

Consumer price indices, owner-occupied housing and measures of underlying inflation in monetary policy of selected central banks*

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1 Introduction

Consumer price indices play an important role in the monetary policy of central banks, for assessing price stability or, more directly, when inflation targeting is applied. Central banks also look into underlying inflation. For that purpose, statistics are derived from headline consumer price indices to identify the impact of temporary factors affecting inflation, e.g. the impact of volatile oil price movements or changes in indirect tax rates. Statistical aspects of inflation measurement, e.g. whether the index is compiled as an inflation index on a cost-of-goods basis or as a cost-of-living index, may impact on how headline and derived consumer price indices are embedded into a monetary policy framework. If owner-occupied housing is included, measuring changes in the cost-of-living suggests the application of the use approach (rental equivalence approach or user cost approach), while owner-occupied housing may be incorporated by means of the net acquisition approach in cost-of-goods indices.

The paper compares the role of consumer price indices for purposes of monetary policy by the European Central Bank, the Bank of Canada, the Bank of England, the Bank of Japan, the Central Bank of Iceland, the Federal Reserve System of the United States, the Reserve Bank of Australia, the Reserve Bank of New Zealand and the Sveriges Riksbank (Central Bank of Sweden). Related to the different treatment of owner-occupied housing in the respective countries, the paper elaborates on how central banks look into this element of inflation measurement. A special focus is put on the current discussion of this matter in Europe. Given that the HICP is an acquisition-based index, the potential impact that asset prices may have on a measure of owner-occupied housing deserves particular attention in the context of monetary policy. The paper also presents approaches by central

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banks to gauging underlying inflation. The statistical properties of various measures are discussed with respect to the role given to such derived indicators by the respective central bank.

2 The role of consumer price indices in the monetary policy of selected central banks

Central Banks typically define the measure with which the achievement of price stability is assessed by referring to the respective national consumer price index. When comparing these indices across countries, differences in terms of concepts and coverage can be identified in several cases. For example, consumer price indices for the USA and for Sweden are designed in a way that they closely approximate cost-of-living indices. In other countries consumer price indices are usually following the cost-of-goods approach. In terms of coverage the treatment of owner-occupied housing constitutes another important difference between the consumer price indices across countries.

The central banks selected in this paper are using consumer price indices which differ in terms of their statistical underpinning. Nevertheless, it is typically the headline consumer price index which plays the most prominent role in the context of monetary policy decision making, regardless of its concrete design. In order to get insights into “drivers” of inflation central banks are monitoring also other price statistics, like producer and import price indices. Measures of underlying inflation are designed to filter for transitory effects in consumer price indices so that trends could be identified more reliably. The following comparison starts with the case of the European Central Bank.

2.1 European Central Bank

Monetary policy

The primary objective of the European Central Bank (ECB) and the national central banks of the euro area, i.e. the Eurosystem, is to maintain price stability. This is laid down in Article 127 (1) of the Treaty on the Functioning of the European Union. “The primary objective of the European System of Central Banks ... shall be to maintain price stability.” “Without prejudice to the objective of price stability”, the Eurosystem shall also “support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union”. These include, inter alia, “full employment” and “balanced economic growth”.

When introducing the monetary policy strategy for the euro area in 1998, the ECB had to decide which price index to refer to in its quantitative definition of price stability. In the “Background Studies for the ECB’s Evaluation of its Monetary Policy Strategy” (2003) Camba-Mendez explained the key requirements for such a price index, credibility, reliability and comparability:¹ “A credible index should have a direct link to households’ welfare, both in theory and practice. To be reliable it should be

¹ See Camba-Mendez, G. (2003), p. 31-41.

exempt of significant measurement errors and be subject to few revisions. Moreover, information should be available on a timely basis and be comparable internationally.”²

The Eurosystem chose the Harmonised Index of Consumer Prices (HICP) as its reference price index. The HICP was newly created by the European Statistical System, based on existing, but heterogeneously conceptualised and compiled national consumer price indices. The HICP is a cost-of-goods index, i.e. it refers to a basket of goods and services which is annually reviewed. Chain-linking is conducted with December of the previous year as the link period.

The HICP was released for the first time in March 1997, designed as a consumer price index which is comparable across EU Member States and the euro area. A key property, in terms of ECB purposes, is that HICPs are based on monetary expenditure in Member States so that national HICPs can be aggregated to total indices for the euro area and the EU without any omission or double-counting.

