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National Accounts

Quarterly national accounts inventory based on ESA 2010 methodology

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Preliminary remarks

The present document contains the detailed description of the quarterly methods and sources used for the compilation of the gross domestic product of Germany in compliance with the European System Accounts 2010 (ESA 2010).

The inventory refers to the status as at August 2024

The structure of the description follows a uniform European standard that was developed by the Statistical Office of the European Communities (Eurostat).

The present inventory was compiled by staff from the National Accounts Divisions of Department D "National Accounts, Prices" in the Federal Statistical Office of Germany.

Wiesbaden, August 2024

Chapter 1 Overview of the system of quarterly national accounts

1.01 The objective of the National Accounts (VGR) is to provide a comprehensive, clear, and sufficiently detailed quantitative overview of the entire economy of a country. To maintain clarity, summaries are necessary. This involves consolidating numerous economic units and aggregating economic processes to derive meaningful indicators. The most widely used international indicator is the Gross Domestic Product (GDP). The quarterly results of GDP calculations are a crucial element in general economic monitoring and an indispensable foundation for macroeconomic analyses and forecasts on both a national and international scale.

1.1 Organisation and institutional arrangements

1.02 With regard to organisation, quarterly GDP and other NA aggregates are for the most part calculated in divisions D1and D2 of the Federal Statistical Office. In 2024, around 110 persons are employed at the NA department. Furthermore, the balance of payments statistics division of the German Central Bank (Deutsche Bundesbank) and the working time measurement concept conducted by the Institute for Employment Research of the Federal Employment Agency contribute to the GDP and other NA calculations. In the Federal Statistical Office, NA are organized as follows:

Figure 1-1: Organisation of the German system of national accounts

1.03 The quarterly GDP calculations are completely integrated into the organisation of the annual accounts with regard to contents, time and personnel.

1.2 Publication timetable, revisions policy and dissemination of QNA

1.04 First quarterly results of GDP without particular breakdown are published as press release 30 days after the end of a reporting quarter.

1.05 The more detailed figures are published in the form of a detailed press release, on the internet, in the GENESIS database and as free-of-charge electronic around 55 days after the end of the reporting quarter. In addition to the production approach of GDP broken down by eleven industries, the expenditure approach components – consumption, capital formation, balance of exports and imports, according the international harmonized breakdowns - each nominal and price-adjusted- are published. The detailed results also include data on income, employment and volume of work.

1.06 At the publication dates mentioned, previous quarters are also revised if necessary, and at the summer release date, up to four preceding years and the associated quarters may be revised (current revisions). The revision calendar can be found on the Destatis homepage:

https://www.destatis.de/DE/Themen/Wirtschaft/Volkswirtschaftliche-Gesamtrechnungen-Inlandsprodukt/Methoden/_inhalt.html#474978

1.3 QNA compilation approach

1.07 The concepts, definitions and classifications of the ESA[1] 2010 are applied to all calculations. For the most recent periods, the quarterly results are usually extrapolated with suitable indicators and reconciled with annual results as soon as these are available from the relevant surveys. Exceptions from this procedure are primarily made with regard to the calculation of gross fixed capital formation (GFCF) in

[1] European System of Accounts

machinery and equipment that is determined using the commodity flow method based on monthly and quarterly data and the calculation of exports and imports, which are derived from the monthly data of the foreign trade and balance of payments statistics. For these aggregates, the annual results arise from the summation of the quarters. At any time, the data sets of the quarterly accounts correspond to the results of the annual accounts.

1.08 In Germany, quarterly GDP – as in the annual calculations – is determined using the production approach and the expenditure approach, with both approaches to a large degree being autonomous and being brought together in a balancing process. The third variant via the income approach (distribution-of-income account) cannot be applied in Germany due to the lack of information about entrepreneurial income for periods of less than one year. Therefore, “operating surplus including mixed income” is determined as a residual component.

