China?

An additional aspect is the volatility of prices. Prices for some food items, particularly fresh goods – fruit, vegetables and meat – that occasionally fluctuate widely, would create an inflationary drift by implicitly attaching greater weight to price increases than to decreases. This issue is no longer limited to fresh goods: after a period of relative stability, oil prices may be showing a higher degree of volatility as well, with the same consequences as for food items in the past.

3. Price indices and expenditure weights

Conceptually, the weights of the different components of the CPI should correspond to their shares in the expenditure of households in a given year, either the base year (Laspeyres index) or the current year (Paasche) or any other period chosen as the base for inflation measurement. In reality, however, the weights of the various components in the index measuring inflation rarely correspond to the composition of household expenditure, if at all. In addition, the measure

of household expenditure may contain imputed items that are not easily translated into components of the index measuring inflation.

Overall inflation is an aggregate index of category price indices (food, housing, energy, restaurants, etc.) with weights mirroring the shares of household expenditure, but a direct comparison of the CPI weights and household expenditure shares reveals some disparities in both the US and Europe (see the appendix for complete details). Moreover, the CPI does not include certain expenditure items such as pensions and insurance. In addition, spending that represents an investment, such as the cost of housing, is generally excluded from the price index basket.

In fact, 'housing' is probably the most important source of differences between the estimated expenditure components and the CPI. An average household in a developed country allocates a high proportion of its income to rent or the cost of owner-occupied housing. Whether to include this and the methodology for doing so is a major problem for statisticians, for which there is hardly an 'objective' solution. Furthermore, the solutions applied tend to differ considerably from one country to another, aggravating the problem of cross-country comparability of inflation measurements. Thus, as seen in the appendix, the weight of housing costs in the US CPI is some 14 points lower than in the household expenditure survey, while in the euro area the weight of housing in the HICP is not significantly different from the (rebased) weights among the expenditure categories.

In the US, the CPI contains a large item called 'owners-equivalent rent', which amounts to nearly 25% of the total, thereby 'squeezing' the weights of all the other categories, including energy and food. As a result, the weight of energy in the US CPI is about 9.7%, but it would amount to 12% if owner-occupied housing were excluded from the calculations.

In the first half of 2008, the price of energy increased by 15% in the US and 11% in Europe, much less than the price of oil. This is the effect of at least two major factors. First, the price index includes many items other than petroleum (e.g. gas and electricity) whose prices do not vary one to one with the price of crude oil. Second, the retail price of energy contains many other elements, such as the costs of distribution, refinery costs and taxes. This latter aspect is particularly relevant for Europe. Take for example gasoline: a government tax amounting to more than 50% in Europe (52% in Italy, 50% in France, 56% in Germany and 61% in the UK versus 21% in the US) implies that a higher oil price translates into a lower percentage increase in prices at the pump.

Nevertheless, even after adjusting the expenditure shares for items that by definition are not taken into account in the CPI weights, important disparities remain between the two sets of weights. As seen in the appendix, in the US the weight of the item education and communication is substantially higher in the CPI than in the (rebased) expenditure breakdown.

As far as the European HICP index is concerned, the discrepancies between rebased inflation weights and expenditure shares never exceed 2%, except for restaurants and hotels (2.65%) and miscellaneous (which amounts to –3.5%). Indeed, the existence of a unified classification in Europe (the so-called 'COICOP') for CPI weights and expenditure shares simplifies the comparison. The weight of energy in the HICP, at roughly 10%, is higher than the weight of energy in consumer expenditure (where it is only 9%). Consequently, it appears that the European measure of consumer prices also overestimates the impact of energy price increases on consumers' income. The same applies, *mutatis mutandis*, for food.

At the national level, one major distortion can be easily spotted: the difference between the HICP weights and effective expenditure is much higher for new member states than for the old ones, implying that they are probably still in the process of adjusting to the unified method of calculation.

4. Other technical and political aspects of inflation measurement

It should thus be evident that a direct comparison of US and EU inflation indices is inappropriate, as they are calculated using somewhat different methods and baskets of goods. In fact, there is no internationally agreed standard methodology of measuring inflation since such indices are generally used for national purposes, such as wage arrangements and price stabilisation policies, and are frequently subject to heated discussions and social and political negotiations. This disparity affects government programmes to the extent that they are indexed to inflation as well as monetary policy. Not only is the Fed targeting the US monetary policy on the so-called 'core inflation' (excluding food and energy) while the ECB refers to the overall HICP index, but also the two policies differ from their starting points.