By referring to the HICP, the ECB Governing Council defined price stability “... as a year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2%.”³ In 2003, the Governing Council added that price stability is maintained by inflation rates below, but close to, 2% over the medium term.

Owner-occupied housing

Eurostat and the national statistical institutes have continued to improve the HICP further, ever since its inception. Fundamental achievements in the late 1990s and early 2000s were a harmonised coverage of social, education and health services. The treatment of owner-occupied housing (OOH), however, has not been finally agreed upon.⁴ Since the HICP is based on actual monetary transactions, net acquisition indices on OOH were developed by the ESS and have been made available, on an experimental basis, since 2015. According to a rough estimate, based on owner-occupiers ratios in euro area Member States, an OOH net acquisition index would have a weight of around 9% in an euro area HICP including OOH.

The experimental OOH indices are reported at a quarterly frequency, with a reporting delay of three months. Hence, an integration of these indices into the HICP would require compromising the monthly frequency of the HICP as well as its timeliness. HICP flash estimates are published already at the end of a reporting month. A full breakdown is made available around two weeks thereafter. At those dates net acquisition OOH indices are only available with a lag of one quarter.

When the European Statistical System developed its experimental net acquisition indices on OOH, it turned out that land prices could not be separated reliably from the transaction prices. As a consequence, these experimental indices contain asset price elements. For purposes of the ECB's

² Irving Fisher Committee on Central-Bank Statistics (2006), p. 46.

³ European Central Bank (2018).

⁴ For an overview of treatments of owner-occupied housing, with a focus on the HICP, see Eiglspurger, M. (2006).

monetary policy, it would be a disadvantage, if asset price movements impact on the consumer price index which is used as a reference for the definition of price stability.

A final decision of the inclusion of OOH in the HICP may be drawn after the Commission will have provided by end-2018 a report to the European Parliament and the Council on the suitability of integrating OOH indices into the HICP, which it is obliged to provide according to the reviewed HICP framework regulation.⁵ The ECB is currently focusing on investigating the statistical properties of experimental OOH indices and on assessing which impact a potential inclusion may have on the euro area HICP.

Other price statistics and measures of underlying inflation

In order to get a better insight into “drivers” of inflation and inflation trends, the ECB is monitoring various measures derived from the HICP as well as additional indicators. Producer price indices for industrial goods and for services, import price indices, commodity prices, implicitly compiled deflators of GDP and private consumption and residential property price indicators are brought together in order to obtain a comprehensive picture of inflation dynamics and interrelations. The ECB’s tool box also contains data from a survey by the European Commission on inflation perceptions and expectations as well as price-related assessments from the Purchasing Managers Index (PMI).

Eurostat and the National Statistical Institutes of the EU compile HICPs at constant tax rates and HICPs – administered prices. HICPs at constant tax rates (HICP-CT) are calculated by holding the tax rates of previous year’s December constant over an entire calendar year. The concept assumes that the impact of a tax rate change passes fully through to consumer prices and reveals its full effect from the point in time on the tax rate change enters into force.

HICPs – administered prices (HICP-AP) are based on baskets of goods and services which include only those products the prices of which are fully or significantly influenced by the government. The composition of these baskets varies across EU Member States and may vary over time, depending on changes in price regulation. Both the HICP-CT and the HICP-AP aim at controlling for the direct influence of governmental decisions on inflation and help detect market-driven inflation.

The European Statistical System does not provide seasonally adjusted HICPs. Therefore, the ECB is calculating and publishing such data for the euro area. They are released for the euro area flash estimate and for the full release, on the same day the non-adjusted data are published by Eurostat.

The ECB is using several measures of underlying inflation.⁶ The range comprises exclusion-based measures, compiled by the ESS, as well as trimmed means and a weighted median, calculated by the ECB.⁷ Permanent exclusion-based measures include HICPs excluding energy, HICP inflation excluding unprocessed food and energy; currently, the HICP excluding food and energy is monitored

⁵ See Recital (10) in: The European Parliament and the Council of the European Union (2016).

⁶ See Praet, P. (2017), slide 7, chart “Measures of underlying inflation”.

⁷ See European Central Bank (2009).

most prominently.⁸ However, disregarding these items in a price index over the entire time span might imply that some trend inflation is not taken into account and may, under such circumstances, not be considered as providing key insights about underlying inflation.⁹

A time-varying exclusion of items whose price changes are extreme is typically conducted in form of “trimmed means”. The ECB’s trimmed means, i.e. 10%, 30% trimmed means and the weighted median, are derived from year-on-year rates of change which are aggregated by multiplying the rates of change with the respective expenditure weight. By doing so, the aggregation formula is different from the HICP aggregation method. The HICP is a Laspeyres-type index which is chain-linked over December of the respective previous year.