1.09 The entire spectrum of the short-term economic statistics is used as data base for the GDP calculations supplemented by some non-official information. The concrete methods of calculation are crucially dependent on data availability. On the one hand, nominal indicators are used (e.g. turnover of trade and the hotel and restaurant industry, exports, imports) which are deflated with price data and, on the other, "real" indicators are used (e.g. production indices in manufacturing, hours worked in the construction industry,) which are inflated with price indices to get results at current prices.

1.4 Balancing, benchmarking and other reconciliation procedures

1.10 With regard to the reconciliation and validation of the quarterly GDP calculations, a distinction can be made between the following phases: partial reconciliation of components, macroeconomic GDP balancing and in-process quality assurance.

1.11 In the partial reconciliation of components, aggregates that are especially closely linked as regards statistics are checked for coherence already in the preliminary stages of GDP reconciliation. An example is the coherence of gross value added (GVA) representing the production approach in the construction industry with the suitable components of the GFCF in buildings and structures representing the expenditure approach.

1.12 This is followed by the central GDP balancing on the macro level which is used to bring together in a macroeconomic system the calculation results of the production and expenditure approaches that are to a large degree determined independently. This reconciliation is a systematic iterative procedure in which in an interactive process between several competent and experienced persons, taking account of a large number of different indices, a result is finally defined. So, this is not a mechanical procedure or a mathematical method defined beforehand. The process focuses on the analysis of the results in the course of time (time series). In particular, the following aspects are considered in the process: the comparison between new and previous results of an earlier date of computation, the comparison between provisional and final results for past quarters, the plausibility of the separate time series and of the deflators, a feedback with the results of the distribution-of-income account (e.g. operating surplus, labour's share in national income, savings ratio) and the results of the sector accounts, an analysis of other macroeconomic indices (productivity, unit labour costs) and finally also a feedback with the results adjusted for seasonal and calendar variations. The result always is a consistent data set with coherent quarterly and annual results at current and at price adjusted.

1.5 Volume estimates

1.13 The volumes are measured using an annually changing price basis (previous-year price basis) with chain-linking. In accordance with European regulations, the index type used at the lower calculation level for the measurement of volumes is a Laspeyres index and, accordingly, a Paasche index is used for the

implicit measurement of prices. The "annual overlap" method is applied to draw up the quarterly accounts. The price indices used at the lower calculation level originate from price statistics, which, in addition to consumer prices, also provide producer prices, foreign trade prices, construction prices and prices for agricultural products.

1.6 Seasonal and calendar adjustment

1.14 In addition to the year-on-year comparison of the quarterly GDP, the seasonally and calendar-adjusted previous-quarter comparison is published in the German NA to facilitate a more current short-term economic analysis. To this end, the Federal Statistical Office uses the X13 method on the base of JDemetra+ software. The adjustments for seasonal and calendar variations of the quarterly time series of the NA is based on close co-operation with Deutsche Bundesbank. Adjustments for seasonal and calendar variations are made on every publication date, with the seasonal factors being estimated once per year in August. These projected seasonal factors are usually being used on the following dates.

1.7 Additional information

1.15 This methodological description focusses on the quarterly calculation of GDP and some other NA aggregates, shortly quarterly national accounts (QNA). The description comprises the quarterly disaggregation of annual figures as well as the quarterly extrapolation at the current edge. The calculation of annual figures is described in the German inventory “ESA 2010 methods and sources for the German GNI and its components” which is published on our homepage.

https://www.destatis.de/EN/Themes/Economy/National-Accounts-Domestic-Product/Publications/Downloads-National-Accounts-Domestic-Product/esa-2010-methods.pdf?__blob=publicationFile

The Quality Report of NA can be found here:
https://www.destatis.de/EN/Methods/Quality/QualityReports/National-Accounts-Domestic-Product/einfuehrung.html

The links to the homepage of NA (**German and English)**

http://www.destatis.de > Volkswirtschaftliche Gesamtrechnungen

http://www.destatis.de > English > National accounts

Chapter 2 Publication timetable, revisions policy and dissemination of QNA

2.01 The revision timetables for the QNA are fully integrated into the annual national accounts (ANA), as are the calculations themselves. A distinction is made between current revisions and the major revisions that take place every five years. The most recent major revision took place in 2024, and the next is scheduled for 2029. During the annual current revisions, the quarters of up to four preceding years are revised. In Germany, this occurs alongside the calculation of the second quarter of a year. Alongside with the calculations of the first quarter of a year, it is possible to revise the four preceding quarters. At the time of calculating the third and fourth quarters of a year, changes may be made to the previous quarters of the same year, while the preceding years generally remain unchanged.

