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Methodology of calculating core inflation measures published by Narodowy Bank Polski

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Introduction

Core inflation indices serve to assess the mid-term and long-term trend in the overall price level. Despite differences in the definitions of core inflation that can be found in the literature, it is usually assumed that core inflation is the part of inflation, which is related to inflation expectations and demand pressure, and is not directly dependent on supply shocks. From the point of view of the central bank, the most important features of core inflation seem to be the following:

- It approximates the mid-term and long-term trend in the growth of the prices of consumer goods and services in the economy.
- It illustrates the trends in price of those products, which prices change to a lesser extent because of pronounced periodical and seasonal fluctuations, as well as shifts resulting from supply shocks, which are usually temporary in nature.
- It points to the component of inflation that is more strongly linked with the pursued monetary policy than is the case with the remaining components.
- It is useful for analysing the (ex post) assessment of the direction and scale of the impact of the pursued monetary policy on inflation.
- Its indices are usually characterised by a smaller volatility over time than CPI (*Consumer Price Index*) inflation indices.

The above-mentioned features of core inflation make it a useful monetary policy tool.

At least three groups of core inflation measurement methods can be distinguished: mechanical methods, statistical methods and methods based on formal theoretical models. Narodowy Bank Polski calculates and publishes four measures of core inflation. Three of those measures are calculated using mechanical methods and one with the use of statistical methods.

Core inflation indices allow an in-depth assessment of ongoing inflationary processes in the economy. However, these indices are not free of shortcomings and it is difficult to indicate which of the core inflation measures best reflects the medium-term trend in price growth. It needs to be highlighted that in various economic conditions, particular measures of core inflation may approximate the non-observable trend of the overall price level with a varying degree of accuracy. Therefore, the applicability of these measures may change in time and depends, to a large extent, on the character of shocks affecting the prices of the goods and services that are excluded from the particular measures of core inflation. Core inflation indicators are used at Narodowy Bank Polski – similarly as in other central banks – in its analytical, forecasting and research activities and also in the monetary policy making process.

Methodology of calculating core inflation measures

Narodowy Bank Polski has been publishing core inflation measures since 1998. Over the years, both the contents and the scope of the published measures have undergone changes. Since March 2009 Narodowy Bank Polski has calculated and published the following core inflation measures:

- inflation net of administered prices,
- inflation net of most volatile prices,
- inflation net of food and energy prices,
- 15-percent trimmed mean.

What follows is a synthetic description of how the inflation measures calculated and published by Narodowy Bank Polski are constructed. Monthly indices are calculated both in relation to the previous month (month-over-month) and in relation to the corresponding period of the preceding year (year-over-year). Quarterly indices are calculated both in relation to the previous quarter (quarter-over-quarter) and in relation to the corresponding period of the preceding year (year-over-year). Annual indices are average indices in year-over-year terms. All the monthly indicators are calculated according to the methodology used for calculating the CPI. All the quarterly and annual indicators except for the 15-percent trimmed mean are calculated according to that methodology.

The calculations are based on a disaggregated database of elementary price indices¹ of consumer goods and services as calculated by the Statistics Poland. The published measures are not subject to seasonal adjustments or smoothing procedures. All the indicators are presented as rounded to one decimal place.

Measures calculated by means of mechanical methods

The most common method of calculating core inflation is the method of excluding some groups of goods or services from the overall price index of consumer goods and services (CPI). In order to calculate this measure of core inflation, the aggregated price index has to be calculated on the set stripped of a selected group of goods and services. Most commonly excluded goods and services are those whose prices display strong disruptions caused by supply shocks or those whose price shifts have only a limited informative value (e.g. due to

¹ This is the lowest available aggregate level.

different forms of regulation). The drawback of this group of methods is, to a certain extent, the arbitrariness of selection of the excluded group of goods.

This method of measure construction is used in the case of the following core inflation indicators: inflation net of administered prices, inflation net of most volatile prices and inflation net of food and energy prices. What follows is a detailed description of how these measures are calculated.

Inflation net of administered prices²

This indicator is created by eliminating prices which are not shaped by market mechanisms but are subject to various regulations and thus the distribution of their shifts may not reflect the long-term inflation trends. In the classification of administered prices the definition used by the European Central Bank was adopted.³ Administered prices include final prices of goods and services which are administered exclusively or to a great extent by government institutions, regulators and self-governments. The definition includes prices which result directly from legal acts or administrative decisions, which are subject to approval or may not be changed without approval of competent government entities (e.g. regulatory authorities) and prices whose level or rate of change are subject to legal restrictions. From this definition are excluded those prices which are administered indirectly through changes in indirect tax rates, taxes and ecological fees, regulations in the safety of products and the Common Agricultural Policy.

A separate group of administered prices, excluded from the CPI, includes⁴: housing rental charges, water supply, refuse and sewerage collection services, certain energy carriers (electricity, natural gas, heat energy), passenger transport by railway and combined passenger transport⁵, postal services, other services in respect of personal transport equipment and other (not elsewhere classified) services⁶. In 2024 the share (weight) of administered prices in the CPI basket amounts to 16.4% (*cf.* Table 1 in Annex 1). The inflation measure net of administered prices is constructed through calculation of the aggregated price index on the set stripped of the group of administered prices determined with the use of the above method.