The ECB’s dynamic factor model is based on the detailed HICP item breakdown from each of the euro area countries. Super-core inflation is a concept for which the ECB only refers to those items in HICP excluding food and energy that have been identified to be sensitive to economic slack operationalised by the output gap. A diffusion index is calculated as the share of individual HICP items which have seen an increase in their annual rate of change over the past three months.

2.2 Bank of Canada

Monetary policy

The Bank of Canada’s monetary policy framework consists of two key elements, an “inflation-control target”, established in 1991, and the support of a flexible exchange rate regime. Inflation-control targeting is agreed upon by the Bank of Canada and the government for a five-year period. The last review took place in 2016. The current inflation-control target is two per cent, within a range between one per cent and three per cent. The Bank of Canada operationalises its inflation-control target in terms of year-on-year growth rates of the headline consumer price index for Canada. The index includes owner-occupied housing according to a variant of the user cost approach.

Owner-occupied housing

Statistics Canada’s user cost index comprises mortgage interest costs, depreciation (replacement cost), property taxes, owner occupiers’ home and mortgage insurance, expenses on maintenance and repairs and other expenses related to owner-occupied housing.¹⁰ It excludes potential capital gains or losses, related to changes over time in house prices.¹¹ Canada’s user cost index does also not cover opportunity costs for capital invested in the house purchase for which an alternative investment could have yielded interest.¹² A. Baldwin (2015) explained Canada’s variant of the user

⁸ See European Central Bank (2015), p. 1.

⁹ See, e.g., European Central Bank (2013), pp. 63-67.

¹⁰ See Soumare, A. (2017), p. 5.

¹¹ For a general argument for excluding potential capital gains – and a risk premium – from a user cost index on OOH as an element of a consumer price index see Hill et al. (2018), p. 14-15.

¹² See Baldwin, A. et al. (2010), p. 8.

approach as follows: “If one thinks in terms of cost accounting the logic of the approach becomes clearer. Depreciation is included because it would be considered a cost of owning a dwelling if it were a commercial asset, and deductible for tax purposes. By contrast, the opportunity cost of owner’s equity in a home would not be considered a deductible cost and it is not included in the index.”¹³

Other price statistics and measures of underlying inflation

The Bank of Canada is prominently monitoring the private consumption expenditure, implicit GDP deflators, and also commodity price indices.¹⁴ In terms of underlying inflation, the Bank identifies among various measures an “operational guide”, thereby spelling out its preferred measures of underlying inflation. From 2001 to 2016 the “CPIX”, which excludes price indices for fruit, vegetables, gasoline, fuel oil, natural gas, mortgage interest, intercity transportation and tobacco products and adjusts the remaining elements for changes in indirect taxes¹⁵, was used by the Bank as an “operational guide”. Before 2001, Bank of Canada’s main measure of underlying inflation was the “CPIXFET” which excludes price indices for food and energy and changes in indirect taxes. Since the November 2016 CPI update, the Bank is monitoring and assessing underlying inflation by looking at three measures: “CPI-common”, “CPI-trim” and “CPI-median”.

These measures are calculated by Statistics Canada, but according to Bank of Canada specifications. The Bank of Canada’s “CPI-trim” disregards the items with the 20% of the highest and 20% of the lowest month-on-month rates of change. “CPI-common” is the Bank’s factor-model-based core index that combines common effects, derived at the level of 55 CPI basket categories. “CPI-median (weighted median) is a measure of core inflation corresponding to the price change located at the 50th percentile (in terms of CPI basket weights) of the distribution of price changes in a given month.”¹⁶ “CPI-common” is based on the CPI excluding changes in indirect taxes, CPI-median and CPI-trim on seasonally adjusted components of the CPI excluding changes in indirect taxes. Another core inflation measure, not part of the operational guide, is obtained by weighting the categories inversely proportionally to the index variability of that category; it is named “CPIW”.

2.3 Bank of England

Monetary policy

According to the Bank of England Act 1998 the Bank of England has to deliver price stability according to the target set by the Government.¹⁷ Inflation targeting was introduced in October 1992. The current target is quantified as 2.0% in terms of the all-items consumer price index. Before 2003

¹³ Baldwin, A. (2015), p. 3.

¹⁴ See Irving Fisher Committee on Central-Bank Statistics (2006), p. 47.

