

CPI adjusted for tax changes and excluding energy products

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In 2001, Statistics Norway published three new indicators derived from the Consumer Price Index (CPI). The publishing of these indicators was partially inspired by the mandate given to Norway's central bank, Norges Bank, to define monetary policy in relation to an inflation target. The growth in the CPI All-item Index is not necessarily the most relevant and meaningful measure. CPI adjusted for certain factors, for example changes in indirect taxes, can give essential additional information about the more general movements of price growth. This article provides documentation of which adjustments are made in the three derived CPI series, the grounds for carrying out these derivations as well as the assumptions that the adjustments are built upon.

Introduction

The Consumer Price Index (CPI) is an economic measure derived from prices on a selected sample of goods and services. Occasionally the price development on a limited number of goods will completely dominate CPI development and thereby impair the indexes' informational value concerning the more general price development. This happened in 1999 and 2000 when there was a particularly steep price increases on oil related products in addition to considerable changes in electricity prices. These changes contributed to the decision by Statistics Norway in the fall of 2000 to publish a Consumer Price Index excluding energy goods (CPI-AE).

On March 29, 2001, Norges Bank received a new mandate for monetary policy, where the operational target is annual growth in consumer prices at 2.5 per cent over time. The regulations also specify some effects related to price growth whose influence must be discounted when the central bank assesses the monetary policy. As groundwork for their annual assessment of the results for monetary policy, the central bank will emphasise the development of an indicator for consumer price growth that has been corrected for changes in taxes and energy prices, see Norges Bank (2001).

On October 10, 2001, Statistics Norway published, one series for consumer price growth adjusted for real changes in taxes (CPI-AT) and another series in which the consumer price growth is adjusted for both real changes in taxes and energy prices (CPI-ATE). In this paper's first section, the relationship between the

monetary policy regulations and the Statistics Norway adjusted series is explained. In the second section, the principles behind the removal of tax change effects in CPI-AT are discussed. The approach to handle energy goods in CPI-AE is described in the third section. The fourth section explains how the real effects from tax changes and energy prices are incorporated into the indicator CPI-ATE. Finally, the paper's conclusion gives a summary of how CPI and the derived indicators have developed in the time up to October 2001.

New regulations for monetary policy

In the spring 2001, Norges Bank was given new guidelines for the monetary policy. In the regulations presented March 29th, the central bank was instructed to apply the instruments of monetary policy to establish stable and low inflation. The operational target is a annual growth in consumer prices that over time is near 2.5 per cent. There are however some circumstances which the central bank is not to incorporate into their monetary policy decisions:

"In general, the direct effects on consumer prices resulting from changes in interest rates, taxes, excise duties and extraordinary, temporary disturbances shall not be taken into account."

Ministry of Finance (2001).

The regulations therefore go a long way towards defining a basis for a separate indicator that will be a guide for the exercise of monetary policy. As such, this indicator can be used to further the monetary policy's ability to fulfil the goals of the operational target. Nevertheless the wording 'extraordinary, temporary disturbances' gives significant room for interpreting which specific factors should be adjusted for in the formulated consumer price growth, and also how one should measure such direct effects. Even how those effects are handled in relation to changes in interest

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rate levels and taxes and excise duties, are far from obvious.

In the first of Norges Bank's inflation reports after the new regulations were established, the bank presented their interpretations of which direct effects the consumer price growth should be adjusted for. With reference to preliminary analysis, the bank estimated that changes in interest rates would normally have a negligible direct effect on CPI growth. This lack of effect is connected to the fact that interest does not enter directly into the housing cost component nor other components in the Norwegian Consumer Price Index. On the other hand, the central bank does want to adjust for the direct effects of changes in energy prices. In the last years, large changes in the energy prices have made it complicated to assess general price growth tendencies. Lastly, the bank decided that they would adjust for the direct effects on the Consumer Price Index due to tax changes.

There is no steadfast answer to how one should distinguish between special and general price changes. One objection to permanently adjusting for the direct effects of energy price changes is that not all of these changes can be regarded as of 'extraordinary, temporary' character. A simple interpretation of the regulations is that it does not give room to remove any other price effects on a permanent basis than those that come from changes in interest, taxes and excise duties. However, if one looks at the variation in energy prices in relation to the average for the remaining goods and services in CPI in the last two years, one can reasonably say that the development of these prices is of 'extraordinary, temporary' character.