The European HICP differs from the US CPI in two major respects. First, the HICP includes the rural population in its scope (see Box 2 for additional information about the HICP). Second, and probably more importantly, the HICP excludes owner-occupied housing, mainly because the methods used to measure price changes for this component are controversial and difficult to calculate.

Box 2. The HICP for Europe

Despite being named the Harmonised Index of Consumer Prices, the reference price index in Europe is based on a basket of goods and services that is not homogeneous in all member states. Nor are the weights used for aggregation purposes. These differences arise from the attempts by the index to mirror closely the spending patterns of consumers in each country, which would not be obtained if a homogeneous basket and set of weights were used. Not only are weights specific for each country, but also the data sources for them are not standardised. Eurostat gives each member state the freedom to choose the most comprehensive and reliable source available and thus each country integrates different statistical information. In general, the two main sources are the Household Budget Survey, which is carried out every five years, and the national accounts, available on a yearly basis.

What is standardised is the methodology of the computation. For example, some standard procedures for updating the basket are defined: each country has to adjust the weights of items in its basket in the event of significant changes in expenditure (defined as greater than 1/1000 of the total). Additionally, a general review has to be carried out at least once every seven years (although the recent rate of updating has been more frequent).

In the aggregate index for the EU-27 (euro area), each member state has a weight reflecting the proportion of its final, monetary household-consumption expenditure out of the total for the EU (euro area). In order to take into account the different national currencies, especially in the first version of the HICP developed in 1997, the values of final consumption expenditure are converted into purchasing power standards (PPS) using the purchasing power parities (PPPs) for final consumption.

In theory, American monetary policy should be more sensitive to movements in the housing sector than the European one is, because the US CPI, as indicated above, uses a rental equivalence approach that estimates the changes in the amount owner-occupants would pay to rent equivalent housing. By contrast, the HICP completely excludes owner-occupied housing costs in the computation of the inflation index.

Actually, the effect of the rental equivalence on the inflation index is strongly attenuated by the inability of the current price index for housing to reflect accurately the trends in market prices in the real estate sector. Given an increase in the inflation index for housing in the US of 30% from 2000, the house price index by the OECD has shown a cumulated variation of more than 50%

for the same period and the more volatile Case-Sheller index has more than doubled. One explanation for this discrepancy is that the major component of the price index for housing is the owner's equivalent rent (as described above), which is indirectly estimated by using the rental price, rather than the selling price. The former is likely to adjust more slowly than the latter, as it is generally linked to a multi-period contract (see Box 3 for more details).

Box 3. The housing component in the US CPI

The CPI for housing is not computed by the BLS according to the classical procedure for the prices of goods and services, which concerns two steps: first, the collection of prices for elementary indices, and second, their aggregation by using a variant of the Laspeyres index formula with weights representing the importance for consumers of each item/category within his/her basket. It is based on the rental equivalence (REQ) index, namely a measure of the change in the cost of shelter for renters and owners, respectively. Each month, BLS field representatives gather information from renter units on the rent for the current and previous months and on the services that are provided.

The REQ index is designed to measure the change in the rental value of owner-occupied housing and thus it measures the change in the amount a homeowner would pay to rent or would earn from renting his or her home in a competitive market. It is a measure of the change in the price of the shelter service provided by owner-occupied housing.

The owner's equivalent rent is the major component of the housing index, to which it contributes more than 56% (see Table B3.1), and it is also relevant in general terms, given that it has a weight in the total CPI index of around 24%. This means that more than a quarter of total inflation is driven by its trend.

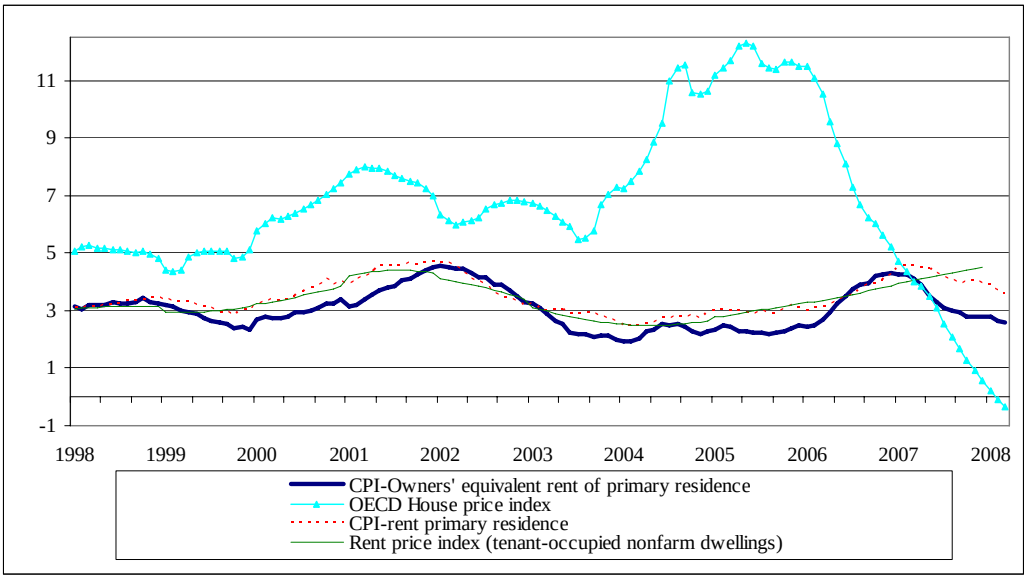
Table B3.1 Component weights in the housing index (August 2008 release)