¹⁵ For the difference between a consumer price index which excludes changes in indirect taxes and a consumer price index at constant tax rates see Baldwin, A. (2015).

¹⁶ Statistics Canada (2018).

¹⁷ Here and in the following see Smith, J. (2016).

the target was quantified by means of a measure of underlying inflation, derived from the Retail Price Index (RPI) by excluding mortgage interest (RPIX). Since 1997 the inflation target is set as a focal target and is applied in a symmetrical manner. In case the year-on-year inflation deviates from the target by more than one percentage point in either direction, the Governor is supposed to explain to the Chancellor of the Exchequer the reasons for the deviations and the actions intended by the Bank in order to bring inflation back to its target.

Owner-occupied housing

The UK's Office for National Statistics compiles and publishes every quarter a comparison of three approaches to the treatment of OOH in the framework of its national consumer price index: "Understanding the different approaches of measuring owner occupiers' housing costs (OOH)"¹⁸. The CPI itself, however, does not include OOH. A variant, the CPIH, covers OOH by means of the rental equivalence approach. The RPI, from which the former quantification of the target was derived, includes OOH in terms of interest cost, building insurances and the local tax on property, i.e. the Council Tax. As of 1995, depreciation has been included in the RPI.¹⁹ Within the stock of mortgages data of previous vintages, i.e. mortgage contracts agreed upon in past periods, are price-updated in order to take into account changes in dwelling prices from the period when the contract was agreed upon to the reporting period. For this, the respective house price index values are used.²⁰ Then, the appropriate mortgage interest rates are applied in order to calculate interest payments for the revalued mortgage stock. Depreciation is not fixed at a certain plausible value, related to the assumed period of using the dwelling for shelter purposes, but derived from a house price index; its volatility is reduced by exponential smoothing.²¹

Other price statistics and measures of underlying inflation

Core inflation in the UK is mainly monitored by referring to the CPI excluding food and energy. Since 1993, the Bank of England publishes an "Inflation Report" every quarter. The report presents the Bank's view on economic developments, from the supply and from the demand side, puts inflation into a broader context of changes in prices and costs and gives an outlook on expected future developments. House price inflation is dealt with in a dedicated chapter.

2.4 Bank of Japan

Monetary policy

Price stability is one objective of the Bank of Japan. In January 2013, the Bank of Japan's Policy Board introduced a price stability target, giving the achievement of price stability more prominence

¹⁸ See, e.g. Office for National Statistics (2018).

¹⁹ See Office for National Statistics (2014), p. 80.

²⁰ Here and in the following see Office for National Statistics (2014), p. 76.

²¹ Here and in the following see Office for National Statistics (2014), p. 80.

compared to its previous recognition as a goal of monetary policy.²² The price stability target is 2%, in terms of year-on-year growth rate of the consumer price index. In its monetary policy framework the Bank of Japan is also looking into the shape of the yield curve, i.e. controlling short-term and long-term interest rates by means of market operations.²³

Owner-occupied housing

The CPI for Japan includes imputed rents for owner-occupiers; imputed housing rentals are derived from data on actual rents referring to strata by type and size.²⁴ The weights of rents imputed for owner-occupiers are obtained from the “National Survey of Family Income and Expenditure”.

Other price statistics and measures of underlying inflation

Statistics Japan compiles consumer price indices which exclude fresh food as well as indices which exclude fresh food and energy, of which one variant does not exclude alcoholic beverages. A CPI which excludes imputed rents is provided as well.

The Bank compiles several measures of underlying inflation, a 10% trimmed mean, a weighted median and diffusion index.²⁵ The Bank’s toolbox also contains the mode of the distribution of price changes by items. While the mode is not commonly used by other central banks in the context of measures of underlying inflation, the Bank finds to useful in order to identify shifts in a price distribution, in particular when the distribution is skewed.

2.5 Central Bank of Iceland

Monetary policy

The Central Bank of Iceland’s monetary policy aims at contributing to price stability.²⁶ In 2001, the quantitative target was set to two and a half percent in terms of annual inflation of the CPI for Iceland. If the year-on-year rate of change of the CPI deviates by more than one and a half percentage point from the target in any direction, the Bank has to send a letter to the government in which it explains the reasons for the deviation and its actions in order to bring actual inflation close to the target.