2.02 The major revisions encompass the entire time series with annual and quarterly data. These can be associated with changes in sources, methods, concepts, and/or classifications.

2.1 Release policy

2.03 The QNA results are presented and published following a regular schedule, depending, among other things, on the delivery obligations to Eurostat. These results are made available to users in the form of free electronic publications, in the GENESIS database, and in selected tables on the website of the Federal Statistical Office. Additionally, the most important results are announced and commented on in press releases at the respective publication dates.

2.04 The first quarterly GDP results without detailed component breakdowns are published 30 days after the end of the reporting quarter. The detailed results are published after 55 days in the form of a comprehensive press release. Therefore, publications occur in April/May (1st quarter), July/August (2nd quarter), October/November (3rd quarter), and January/February of the following year (4th quarter). The announcements are made through press releases, which are, for the t+30 publication, issued at 10:00 AM and for the t+55 publication at 8:00 AM on the respective day, as well as on the website, in the GENESIS database, and in the aforementioned free electronic publications.

2.05 The German NA follow the principles of the Harmonized European Revision Policy (HERP) and the guidelines for revising ESA data. The exact publication dates for the following year are announced at the end of the current year in the online publication calendar of the Federal Statistical Office. [2] Quarterly sector accounts and quarterly government accounts are delivered to Eurostat in accordance with European regulations no later than 85 days after the end of the reporting period and published on the Destatis homepage. Whereas the government accounts are publishing regularly press releases, the sector accounts are highlighting special figures from time to time.

2.2 Contents published

Thirty days after the end of the reporting quarter (t+30), the GDP is published in current prices, price, seasonally and calendar adjusted. Other components of GDP are not quantitatively shown but are

[2] https://www.destatis.de/SiteGlobals/Forms/Suche/Termine/DE/Terminsuche_Formular.html?nn=206104

qualitatively described in the press release. An example for a press release can be found here: https://www.destatis.de/DE/Presse/Pressemitteilungen/2024/01/PD24_038_811.html

2.06 The quarterly publication of detailed GDP results (t+55 and later) includes the reconciled results of the production, expenditure, and income approaches to GDP, as well as the employment and the volume of work accounts. An example for a press release is: https://www.destatis.de/DE/Presse/Pressemitteilungen/2023/11/PD23_451_811.html

2.07 In the breakdown by eleven economic sectors, both current and price-adjusted gross value added (GVA) figures are reported, along with income distribution figures, employment and volume of work results, and composite measures such as labour productivity per employed person.

2.08 On the expenditure side, private consumption expenditure and government consumption expenditure is published alongside with GFCF, broken down into capital formation in machinery and equipment, in construction, and in other capital formation. Changes in inventories, including the net acquisition of valuables, and imports and exports of goods and services, along with the resulting net exports, are also reported. Additionally, household final consumption expenditure is detailed by purpose. Final consumption is also detailed into final consumption expenditure and actual final consumption. GFCF, imports and exports, and government consumption are also published with further breakdowns. The expenditure-side figures are presented in both current and price-adjusted terms (except for detailed government consumption expenditure). For some aggregates, implicit deflators are provided as indicators of price development, and for imports and exports, the terms-of-trade effect is also shown.

2.09 The focus of the publications is on the absolute values in current prices in billion euros, chain indices adjusted for prices, and their growth rates. In addition, absolute values in previous year's prices and chain-linked volume measures are provided. Since presenting chain indices or chain-linked absolute values for balance measures is not feasible or straightforward, the real net exports and real changes in inventories are only shown as their respective contributions to GDP growth (see also section 3.3.1).