After the alterations to the monetary policy, Statistics Norway developed an indicator for the Consumer Price Index purged of the direct effect of real tax changes (CPI-AT). The adjustments that are made in the indicator CPI-AT were then combined with the earlier derived CPI-AE into one indicator where the Consumer Price Index is accordingly adjusted for real changes in both taxes and energy prices.

In the data on which the Consumer Price Index is based there is no explicit information on taxes. Calculation of the effects from tax changes on CPI is built therefore upon a line of assumptions.

Taxes and Duties in the Consumer Price Index

The regulations state that all direct effects on the consumer prices by tax changes should be removed from the monetary policy's consumer price measure. In this case Statistics Norway interprets direct effects as real changes in taxes and duties which are directly added to consumer goods and services; not tax and duty changes that first have an effect through prices on contribution factors or other products then later are to be added onto the retail prices on consumer goods

Table 1. Taxes, which are adjusted in CPI-AT

Value added tax	Tax on Mineral products
Tax on Spirit, wine and beer	Tax on Chocolate and sweets
Tax on Tobacco	Tax on Non-alcoholic drinks
Tax on Petrol	Tax on Sugar
Tax on Autodiesel fuel	Tax on Air Travel
Tax on Marine motors	Tax on Tapes
Consumer tax on electricity	Tax on Radio and television materials

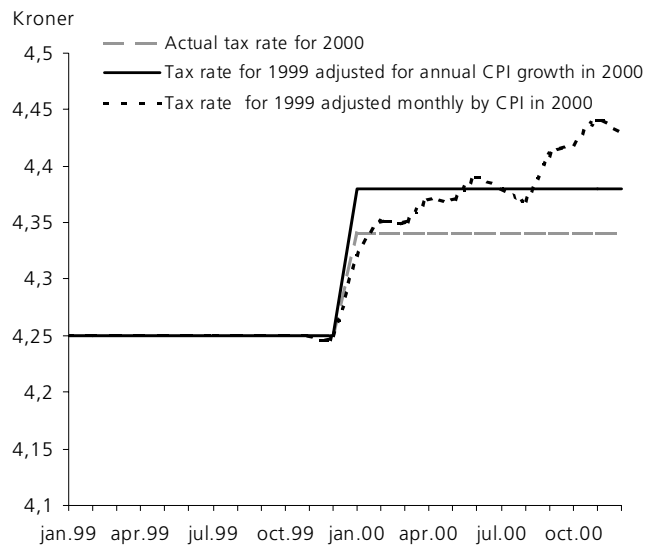
Source: Statistics Norway.

and services. This interpretation implies that large portions of the total tax and duty system are not relevant for such adjustments. Even after this clarification, there are unclear challenges connected with identifying the effects that real changes in the actual taxes and duties have on consumer prices.

The Consumer Price Index is based on a sample of goods and services that covers a broad spectrum but is far from encompassing all goods and services. The sample is designed to be a representative list of goods and services for the private consumer, and can fulfil that purpose without covering all taxable products. This means that the measured consumer price growth does not necessarily detect the effects of all types of tax and duty changes tied to consumption. A comprehensive survey of taxes and duties in connection with the development of the CPI-AT indicator shows, however, that the most significant taxable products are represented in the Consumer Price Index goods sample.

Table 1 gives an overview of which taxes are adjusted for in the CPI-AT. The CPI-AT selection criteria are defined as taxes which can be directly connected to the measured prices on goods and services in the CPI sample. In addition to the taxes that are listed in the table, tax changes on motor vehicles should also have been adjusted. The term 'motor vehicles' refers to cars and motorcycles. The excise duties on cars and motorcycles are determined from a defined list of characteristics (for example, horsepower is one determining characteristic). These characteristics are not incorporated into the current data collection process for CPI at Statistics Norway. The intention is then to change the data collection procedure such that changes in duties based on such characteristics can be adjusted for in the future. There are, however, grounds to believe that the real tax changes on motor vehicles has had little meaning for consumer price growth during the previous three years.