Owner-occupied housing

The CPI for Iceland includes OOH according to the user cost approach. User costs are calculated in form of an annuity, suggesting that they are closely related to imputed rents.²⁷ The real interest rate is quantified by referring to the all-items consumer price index. Potential capital gains or losses are excluded. Opportunity costs for equity are included; a long term rate of return required by pension

²² See Bank of Japan (2013), p. 1.

²³ See Bank of Japan (2018).

²⁴ Here and in the following see Statistics Japan (2018).

²⁵ Here and in the following see Hogan, Y. et al. (2015), p. 2.

²⁶ Here and in the following see Central Bank of Iceland (2018).

²⁷ Here and in the following see Guðnason, R. and Jónsdóttir, G.R. (2009).

funds is applied for quantifying the interest which would have been earned had an alternative investment been chosen.

Other price statistics and measures of underlying inflation

Statistics Iceland compiles four exclusion measures.²⁸ “Core Index 1” excludes prices of vegetables, fruit, other agricultural products and petrol, “Core Index 2” disregards also prices for public services. The Bank outlines that “estimates of underlying inflation should ignore the impact of real interest rates on measured inflation. Since monetary policy has a direct effect on the interest cost component (largely reflected in the housing component of the index), the Bank considers it misleading to regard interest costs as part of underlying inflation.”²⁹ “Core Index 3” takes this consideration on board by excluding also real mortgage interest; “Core Index 4” disregards also market prices for housing.

Statistics Iceland’s constant-tax-rate index excludes the first-round effects of changes in indirect taxes by holding the rates of indirect taxes and excise duties constant at the level that had been in place in the preceding February. The Bank created a dynamic factor model which extracts a core inflation component from 230 time series of the CPI for Iceland.³⁰

2.6 Federal Reserve System

Monetary policy

The mandate of the Federal Reserve System of the United States (Fed) comprises price stability and maximum employment. As an indicator for assessing price stability the Fed refers to the price index for personal consumption expenditures, a monthly and seasonally adjusted statistic derived from the US National Accounts. In quantitative terms, the Fed considers a year-on-year growth rate of 2% of the price index for personal consumption expenditures as indication of price stability.

Compared with the consumer price index, the price index for personal consumption expenditures has a broader coverage, e.g. by including the contributions of employers to employees’ health insurances, and is calculated as a Fisher index.

Owner-occupied housing

The US CPI includes OOH in form of “owners’ equivalent rent of primary residence” (OER) which is obtained by the Bureau of Labor Statistics from a survey about actual rents.³¹ Weights are derived from a household expenditure survey in which owner-occupiers are approached directly. Private consumption expenditure estimate “space rents” for OOH, which are calculated by multiplying the number of owner-occupied units with an imputed rent per unit, derived from actual rents.

²⁸ Here and in the following see Central Bank of Iceland (2015), p. 53.

²⁹ Central Bank of Iceland (2007), p. 2.

³⁰ Einarsson, B.G. (2014).

³¹ See Bureau of Labor Statistics (2016).

Other price statistics and measures of underlying inflation

The Fed also monitors other price statistics, e.g. the CPI and the producer price index, including their breakdowns.³² In terms of core inflation the Federal Reserve System looks into price indices which exclude food and energy, the median Consumer Price Index and a 16% trimmed-mean.

The Federal Reserve Bank of New York compiles and published an “Underlying Inflation Gauge” (UIG). The UIG is a daily updated ... thereby focusing “on the persistent common component of monthly inflation”³³.

2.7 Reserve Bank of Australia

Monetary policy

The objectives of the monetary policy, officially stated by the Reserve Bank of Australia, are a stable currency, full employment and to contribute to the economic welfare of the Australian population. In 1993, inflation targeting was introduced.³⁴ The Governor of the Reserve Bank and the Australian Treasurer published in 1996 a “Statement on the Conduct of Monetary Policy” in which the target inflation was implicitly specified by means of a core inflation measure. Effectively, the target was very close to the Treasury’s measure of underlying inflation which, inter alia, excludes expenses on mortgages which was at that time a component of the OOH index in the Australian CPI. With the Australian Bureau of Statistics removing mortgage interest payments from its CPI in 1997, the Reserve Bank switched to the headline CPI as its measure for quantifying the inflation target. The current target is an inflation rate between two and three percent, on average, over the medium term.

Owner-occupied housing

The CPI for Australia includes OOH according to the net acquisition approach. The Australian Bureau of Statistics compiles the net acquisition price index for OOH by using survey data about prices of “project homes”. Prices of land are excluded. By referring to project homes, the index is representing the price development of the construction of new houses. A matched model approach is applied by referring to the most commonly constructed houses by city. Since March 2017, a price index for attached dwellings is added to the CPI’s OOH component.³⁵ It makes use of a “component cost approach”, i.e. refers to producer price indices of inputs for constructing apartments. Its composition is held constant.