² In the core inflation indicator net of regulated prices, published until the end of 2008, the category of **regulated prices**, different from the currently used category of **administered prices**, was used. Regulated prices included: (1) prices administered directly or indirectly by government institutions, local governments or regulators, (2) services provided by government monopolies: transport, postal and telecommunications services, insurance, and (3) prices largely impacted by excise tax (fuels, alcohol, tobacco).

³ For the definition of administered prices, see Annex no. 2 and information on the website: <https://ec.europa.eu/eurostat/web/hicp/methodology>.

⁴ Scope of the administered prices in the subsequent years shows the Table 2 in Annex 2.

⁵ Combined transport includes periodical fares for bus, tramway and underground transport.

⁶ The group of other services includes such services as: legal services, services of government authorities, funeral and cemetery services.

Inflation net of most volatile prices

This core inflation measure was introduced in March 2009⁷. This indicator is constructed by excluding the impact of those goods and services prices which are subject to various demand and supply shocks and/or which are characterised by strong seasonal shifts, variable over time. As a result of strong volatility of certain prices, the CPI, at least within a short-time period, may not accurately indicate the long-term growth trend of the overall price level. For this reason, the core inflation measure net of most volatile prices is constructed.

The basket of the most volatile prices is determined with the use of the empirical method, and this basket is adjusted, at the beginning of every year, for the data released in the preceding year. The criterion of sample standard deviation at the level of elementary price indicators is used to determine the basket of most volatile prices.⁸ Every year the basket of the most volatile prices includes goods and services, starting from the most volatile ones until their weight reaches 20% of the CPI basket.⁹ The inflation measure net of the most volatile prices is constructed through calculation of the aggregated price index on the set stripped of the basket of the most volatile prices determined with the use of the above method. Thus determined group of the most volatile prices includes mainly¹⁰: a significant part of food products (mainly unprocessed products, e.g. vegetables and fruits), energy products (fuels, gas, heating fuels) and some services (passenger transport by air, television and radio licence fees and subscriptions, financial services, telecommunication services).

Inflation net of food and energy prices¹¹

This indicator of core inflation eliminates the prices of food and non-alcoholic beverages and energy that are particularly sensitive to internal and external supply shocks. The group of energy prices includes engine fuels and energy carriers (electricity, natural gas, central heating, hot water, heating fuels)¹². In 2024 the share (weight) of food and energy prices in the

⁷ Inflation measure net of the **most volatile prices** replaced previously used two inflation measures (one used since 1998 - the inflation measure net of the **most volatile prices** and second used since 2000 – the inflation measure net of most volatile prices and **fuel prices**) which were calculated using different methodology.

⁸ Standard deviation is calculated using the time series of annual growth of elementary groups' prices over the past three years. Then, elementary groups are arranged in a descending order according to this criterion.

⁹ In practice, the share of most volatile goods and services may slightly exceed 20%. In 2024 the weight of most volatile prices amounts to 20.1% of the CPI basket (*cf.* Table 1).

¹⁰ As a result of using the method of determining most volatile prices this basket is changing every year.

¹¹ In connection with the publication of the series of core inflation net of food and energy prices, starting from June 2008, the NBP after having published the data for December 2008 ceased to publish core inflation net of food and fuel prices.

¹² According to the international classification COICOP used by Statistics Poland to calculate the Consumer Price Index, the group "Fuels and lubricants for personal transport equipment" ("engine fuels") is included in the group "Transport" (COICOP 07), while the group "Electricity, gas and other fuels" ("energy carriers") belongs to the group "Housing, water, electricity, gas and other fuels" (COICOP 04).

CPI basket amounts to 45.5% (*cf.* Table 1 in Annex 1). The inflation measure net of food and energy prices is constructed through calculation of the aggregated price index on the set stripped of the basket of food and energy prices.

Measures calculated by means of statistical methods

15-percent trimmed mean

The only measure calculated with the use of statistical methods is the 15-percent trimmed mean. In case of monthly indices, it is a weighted average calculated on the set of price groups whose accumulated weights (corresponding to previously sorted in an ascending order price indicators) are higher than 15% and lower than 85%. The distribution of price changes is trimmed symmetrically on both sides. The groups of prices that have changed most significantly in relation to the base period, with the total weight of 30%, are eliminated in this way. The 15-percent trimmed mean is calculated according to this procedure separately on a monthly and annual basis, i.e. it cuts off those groups of prices which were characterised by the largest changes in relation to the previous month and in relation to the corresponding month of the preceding year, respectively. Due to changing basket composition, quarterly and annual indices are based on monthly indices and they are calculated using the geometric mean formula.