2.10 For a variety of these measures, seasonally and calendar-adjusted data are published, and for certain income distribution figures, only seasonally adjusted data are provided using the X13 method based on the JDemetra+ software.

2.11 In the German NA, no monthly results are published. An exception is the number of employed persons, which is calculated monthly and published in a separate press release.

2.3 Special transmissions

2.12 The German QNA are transmitted to Eurostat in accordance with the mandatory ESA transmission program. Additionally, there are supplementary agreements between Eurostat and the member states for the early submission of national GDP results 30 days after the end of the reporting quarter (t+30).

2.13 Privileged users, besides Eurostat, primarily include the Deutsche Bundesbank and certain ministries. Since the seasonally and calendar-adjusted results are prepared in collaboration with the Deutsche Bundesbank, the Bundesbank has access to the necessary raw data a few days before the respective publication dates. One hour prior to the official release of the press announcement, the Federal Ministry for Economic Affairs and Climate Action, the Federal Ministry of Finance, the Federal Chancellery, and the Bundesbank receive the results under embargo.

2.4 Policy for metadata

2.14 The German QNA have joined the IMF's SDDS Plus. For details see http://dsbb.imf.org/Applications/web/dsbbhome.

2.15 The metadata for the German NA are shown concisely in the quality report which is published on the Destatis website: (https://www.destatis.de/DE/Methoden/Qualitaet/Qualitaetsberichte/Volkswirtschaftliche-Gesamtrechnungen/volkswirtschafliche-gesamtrechnungen.html).

Chapter 3 Overall QNA compilation approach

3.1 General architecture of the QNA system

3.01 The QNA calculating GDP in Germany are based on an indicator-supported methodology that is fully integrated into the ANA. The process involves distinguishing between current quarterly estimates (without annual accounts) and later quarterly estimates adjusted to align with independently determined annual results (benchmarking).

3.02 The starting values for the current quarterly estimates are derived from the corresponding quarters of the previous year. Selected indicators reflect the economic development of the reporting quarter compared to the same period of the previous year. Therefore, the quarterly GDP results at the current boundary are determined through extrapolation. Monthly or quarterly statistics, which are typically available with a time-lag of one to two month, serve as indicators in this process. As a result, especially the flash estimates released 30 days after the end of the respective reporting quarter include a relatively high proportion of estimation. Over time, these preliminary estimates are revised according to the revision plan described in Chapter 2, based on the broader data available at that time.

3.03 The concepts are identical for QNA and ANA. However, the information available for QNA is not as comprehensive as that for ANA, necessitating the occasional use of plausible hypotheses as substitutes. The results of intra-annual and annual calculations are fully compatible and aggregable at any point in time. Both calculation systems are conducted within the same organizational units and by the same personnel. This organizational structure allows for a high degree of specialization among the staff in specific characteristics or economic sectors, and it also ensures an immediate and detailed feedback loop between the final ANA and the current QNA.

3.04 The calculation of GDP in the QNA, as in the ANA, is fundamentally based on two separate and independent approaches: the production approach and the expenditure approach. The income approach, as a potential third pillar, can only be partially implemented due to insufficient statistical information on corporate profits. The production and expenditure approaches are largely independent of each other, allowing for actual cross-checking. However, a preliminary alignment is conducted when using the same indicators to avoid unnecessary discrepancies in the accounting system (e.g., in the initial values of construction statistics used as a basis for calculating GFCF and the GVA of the construction industry).

3.05 The production and expenditure approaches to GDP calculation are conducted using a bottom-up method. A multitude of time series is calculated separately and then aggregated. A mixed-method approach to calculation is employed, determined by the specific data available. Many time series are extrapolated using indicators at current prices, primarily turnover figures, and then price-adjusted by deflation using price indices. In other cases, the price-adjusted values are first extrapolated, such as with production indices, and then converted to values at current prices through inflation. A characteristic feature of all calculations is the close integration of estimates for both current prices and price-adjusted results. This integration allows for the plausibility of both results and the implicit price development to be assessed during the calculation process.