³² See here and in the following Board of Governors of the Federal Reserve Board (2018).

³³ Amstad, M et al. (2017).

³⁴ Here and in the following see Cockerell, L. (1999), p. 1.

³⁵ See here and in the following Australian Bureau of Statistics (2016).

Other price statistics and measures of underlying inflation

The most important measure of underlying inflation in Australia is the Treasury's Underlying Rate of Inflation.³⁶ This rate has been published by the Australian Bureau of Statistics since 1994 and was back-calculated to 1971. It disregards those CPI components which are highly volatile, are affected by strong seasonal fluctuations and items whose prices are directly influenced or substantially impacted by government policy. This amounts to the removal of items that account for about 49% of the CPI while maintaining a balance between excluding the appropriate items and still having an adequate coverage of items to be priced.

2.8 Reserve Bank of New Zealand

Monetary policy

Until the end of the 1980s, the Reserve Bank of New Zealand (RBNZ) was not an independent institution.³⁷ In the 1973 version of the RBNZ Act, it was laid down that the RBNZ should "give effect to the monetary policy of the government". With the RBNZ Act of 1989, four pillars were set up: Next to the establishment of operational independence (the target itself is agreed upon with the government in a so-called policy targets agreement – PTA), transparency, and a single decision maker (only the governor is responsible for the monetary policy), a single objective was set for monetary policy: "The primary function of the Bank is to formulate and implement monetary policy directed to the economic objective of achieving and maintaining stability in the general level of prices." Price stability was defined as a band between 0 and 2% inflation as measured by the Consumer Price Index (CPI), making New Zealand the first country to formally apply inflation targeting. At the beginning, the target was very strict, but became more flexible in the course of time. Initially, the target needed to be met at a set date – this was revised to a medium term focus in the course of time, allowing for deviations to be explained by shocks out of the bank's control. From 1999 on, also secondary considerations were taken into account, not only the inflation target: The monetary policy should try to avoid unnecessary instability in output, interest rates and the exchange rate. This was expanded in 2012 by the monitoring of asset prices and keeping an eye on the soundness of the banking system. With the increasing flexibility, the inflation target itself has been revised three times: from 0 to 2% in 1989 to 0-3% (1996), 1-3% (2002), and finally 1-3% with a focus on 2% (2012). At the moment, New Zealand is reorganising its Central Banking framework, a work that has not yet been finalised. It is intended to add an employment objective, for which a qualitative objective is envisaged.

³⁶ See here and in the following Parliament of Australia (2018).

³⁷ Here and in the following see McDermott, J. and Williams, R. (2018).

Owner-occupied housing

The CPI contains the position “home ownership: purchase of new housing” with a weight of around 5%.³⁸ This means that New Zealand’s CPI comprises OOH. It is included according to the net acquisition approach: it “...measures the change in price of buying a newly built house excluding the land the house is built on. We survey the price of buying a newly constructed dwelling from builders that build standard-plan houses.”³⁹ Second-hand houses are excluded, as usual with the net acquisition approach: “Under the acquisition framework, spending on newly built houses by owner-occupiers and alterations and additions to existing owner-occupied houses are included. Sales within the household sector of existing owner-occupied houses are excluded because they do not add to the stock of owner-occupied houses.”⁴⁰ The surveying of the prices for newly built houses from construction companies is an interesting approach to exclude land prices from the index.

Historically, New Zealand’s CPI has included OOH since 1948. It started with a user cost approach, and evolved slowly towards the net acquisition concept, with major steps made in 1974 (moving to an expenditure- and therefore acquisition-based index), 1993 (only newly constructed buildings considered) and 1999 (exclusion of mortgage payments).⁴¹

Other price statistics and measures of underlying inflation

Next to the inflation target as measured by the CPI, the RBNZ has “...the objective of “a stable general level of prices”⁴². For that purpose, the RBNZ monitors other price statistics than the CPI, too. One major concern is the measurement of underlying inflation by adjusting the CPI for idiosyncratic shocks. In 2006, the RBNZ determined a dynamic factor model as well as the 10% trimmed mean as its preferred measures of core inflation.⁴³ Since then, the RBNZ has recognised the usefulness of other means of underlying inflation, like variance-adjusted measures and exclusion measures that account for the reasons of volatile headline inflation. But measures themselves are not enough for assessing underlying inflation: “...all these methods of analysing the inflation rate itself are still only one element in the rich mix of information we use in analysing the outlook for inflation, including regular discussions with businesses, financial institutions, government agencies and unions.”⁴⁴

Already in 2012, the monitoring of asset prices has been included into the PTA as a secondary consideration of monetary policy. The introduction can be seen in the light of the trend towards a larger importance of macroprudential policy, triggered by the financial crisis of 2008/2009. As part of

³⁸ Statistics New Zealand (2018).