Annex 1 - share (weights) in the CPI of groups of goods and services excluded from particular core inflation measures

Table 1 Shares (percentage weights) in the CPI of groups of goods and services excluded from particular core inflation measures (2001-2024)

Year	Administered prices	Most volatile prices	Food and non-alcoholic beverages	Energy	Food and non-alcoholic beverages and energy
2001	18.1	20.1	30.1	13.9	44.0
2002	19.5	21.5	29.7	14.5	44.2
2003	20.2	20.2	28.2	14.6	42.8
2004	20.6	20.5	27.0	14.9	41.9
2005	20.8	20.4	26.9	14.4	41.3
2006	18.2	20.6	27.2	15.3	42.5
2007	12.7	20.4	26.2	16.1	42.3
2008	12.0	20.6	25.7	15.0	40.7
2009	12.0	20.3	24.6	15.3	39.9
2010	12.4	20.5	24.1	15.8	39.9
2011	12.7	20.4	24.0	16.9	40.9
2012	13.9	21.5	24.2	17.6	41.8
2013	14.3	21.6	24.3	17.8	42.2
2014	14.9	20.2	24.6	18.2	42.9
2015	14.9	20.0	24.4	17.5	41.9
2016	14.9	20.3	24.0	17.1	41.1
2017	14.7	20.3	24.2	16.1	40.4
2018	14.4	21.0	24.4	16.2	40.6
2019	15.1	22.1	24.9	16.2	41.1
2020	14.7	23.5	25.3	15.7	40.9
2021	15.3	21.2	27.7	15.7	43.5
2022	15.0	20.5	26.6	17.1	43.7
2023	15.3	21.3	27.0	18.3	45.2
2024	16.4	20.1	27.6	17.9	45.5

Source: NBP calculations based on Statistics Poland data.

Annex 2 - Administered prices

The ECB's definition of administered prices

According to the ECB's definition, administered prices cover those components of consumer goods and services whose final prices are fully or mainly influenced by government (central, regional and local government) and regulators. Administered prices include:

- Fully administered prices cover the prices of goods and services that are directly set by government (e.g. public transport charges, fees for administrative documents).
- Mainly administered prices cover the prices of goods and services which government or another national regulator have significant influence on. These may include, for example, prices that cannot be changed without prior approval of a national regulator or public authority. What is important, influence of such decisions may have a direct bearing on retail prices or indirect via wholesale prices. However, the regulator must have a very significant impact on the consumer price.

Covered in the definition of administered prices are:

- Price changes approved by governments and national regulators.
- The effects of restrictions in the consumer price level (price caps/ price floors), if binding.
- The effects of permanent (long-term) restrictions on consumer price changes (price growth regulation).
- Social rents offered at a heavily subsidized price level to, for example, low-income households.
- Fixed, Government-set fees for health, education and other social services in so far as covered in the HICP basket.

Not covered in the ECB's definition of administered prices are:

- Consumer prices subject to indirect taxation and excise duties (goods and services with a high indirect tax component in the final price e.g. tobacco products, fuel).
- Effects of product regulations such as safety or environmental standards.
- Prices subject to Common Agricultural Policy of the European Union.
- Index-linked prices, unless the reference indicator is an administered price or when the index-linking is mandatory and enforced by regulation and law.
- The effects of transitory restrictions on consumer price changes (e.g. restrictions in place in some countries at the time of the changeover to the euro).

For telecommunications services, the ECB adopted the following definition:

- Fixed line and internet services: if price regulation exists, and is binding, at the retail level, (for at least 50% of the consumption expenditures), fixed line services should be considered as mainly administered. If price regulation exists only at the wholesale level, fixed line and internet services should be classified as non-administered prices unless there are arguments (quantitative or qualitative) for its dominant impact on retail prices.
- Mobile telephone services are considered as non-administered prices unless there are arguments (quantitative or qualitative) for a dominant impact of price regulation at the wholesale level on retail prices, or if the share of revenues from regulated rates is above 50% of total revenues of mobile operators.

For gas and electricity prices, the ECB adopted the following definition:

- The HICP sub-indices for electricity and gas cover both a service component (transmission and distribution of electricity and gas) and commodity component (electricity and gas itself).
- In the case where only the service component, and not the commodity component, falls under the above definition of an administered price, the whole subindex shall not be considered as an administered price.
- In the case where both the service and the commodity component fall under the above definition of an administered price, the whole subindex should be considered as an administered price.

Table 2 Administered subcomponents included in the CPI index in Poland

COICOP	Description	Time period
411	Actual rentals paid by tenants	throughout the whole period
412	Other actual rentals	throughout the whole period
441	Water supply	throughout the whole period
442	Refuse collection	from 2012
443	Sewerage collection	throughout the whole period
451	Electricity	throughout the whole period
452	Gas	throughout the whole period
455	Heat energy	throughout the whole period
724	Other services in respect of personal transport equipment	from 2015
731	Passenger transport by railway	throughout the whole period
735	Combined passenger transport	throughout the whole period
810	Postal services	throughout the whole period
1270	Other services, not elsewhere classified	throughout the whole period

Note: Until 2006 the following groups were considered to be administered prices: telephone and telefax equipment, telephone and telefax services.

Source: NBP.

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