3.06 Another characteristic is the focus on calculating non-seasonally adjusted results as the first stage of computation. This applies to the calculation results of both the production and expenditure approaches, as well as the GDP reconciliation process. The determination of seasonally and calendar-adjusted results is carried out only in a second stage of the calculation procedure.

3.07 Extrapolation is the dominant technique used in the calculation method for current quarterly data. Only in exceptional cases are absolute values from specialized statistics directly incorporated into the NA for the current period, such as in the calculation of government consumption expenditures. In

extrapolation, a NA figure is determined by multiplying the base value (W) from the corresponding quarter of the previous year by the growth rate of a suitable indicator (Ind):

3.08 $W(t) = W(t–1) \times \{Ind(t) / Ind(t–1)\}$.

3.09 The current system of QNA does not utilize input-output accounting, meaning there are no supply and use tables available for quarters. The integration of input-output accounting is exclusively conducted within the framework of the German ANA. Nevertheless, elements of a commodity-flow approach are present in the QNA. For example, domestic GFCF in machinery and equipment is determined in a detailed commodity breakdown as the difference between the supply of goods (production plus imports) and exports.

3.2 Balancing, benchmarking and other reconciliation procedures

3.2.1 Quarterly GDP balancing procedure

3.10 According to the two separate approaches to calculation of GDP, the production approach determines GDP via the gross value added of producers and net taxes on products, while the expenditure approach calculates GDP as the sum of consumption expenditures, capital formation, and net exports. These calculations are conducted largely independently and are reconciled at a later stage. Although the complete calculation of GDP via the income approach is not feasible in Germany due to insufficient information on corporate profits, the results of the income approach are still used to validate GDP estimates. This validation is achieved using macroeconomic indicators.

3.11 In the quarterly GDP calculations, the reconciliation process initially focuses on the growth rates of non-seasonally adjusted results compared to the previous year. Seasonal and calendar adjustments are performed subsequently (with feedback mechanisms). The precise determination of GDP levels, however, is examined more thoroughly within the annual accounts.[3]

3.12 The reconciliation and validation of the quarterly GDP calculations can be sub-divided into three stages:

- partial reconciliation of components
- macroeconomic reconciliation of GDP
- in-process quality assurance

3.13 In the partial reconciliation of components, sub-aggregates that are statistically closely related are checked for coherence in advance of the GDP reconciliation process. Examples include the reconciliation between the calculation of GFCF in construction and the calculation of output for the construction industry, or the alignment of base values for retail trade to calculate private consumption expenditures on one hand, and the production approach for the NACE division retail trade on the other hand. This stage also includes adjustments based on analyses between preliminary indicators and final NA results. In this context, supplementary additions or subtractions to statistical indicators are made in the current GDP calculation to approximate the final expected results as closely as possible.

3.14 In the subsequent macroeconomic reconciliation of GDP, the results of the production and expenditure approaches are checked and reconciled. The subsequent GDP reconciliation at the macro level serves to verify and integrate the results of the production and expenditure approaches within a macroeconomic cycle. This procedure is conducted separately for each GDP calculation, starting from the initial provisional quarterly GDP estimates, through the regular, more detailed annual calculations, up to the multi-annual major NA revisions and retrospective calculations. Throughout these calculation cycles, the

3 https://www.destatis.de/DE/Themen/Wirtschaft/Volkswirtschaftliche-Gesamtrechnungen-Inlandsprodukt/Methoden/erlaeuterungen.html

availability of statistical data becomes increasingly comprehensive, and the quality of the NA results is progressively enhanced.

3.15 The practice of macroeconomic GDP reconciliation is characterized by a systematic, multi-stage, and iterative process, wherein an optimized result is finalized through an interactive procedure among national accounts experts, considering a wide range of different indicators. Therefore, it is not a mechanical process or a predetermined mathematical procedure. The reconciliation process can be broken down into the following steps:

(1) The starting point is the calculation results from the production and expenditure approaches at current prices and price-adjusted, as well as the econometric estimates at t+30 for both approaches.
(2) The GDP experts analyse and discuss their calculations and results for the most recent quarter.
(3) Analysis of the time series of GDP aggregates.
(4) Comparison of the current results for all open quarters with the previous calculation vintages.
(5) Comparison of preliminary with final results for earlier quarters.