³⁹ Statistics New Zealand (2014).

⁴⁰ Statistics New Zealand (2014).

⁴¹ See Statistics New Zealand (2008).

⁴² Reserve Bank of New Zealand (2017).

⁴³ Griffiths, D. (2009), p. 16.

⁴⁴ Ranchhod, S. (2013), p. 9.

its “macro-prudential chartpack”, asset price inflation for housing, commercial property and farms is monitored, especially as early warning indicators alongside measures of credit growth.⁴⁵

2.9 Sveriges Riksbank (Central Bank of Sweden)

Monetary policy

The Central Bank of Sweden’s (Sveriges Riksbank) objective is to maintain price stability. The Riksbank introduced inflation targeting in 1993. The current target is to keep inflation around 2% in year-on-year terms.⁴⁶ For this purpose, a variant of the consumer price index is used which keeps mortgage interest rates, an element of the OOH subindex, constant over time. Price stability is defined by the Bank in terms of the consumer price index with fixed interest rates (“CPIF”). The interest rate element is a component of the user cost approach to owner-occupied housing.

Different to most other consumer price indices, the CPI for Sweden is rigorously designed as a cost-of-living index.⁴⁷ Its upper-level aggregation is conducted by means of an annually chain-linked Walsh index. However, for recent reporting periods information about concurrent weights is not available; the final link is calculated according to the Laspeyres formula. The actual Walsh index formula can only be applied when quantity data for the reporting period can be incorporated. Quantity data for, e.g. the year 2015, are incorporated with the review of index values for 2017. Most recent links in the CPI are revised on an annual basis.

We have not found any statement by the Riksbank related to the eventual calculation of the Walsh index. This suggests that the Bank is referring to the originally published CPI with its Laspeyres element at the recent end. Revision due to the incorporating of more recent quantity data would then be not considered in the context of monetary policy decision making. As an alternative consumer price index, which is not revised on a regular basis, the HICP for Sweden would be a candidate to which the Riksbank could refer more intensively. However, the Riksbank is using the HICP primarily for comparison with other EU Member States,⁴⁸ while the HICP does not have a distinctive role in terms of assessing the achievement of price stability.

Owner-occupied housing

In Sweden, OOH is included in the CPI according to the user cost approach.⁴⁹ The index encompasses housing of households with ownership rights in one- or two-dwelling buildings and tenant-owned dwellings⁵⁰. It covers expenses for land rights, municipal real estate fee, costs for

⁴⁵ See Reserve Bank of New Zealand (2018).

⁴⁶ See here and in the following Sveriges Riksbank (2018b).

⁴⁷ Here and in the following see Bäckström, P. and Sammar, M. (2014).

⁴⁸ See Sveriges Riksbank (2018a).

⁴⁹ See here and in the following Statistics Sweden (2017), pp. 3-6.

⁵⁰ Tenant-owned dwellings are apartments in an apartment block owned by a housing association, which can only be sold individually, but only when the association approves the transaction. The households living in an

cleaning, water and sewerage, homeowner's insurance, heating, depreciation and repair. Interest rates for the stock of housing loans are included as well; they are compiled by intervals of contract duration. Because of a one-month reporting delay, projections are used for compiling the current index. The capital stock index for one- and two dwelling buildings and for tenant-owned dwellings is valued at purchase prices.

Residential properties indices, which are representative for the entire housing stock and are reported at a monthly frequency, are not available. A factor price index is used for the capital stock of one- and two dwelling buildings; a transfer price index is used for tenant-owned dwellings. The factor price index reflects changes in the prices of construction materials and labour, and does not include profit margins.⁵¹ Depreciation follows a price index for repairs and maintenance.

The Swedish user cost index assumes that opportunity costs for equity are, by unit, identical to the interest rate related to the borrowing costs. Capital gains are, however, not included.