Housing	**42.4**
Shelter	32.6
Rent of primary residence	5.8
Lodging away from home	2.6
Owners' equivalent rent of primary residence	23.9
Tenants' and household insurance	0.3
Fuel and utilities	5.1
Household energy	4.2
Fuel oil and other fuels	0.4
Gas (piped) and electricity	3.9
Water and sewer and trash collection services	0.9
Household furnishing and operations	4.7
Household operations	0.7

Source: Bureau of Labor Statistics.

Nevertheless, the owner's equivalent index seems to follow the rent index much more closely than the house price index, as shown by Figure B3.1. This is mainly the consequence of the estimation procedure, which is largely based on rent prices, as is clear from the methodological documentation provided by the BLS. "To estimate the change in the implicit rents of the owners, the CPI…measures the change in implicit rents over time by matching owner units to renter units with similar characteristics. The characteristics included location, structure type, and other general traits such as age, number of rooms, and type of air conditioning" (BLS, 2007). What is more, in 1997 the BLS decided to go back to the original procedure adopted in the 1980s, in which the renter sample is reweighed to represent owner-occupied units rather than interviewing owners directly. With the sample units being the same for renters and owners, there is no reason to expect a significant gap between the rent index and that for the owner occupiers.

Figure B3.1 House prices and CPI housing components – Annual % change



In addition to housing, there are other small technical differences between European and US methods. First, the US CPI uses a geometric formula for most elementary aggregates, whereas many European countries choose an arithmetic formula, which tends to rise more rapidly (HICP rules allow either formula). Second, the US CPI adjusts for changes in consumer products and may introduce new products into the pricing samples more aggressively. Third, the European approach deals with insurance in different ways. For example, it uses the so-called 'premiums net-of-claims-paid' approach; by contrast, the US CPI uses gross premiums for household and vehicle insurance. Fourth, the US CPI is produced in seasonally adjusted terms, while Eurostat does not adjust for seasonal movements in the HICP, in the belief that it should reflect consumer purchasing power as it is.

Finally, differences between American and European societies can be important sources of divergence in the movement of indices, even when identical indexing methods are used. One obvious example is medical care: because Americans pay for a much larger proportion of medical expenses themselves, this item has much greater significance in the US indices. By contrast, Europeans generally receive much of their medical care through government programmes, items that are outside the definition of both CPIs and HICPs. Similarly, Americans also pay a larger share of educational costs than do Europeans, which have risen very swiftly in the US in recent years.

Some researchers believe that the higher performance of the US economy with respect to Europe is related to differences between the two CPIs. They argue that the economic strength of the US would appear less robust if European methods of indexing prices were used. Analysts from the BLS, however, argue that the opposite is true. They computed some experimental indices following the HICP methodology with the aim of drawing comparisons. They found that for the period 1997–2005, the US HICP rose more slowly than the official US CPI did. Of course, the new index did not account for all differences, one example being that education in Europe is mostly provided by the government while in the US it is largely privately funded. In part, these discrepancies may be responsible for the remaining differences in the relative performance.

5. Conclusions and policy considerations

The tendency in the public debate is to assume that 'the rate of inflation' is an objective indicator that is more or less valid as a measure of the price changes in the economy. The present working paper, however, has shown that there are good reasons to consider the nuts and bolts of the methodology used in compiling the CPI before drawing hasty conclusions about the general direction of inflation in the economy. The issues at stake essentially concern three points:

1) the general weighting scheme, the impact of changes in relative prices and the scope for substitution among the different components;

2) the possible discrepancies among the weights in the CPI and the share of these components in household expenditure; and

3) the populations and income categories covered by the household surveys.