After initial reconciliation rounds:

(6) Plausibility of changes in inventories (balancing item).
(7) Plausibility of implicit deflators for GDP as well as production and expenditure aggregates.
(8) Feedback with seasonally and calendar-adjusted results
(9) Analysis of macroeconomic indicators such as productivity and unit labour costs.
(10) Coherence checks with the results of sector accounts and of the income approach, e.g operating surplus, wage share, savings rate
(11) Analysis of reconciliation differences in the time series.
(12) Distribution of reconciliation differences across all affected publication values, predominantly using mechanical methods.
(13) Comparison of the results with those of other external institutions.
(14) Discussion of results with external NA experts

3.16 If NA aggregates are affected by reconciliation entries, these are also distributed to more detailed breakdowns. For instance, the reconciliation entries for gross value added (GVA) on the production side are also allocated to GVA by NACE divisions. The structure of the GVA from the original calculation results remains largely unchanged. The GVA by NACE divisions is reconciled to the already determined GDP, with production values generally remaining unchanged due to their better statistical foundation, and the adjustments being made in intermediate consumption. A few areas of calculation are excluded from this reconciliation procedure, such as sector S.13 (general government), sector S.15 (non-profit institutions serving households), and sector S.12 (financial corporations), either because their results are considered particularly well-secured or they are already processed in other subsystems. On the expenditure side, the reconciliation entries are generally made in inventory changes, as these are statistically less well-founded.

3.17 The magnitude of reconciliation differences between the calculation results of the production and expenditure approaches to GDP varies across quarters and does not follow a stable pattern. Additionally, the data configurations change with each revision of the QNA. Generally, the reconciled GDP result falls within the range between the calculation results of the production approach on one hand and the expenditure approach on the other. This applies to both absolute values and growth rates. The magnitude of the overall difference between the production and expenditure estimates of GDP is less than one per cent when measured against the year-on-year price-adjusted rates of change (average absolute deviation in percentage points, calculated using the quarterly estimates for the years 2005 to 2022).

3.18 Besides these two approaches to GDP reconciliation, there are additional measures for process-related quality assurance of the calculations, which are described in Section 3.2.3.

3.2.2 Benchmarking of QNA to ANA

3.19 The question of adjustment between quarterly and annual results arises primarily when annual results are determined at a later date in an autonomous calculation and differ from the preliminary quarterly accounts. Since the annual results are generally statistically better founded and allow for the determination of levels, an adjustment of the quarterly results to the annual results takes place. This applies to large parts of the production approach, private household consumption expenditures, and GFCF in construction. However, there are also cases where the annual results are directly determined as the sum of the quarterly results. Examples include exports and imports as well as GFCF in machinery and equipment.

3.20 The first provisional ANA results (after t+15, t+30, t+55, t+145, t+235 days) are determined based on short-term economic indicators, so the annual results here result from the sum of the quarters.

3.21 Necessary adjustments of the quarterly results to the better-founded annual results are carried out for the individual aggregates or for NACE divisions using various calculation methods tailored to the specific circumstances. Thus, there is no single uniform mathematical procedure. In cases where no specific methods exist, a proportional adjustment of the quarters is applied as a simplified solution. This approach has the advantage that the growth rates of the original values compared to the same quarter of the previous year are not distorted, and the growth rates compared to the previous quarter (within a year) are also unaffected. However, the disadvantage is that there can be a statistically induced jump between the first quarter of a year and the last quarter of the previous year. This issue is examined using seasonally and calendar-adjusted series and corrected ad hoc in significant cases.