Other price statistics and measures of underlying inflation

Statistics Sweden compiles a CPI excluding rents, foreign travel and the effects of tax changes. The Riksbank's main measures of underlying inflation are the trimmed mean "TRIM85", a weighted median and a measure derived from the CPI by weighting its subcomponents according to inverse volatility within last 24 months ("UND24").⁵²

3 Findings

All central banks referred to in this paper give price stability a prominent role in their monetary policy framework, while the design and the concrete application of the indices differ in terms of targeting a focal inflation rate or a range of rates. Rather than a target, the central banks may consider the desirable values of the consumer price index as a reference rate, benchmark or indicator.⁵³ All but one central bank refer to consumer price indices for quantifying price stability; the Fed refers to the price index of personal expenditure, a statistic derived from National Accounts. The Fed favours the deflator over the CPI because of its broad coverage and the use of a Fisher formula.

If owner-occupied housing is included in the reference statistic for price stability, none of the respective central banks is considering removing this sub-index entirely from the price index. The only case of addressing the OOH component with regard to the inflation target is the Swedish Riksbank, whose price-stability target refers to a consumer price index, which holds mortgage interest rates, as an element of the user costs on owner-occupied housing, constant over time.

apartment can continue to make use of their right to occupy the apartment as long as they fulfil the obligations by the associations and can be considered in this respect as "quasi-owners".

⁵¹ See Ribe, M. (2009), p. 7.

⁵² Sveriges Riksbank (2018) and Sveriges Riksbank (2016), p. 30, footnote 17.

⁵³ See Irving Fisher Committee on Central-Bank Statistics (2006), pp. 47-49.

Central banks are using a range of analytical statistics derived from headline consumer price indices. Seasonally adjusted data provide insights into short-term developments that are not obscured by regular effects impacting on consumer prices in a similar manner in the same periods every year. Holding tax rates constant and removing prices significantly affected by administrations aims to gauge how inflation would have evolved if governmental influences had not played a prominent role.

Estimating trend inflation is considered important, since monetary policy decisions unveil their macro-economic effects with a delay. Underlying inflation is considered to give indications about future inflation. Various measures have been elaborated in this context. Trimmed means and weighted medians leave out highly negative and highly positive inflation rates on the item level. Dynamic factor models create metrics from a range of indicators which may comprise non-price statistics.

Consumer price indices that exclude volatile components are more traditional measures of underlying inflation. Typically, price indices for seasonal food, unprocessed food or total food are excluded. In most cases, price indices for energy are disregarded as well. In cases in which the headline CPI includes OOH according to a user cost approach, the range of exclusion measures includes indices which eliminate the mortgage interest element from the user cost index. Its other elements are usually included, also in cases of imputations, e.g. if the depreciation is not derived from observed data, but derived from the assumed average use time of dwellings. The Bank of Canada gives the index which excludes, inter alia, mortgage interest costs, a prominent role as an “operating guide”. When the Bank of England’s monetary policy was using the Retail Price Index, the index which excluded the mortgage element was the key reference. In Iceland, a variant of the exclusion measures also abstracts from the movements of house prices which forms in the headline CPI an element of the user cost index on OOH.

Net acquisition indices on OOH have not been excluded by the Reserve Bank of Australia and New Zealand in their quantification of the inflation target. This is related to design of their OOH indices both of which refer to prices of standard house reported by building companies and to construction price indices. By doing so, the land prices are excluded which is considered important in order to mitigate the impact asset prices may have. The other advantage of referring to prices for newly built houses and dwellings from the supplier side is that these data tend to show much less volatility than regular house price indices that include both structure and land. This comes at the cost of being only representative for certain market segments, while the experimental OOH indices in the EU broadly cover transaction prices of different types of houses and dwellings. However, the fact that the EU OOH indices include land prices is an important obstacle regarding their inclusion in the HICP. Also the quarterly reporting frequency is far away from the current timeliness of HICP publications, while in Australia and New Zealand quarterly OOH data fit to the overall quarterly CPI release regime.

Overall, the design of monetary policy by the central banks referred to in this paper in terms of aiming at stable prices as well as the measures of quantifying the target or yardstick and the analytical tools are very similar, despite the quite different design of the price indices referred to in the quantitative definition of price stability. Important reasons are that the headline price indices are well known by the

public at large; and their compilation is not influenced by the central bank. Hence, suspicions can be avoided that the decision-making institution manipulates the quantitative measure which is used for assessing the success of its policy. This is an important element of the trustworthiness of the central bank, which is one of its main assets regarding its market influence and the effectiveness of its monetary policy.

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