The Consumer Price Index is based upon retail prices where all taxes and excise duties are included in the retail price. Changes in tax rates do not imply an automatic price change on that tax-included product. The competitive market situation can cause merchants of a product to accept a reduction in profit margins instead of adding the entire tax increase onto the product price. There are also examples of the opposite

Figur 1. Adjusted tax rates for petrol

Source: Statistics Norway.

occurring when tax increases are over-compensated in the prices. In addition, early announcements of tax changes can lead to price adjustments before the new tax rate is actually in force. Unfortunately the data available for CPI gives few pieces of information to detail further such relations. For practical reasons, it has therefore been assumed in CPI estimations that a tax change leads to full and immediate effect in the retail prices.

Except for the value added tax and taxes on radio and television materials, the taxes in Table 1 are taxes with a set tax amount per item or volume, independent of retail price. That such a tax is actually unchanged implies that the tax rate must be adjusted in line with the general price increase. The taxes are generally changed only once annually, most often with effects from the beginning of the year. The inflation adjustment for excise duties is based on the annual growth in CPI. As a result, the taxes in the calculation of monthly CPI-AT are adjusted with the CPI growth such that they, for the year, grow in alignment with the yearly growth in CPI. Figure 1 shows an example of how the price adjustments for the taxes are carried out. In this example the petrol tax in 1999 is examined and during which the tax was 4,25 NOK per litre. In 2000, the tax was actually adjusted upwards to 4,34 NOK with the expectation that the annual growth in CPI would be 2,1 per cent. The expectation in the end, underestimated the actual price growth (3,1 per cent) in 2000, implying that petrol taxes actually decreased in proportion from 1999 to 2000. The dotted line in Figure 1 shows the adjusted tax that is included in the calculations of CPI-AT in the individual months of 2000. The fluctuations reflect the monthly variations in the Consumer Price Index for 2000 in relation to the average index for 1999.

The value added tax and a special excise duty on radio and television materials are value taxes that require a slightly different method of price adjustment calculation in the CPI-AT than the price independent duties. Value added taxes are a last addition into the consumer price, whereas other taxes are included in the base price. The value added amount is calculated on the basis of the adjusted, price-independent excise duties. This is to avoid the situation where real changes in the price-independent taxes influence the value added tax. The effect of real changes in the value taxes, that is to say the percentage change, is adjusted out completely in the CPI-AT.

Energy Goods

In the fall of 2000, Statistics Norway began to publish a Consumer Price Index without energy goods. This decision was based primarily upon the strong fluctuations in petrol, paraffin and heating oil prices experienced from the end of 1999 and throughout 2000. Significant swings in the electricity prices throughout earlier experiences were additional reasons for publishing this new indicator. The prices on the products that were removed represented a substantial portion of the variation in the All-item index and as a result were problematic in the illumination of the more general price development.

Technically the calculation of CPI-AE is carried out in the same manner as the calculation of the ordinary Consumer Price Index. The only difference is that the price material and the weight to energy goods are taken out. The weight of all that we have designated as energy products, amounts to 7,75 per cent of the current Consumer Price Index. In CPI-AE, the weights for the remaining goods and services of the CPI are scaled such that they continue to add up to 100 per cent. This gives the same result as if all energy goods are assigned a price development equivalent to the average of the remaining goods and services in CPI. Table 2 gives an overview of the energy goods that are removed in the calculation of CPI-AE. These energy goods are listed with their appropriate weights in the usual Consumer Price Indexes' goods and services sample.

CPI-AE has been calculated back to 1995 and is published on the index level with one decimal place together with a year-to-year growth series.

The Consumer Price Index adjusted for taxes and energy prices

The CPI-ATE indicator is built upon the main components of CPI-AE and CPI-AT. Basically the indicator uses the same calculation approach as for CPI-AT, but the price material and the weights on energy goods presented in Table 2 are removed first. When the energy products are taken out, the taxes that are added on to these products will no longer have a direct influence on these calculations. Nevertheless the changes