3.22 Since, in the practice of the German NA, an initial calculation and reconciliation of unadjusted original values are performed, the seasonal and calendar effects are included in the quarterly results, as well as the calendar effects in the original annual results. The seasonal and calendar adjustment is carried out subsequently. In estimating the calendar effects, special attention is paid to ensuring that only those effects are considered that can be present in the original values due to the underlying base statistics used.

3.2.3 Other reconciliations of QNA different from balancing and benchmarking

3.23 The calculations for QNA are preceded by a series of quality assurance measures, which are largely performed by the data providers of the source statistics. The NA process results from a wide range of primary and secondary surveys, as well as information from other administrative data sources, which are initially verified for plausibility. Based on such plausibility checks, data from the base statistics are corrected for the purposes of where necessary. These corrections are documented accordingly to ensure that the calculations can be audited at any time.

3.24 In the preparation of sector accounts, a review of the system's overall coherence is conducted. This involves analysing whether the economic cycle is consistently balanced. The production, use, distribution, and financing accounts, organized by economic sectors, must be consistent with each other. For each reporting period, a reconciliation and coherence check are carried out with the financing accounts conducted by the Deutsche Bundesbank. Additionally, analyses of productivity indicators, such as GVA per employed person or per hour worked, and labour costs per unit, are performed.

3.25 Additionally, the Deutsche Bundesbank provides further opportunities for the verification and plausibility assessment of NA data through its close collaboration in the seasonal adjustment of the results.

3.2.4 Amount of estimation in various releases

3.26 The extent of estimates for the various calculation stages of the QNA varies significantly across different aggregates, as illustrated in the table below. In the column titled "Well-founded" the proportion of calculations based on data sources that effectively represent the feature being measured is displayed. In contrast, the column "Other information" shows the portions of the calculations that rely on substitute indicators, econometric estimates, analogy-based inferences, or other estimation models.

3.27 In many areas, monthly data sources can be utilised. However, for calculations at t+30 days, data for the final month of a quarter is typically missing, necessitating the estimation of this third month using predominantly econometric methods (see Chapter 8). By the t+55 stage, results for some monthly data sources are already fully available.

3.28 A particular situation arises in the calculation of taxes on products. Although the base information for the three months of the previous quarter is available, there is a need for estimation because the monthly results are time-adjusted by one or two months depending on the type of tax, in order to achieve period-correct accruals in accordance with ESA 2010.

3.29 In other areas, while the base data for the calculations are currently available, the applied calculation method is model-based, leaving some room for estimation. This is the case, for example, in the calculation of FISIM [4]. For calculation areas where intra-annual information is entirely absent, substitute indicators or models are used to estimate the quarterly results at each stage of the QNA. The data situation depicted in the following table exclusively concerns the calculation stages of the QNA. The final accounts, based on annual indicators, are not represented here.

4 Financial intermediation services indirectly measured

Table 3-1 Data bases at different dates of computation of the quarterly accounts

	Publication after T + 55 days		Publication after T + 4,5 months		Publication after T + 7,5 months		Publication after T + 10,5 months	
	Well-founded indicators	Other information	Well-founded indicators	Other information	Well-founded indicators	Other information	Well-founded indicators	Other information
	Coverage in %							
Production approach								
Gross value added								
Agriculture, forestry and fishing	65	35	75	25	80	20	80	20
Industry, excluding construction	90	10	90	10	90	10	90	10
Construction	70	30	100	0	100	0	100	0
Trade, transport, accommodation and food services	75	25	100	0	100	0	100	0
Information and communication	95	5	100	0	100	0	100	0
Financial and insurance activities	42	58	42	58	42	58	42	58
Real estate activities	100	0	100	0	100	0	100	0
Business services	100	0	100	0	100	0	100	0
Public services, education, health	50	50	99	1	99	1	99	1
Other services	100	0	100	0	100	0	100	0
Taxes on products	85	15	100	0	100	0	100	0
Subsidies on products	5	95	100	0	100	0	100	0
Expenditure approach								
Final consumption expenditure								
Households	72	28	84	16	84	16	84	16
Non-profit institutions serving households (NPISHs)	0	100	0	100	0	100	0	100
General government	10	90	99	1	99	1	99	1
Gross capital formation								
Gross fixed capital formation	**49**	**51**	**80**	**20**	**80**	**20**	**80**	**20**
Machinery and equipment	60	40	100	0	100	0	100	0
Buildings	45	55	80	20	80	20	80	20
Other products	0	100	0	100	0	100	0	100
Changes in inventories and acquisitions less disposals of valuables	0	100	0	100	0	100	0	100
Exports								
Goods	100	0	100	0	100	0	100	0
Services	100	0	100	0	100	0	100	0
Imports								
Goods	100	0	100	0	100	0	100	0