There is now increasing political, social and economic importance attached to the sustainable development strategy and to mitigation of and adaptation to climate change. This pressure considerably reinforces the need for substitution at the high end of the scale of energy-intensive goods and services with new energy-efficient technology and profound changes in the behaviour of households and producers.

The measurement of inflation should not be based, as in the past, solely on the assumption of 'business as usual', but take more explicitly into account the need and scope for substitution. It may not be appropriate to change the 'official' measures of consumer and producer prices but there now seems to be a pressing need for accompanying the compilation and publication of the core indices with assessments of the likely effects of substitution in the short, medium and long term. Given the amplitude of recent changes in the relative price of energy, raw materials and certain goods and services, the scope for substitution is probably significant. It would therefore be most pertinent as a test case to produce alternative estimates of inflation using, for example, a CES formula as suggested in the Federal Reserve working paper quoted above.

In addition, the weighting scheme for computing the overall inflation index does not necessarily correspond to the weight of such items in household expenditure. In particular, the weights of the various categories in household expenditure are significantly different for low-income and high-income households. In periods with substantial changes in relative prices (such as the relatively high increase in the prices of energy and food), the rate of inflation (if calculated with the expenditure weights of each income category) may be markedly different from the overall CPI. Consequently, the construction of specific indices for different categories of households might help in understanding the social effects of price increases.

A further complication for the measurement of underlying inflation is that a good deal of the recent price increases in food, oil and a number of raw materials must be viewed as price-level adjustments rather than shifts to higher, permanent rates of price inflation. Hence, a large share of the recent 'inflation' must be considered transitory in nature, likely to be followed by calmer periods or even stability at a new level. As such, while the *Economist* commodity price index rose by 15% during the year up to 2 September 2008, there would be good reasons to assume that a significant proportion of this rate of increase is transitory.

Notably during periods with large shifts in relative prices and resulting changes in the behaviour of households and firms, it would be more attractive for monetary policy and financial stabilisation policy in general to assess the rate of inflation from a longer perspective, attaching less importance to changes over recent periods, such as a month, a quarter or even 12 months.

The options for doing so could include not just qualitative assessments, but also the introduction of complementary measures of current rates of price increases that explicitly take into account the scope for substitution. Such measures could use the CES method outlined above for example, if not as an alternative rod then at least as a way to shed some new light on the policy options.

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Appendix. Comparison between the price index weights and the expenditure shares

There is not an exact correspondence between the categories of the price index and those of the consumption expenditure survey. For the sake of comparison, the following tables report the two score systems rebased on a common total, for the US and the euro area.

Table A1.Comparing CPI weights and expenditure shares in US and in the euro area

	US				
Category of goods and services	**CPI weights (Dec 2007)**	**Expenditure shares (2006)**	**CPI weights rebased (net b)**	**Expenditure shares rebased (net c, d)**	**Diff.**
Food and beverages	14.9	13.6	19.6	16.1	3.5
Housing (a)	42.4	–	–	–	–
Owners' equivalent rent (b)	23.9	–	–	–	–
(a) – (b)	18.5	32.5	24.3	38.5	14.1
Apparel	3.7	3.8	4.9	4.5	0.4
Transportation	17.7	18.2	23.2	21.5	1.7
Medical care	6.2	5.9	8.2	7.0	1.2
Recreation	5.6	5	7.4	5.9	1.5
Education and communication	6.1	2.2	8.0	2.6	5.4
Other goods and services	3.3	3.3	4.3	3.9	0.4
Cash contributions (c)	–	3.7	–	–	–
Personal insurance and pensions (d)	–	11.8	–	–	–
Total	**100**	**100**	**100**	**100**	–
Energy (from housing and from transport)	9.70	8.4	12.74	9.9	2.8

		Euro area-12			
	COICOP items	**HICP weights (2008)**	**Expenditure PPS, HBS (2005)**	**Rebased expenditure**	**Diff.**
cp01	Food and non-alcoholic beverages	15.77	14.32	16.76	-0.99
cp02	Alcoholic beverages, tobacco and narcotics	3.72	2.14	2.51	1.21
cp03	Clothing and footwear	6.83	5.97	6.99	-0.16
cp04	Housing, water, electricity, gas and other fuel	15.34	28.03	15.75	-0.41
cp05	Furnishings, household equipment and maintenance	7.01	5.65	6.62	0.39
cp06	Health	4.05	3.63	4.24	-0.20
cp07	Transport	15.65	12.55	14.69	0.96
cp08	Communications	3.29	2.85	3.34	-0.05
cp09	Recreation and culture	9.69	8.21	9.61	0.08
cp10	Education	1.04	0.88	1.03	0.00
cp11	Restaurants and hotels	9.26	5.65	6.61	2.65
cp12	Miscellaneous goods and services	8.36	10.13	11.86	-3.49
	Total	**100**	**100**	**100**	–
Energy (from housing and from transport)		9.80	7.59	8.88	0.92

Sources: Bureau of Labor Statistics, Eurostat and own calculations.