Table 2. Energy goods in the CPI. Weights 1999-2002, per thousand

	August 1999- July 2000	August 2000- July 2001	August 2001- July 2002
Electricity, gas and other fuels	44.4	41.9	40.2
- Electricity			
- Liquid fuels			
- Solid fuels			
- Heat energy			
Fuels, lubricants, pers.trans.equipment	36.2	34.3	35.1
- Engine oil			
- Unleaded petrol, 98 oktan, self-service			
- Petrol, 98 oktan R, self-service			
- Unleaded petrol, 95 oktan, self-service			
Autodiesel fuel	0.7	0.6	0.6
Engine oil	0.3	0.3	0.3
Petrol	1.4	1.3	1.3
Total weights of energy products	83	78.4	77.5

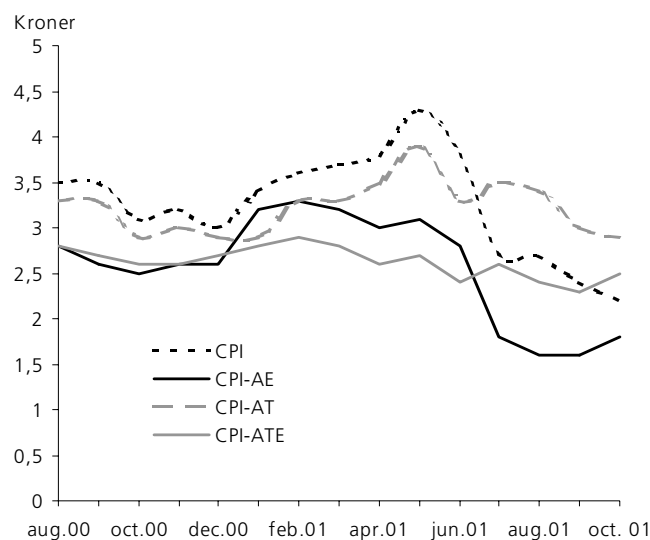
Source: Statistics Norway.

in energy taxes will indirectly influence this indicator. As it is the CPI is used as the adjustment's base, so tax changes on energy products will influence CPI. The direct effect that real tax changes have on CPI growth is equal to the difference between the year-to-year growth in CPI and the year-to-year growth in CPI-AT. Accordingly, the direct effect of price changes on energy goods is defined as the difference between the year-to-year growth in CPI and CPI-AE. Due to heavy taxes on energy goods, the total tax contribution to consumer price growth cannot be derived from the difference between CPI-AE and CPI-ATE.

The tax system is regularly adapted causing the list over which taxes are included in the calculations of CPI-AT and CPI-ATE to potentially vary over time. Revised taxes or eventual new taxes will be taken into the calculations on the condition that these can be connected to the price material in CPI. The same principle can be applied if new energy products should come into or fall out of the CPI goods sample. This means that the contents in CPI-ATE will be able to be changed without being interpreted as disruption to the series. The changes will be documented such that information on the adjustments undertaken is fully available with every publication.

The price growth up to and into 2001

Figure 2 shows the development in the different indicators from August of 1999 until October of 2001. The year-to-year growth in CPI for October 2001 was 2,2 per cent. The tax changes pulled the CPI growth in October down 0,7 percentage points, while the growth in energy prices pulled the CPI growth up 0,4 percentage points. This resulted in a year-to-year growth in CPI-ATE equal to 2,5 per cent.

Figur 2. The Consumer Price Index Year-to-year change

Source: Statistics Norway.

From the figure, it is clearly evident that much of the variation in CPI from August 2000 until October 2001 can be attributed to changes in taxes and energy prices. It should be noted that the year-to-year growth shows much less variation in CPI-ATE than in the three other series. Up to October 2001, the year-to-year growth in CPI-ATE has swung in the narrower margin of 2,3 to 2,9 per cent, while the corresponding time period for CPI is 2,2 to 4,3 per cent.

Up to October 2001, the CPI stands at 3,2 per cent over the same period from last year. CPI without energy goods has not on the other hand increased more than 2,5 per cent. Tax changes increased the price growth in the first half of 2001, but have in the last half contributed to reducing the growth in CPI. By far, most of the tax contribution can be attributed to the extensive changes in the value added tax effective from 1 January and then 1 July 2001. The annual growth as of October 2001 was at 2,6 per cent in CPI-ATE.

References

The Ministry of Finance (2001): *Guidelines for Economic Policy*. Report no. 29 (2000-2001).

Norges Bank (2001): *Inflation Report 2/2001*.