Table A2. Differences between households' survey shares (2005) and HICP weights (2006), by country (without rebasement)

	Food and non-alcoholic beverages	Alcoholic beverages, tobacco & narcotics	Clothing and footwear	Housing, water, elect., gas & other fuels	Furnishings, household equipment & maintenance	Health	Transport	Communica-tions	Recreation and culture	Education	Restaurants and hotels	Miscellaneous goods and services
Belgium	4.2	0.8	1.0	-9.0	1.1	-0.7	1.9	0.0	2.9	0.1	2.7	-5.0
Bulgaria	-7.7	1.0	0.9	-24.8	1.8	0.4	14.1	1.8	2.5	0.6	9.0	0.4
Czech Republic	-1.7	6.9	-0.5	-4.1	-0.7	0.3	2.0	-0.6	-0.1	0.1	2.3	-4.0
Denmark	3.6	1.9	0.7	-10.9	0.9	0.4	0.1	0.0	0.2	0.6	1.5	1.1
Germany	1.0	2.8	0.6	-6.5	0.7	0.8	1.3	0.2	1.0	0.3	0.9	-3.0
Estonia	-1.7	5.2	2.8	-17.1	-0.3	1.0	3.8	-1.4	1.5	0.3	5.0	1.0
Ireland	1.2	1.2	0.4	-13.0	-2.5	1.0	2.7	0.3	1.0	0.5	11.3	-4.1
Greece	1.8	1.0	1.9	-14.7	0.2	0.3	3.0	0.0	1.3	-0.1	7.9	-2.5
Spain	2.3	0.4	2.0	-19.8	1.9	0.8	4.0	0.9	1.2	0.4	5.2	0.6
France	2.8	1.4	-1.1	-11.7	0.5	0.1	4.2	0.2	3.1	-0.1	2.5	-1.8
Italy	-0.8	1.3	2.5	-19.7	3.3	-0.3	4.2	0.6	1.2	0.4	6.7	0.7
Cyprus	2.9	1.1	0.9	-13.2	0.4	0.4	1.5	0.4	0.8	-1.2	4.2	1.8
Latvia	-5.5	3.9	-0.2	-5.5	0.1	0.6	2.8	-1.3	1.3	-0.1	3.8	0.1
Lithuania	-8.6	3.9	0.0	-7.1	2.2	0.4	3.6	-0.7	2.4	0.4	3.3	0.3
Luxembourg	1.9	11.1	-2.0	-20.6	1.7	-0.7	6.4	-0.8	0.7	0.0	1.0	1.3
Hungary	-2.8	4.1	-0.2	-5.9	1.9	0.0	1.1	-1.6	0.4	0.4	5.0	-2.6
Malta	-3.4	2.2	-2.1	-0.8	-1.7	0.1	-2.1	-0.4	-0.8	-0.2	10.5	-1.4
Netherlands	3.0	1.4	0.6	-8.1	1.4	1.4	3.7	1.8	0.9	-0.4	0.8	-6.5
Austria	-0.1	0.2	0.1	-8.1	1.7	2.1	-1.0	-0.5	-1.0	0.2	9.1	-2.6
Poland	-2.4	5.2	-0.1	-11.4	0.5	-0.1	1.2	-1.2	0.9	0.1	1.6	5.6
Portugal	3.1	0.6	2.3	-16.8	2.5	-0.7	7.4	-0.2	-1.1	0.0	3.3	-0.3
Romania	-7.3	0.4	0.8	3.3	0.5	-0.8	1.4	0.5	0.5	0.0	0.8	0.0
Slovenia	0.7	2.6	-0.6	-13.6	1.0	2.4	2.5	0.1	0.5	0.5	4.6	-0.9
Slovakia	-9.1	2.3	-1.6	-1.4	1.7	0.9	0.4	-0.8	1.9	1.0	4.0	0.5
Finland	2.8	3.5	1.8	-12.1	1.2	1.8	0.3	1.1	-0.1	0.4	3.9	-4.6
Sweden	3.6	2.3	1.5	-15.6	-0.5	1.3	2.1	0.5	-1.8	0.4	4.0	2.0
UK	1.0	1.8	1.3	-18.1	0.2	1.0	1.7	-0.4	2.9	0.5	5.7	2.3

Source: Eurostat.

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