	Publication after T + 55 days		Publication after T + 4,5 months		Publication after T + 7,5 months		Publication after T + 10,5 months	
	Well-founded indicators	Other information	Well-founded indicators	Other information	Well-founded indicators	Other information	Well-founded indicators	Other information
	Coverage in %							
Services	100	0	100	0	100	0	100	0
Income approach								
Compensation of employees (domestic)								
Wages and salaries	75	25	95	5	95	5	95	5
Employers' social contributions	70	30	95	4	95	5	95	5
Gross operating surplus incl. mixed income	0	100	0	100	0	100	0	100
Taxes on production	88	12	100	0	100	0	100	0
Subsidies	66	34	100	0	100	0	100	0
Consumption of fixed capital	30	70	30	70	30	70	80	20
Employment accounts (domestic)								
Persons in employment	**65**	**35**	**90**	**10**	**95**	**5**	**95**	**5**
Hours worked per person in employment	**50**	**50**	**75**	**25**	**85**	**15**	**90**	**10**

3.3 Volume estimates

3.3.1 General volume policy

3.30 Volume measurement is conducted in accordance with international conventions and binding European regulations, using an annually changing price basis (the previous year's price basis) with chaining. By using the previous year as the base year, current price relations are always considered.

3.31 In technical terms, results are deflated in current prices using price indices that are standardised to the annual average of the respective previous year. This process initially yields a sequence of annual results in the previous year's prices (for example, results for 2023 in 2022 prices, results for 2024 in 2023 prices, and so on). These results are referred to as unchained volume measures in previous year's prices.

3.32 However, unchained volume measures cannot be compared over time due to the changing price base, making it unsuitable to use them for assessing change rates. To derive a comparable time series, measurement figures must be formed and then chain-linked in a second calculation step. The result is chain indices relative to a reference year. Starting from the 2024 revision, the reference year used will be 2020.

3.33 In accordance with European regulations for volume measurement, a Laspeyres index is used as the index type for volume measurement, implying the use of a Paasche index for implicit price measurement. By multiplying the chain indices by the nominal values of a reference year, the chain-linked volume figures in billions of euros are obtained.

3.34 While the additivity of the components of an aggregate in previous year's prices is ensured, this is not the case for chained-linked results. Chain-linked volume figures are not additive, meaning that the sum of the chain-linked sub-aggregates deviates from the value of the chain-linked total aggregate. These discrepancies occur in all data where sums of individual positions or balances are presented (e.g., GVA by NACE divisions). It was agreed not to computationally eliminate these chaining differences. In publication practice, this non-additivity can lead to interpretational issues for data users and potential calculation or analysis errors. Consequently, in NA publications, chain indices and their growth rates are prominently featured for volume data. Chained volume figures, as well as unchained volume figures in previous year's prices and contributions to GDP growth, are available in a separate publication.

3.35 For QNA, there are various international solutions for forming chain indices. The Federal Statistical Office has opted for the "annual overlap" method, which has the advantage of ensuring temporal additivity.

3.36 A particular challenge with chain-linking is the representation of balance figures, especially changes in inventories and the balance of exports and imports. As these figures can also include negative values over time, representing them as chain indices is not practical, and calculating chained volume figures is not straightforward. Therefore, in the German NA, these balance figures are only presented as contributions to GDP growth. Only growth contributions provide a comprehensive and seamless representation of the uses of GDP, as percentage changes or measurement figures cannot be presented for all aggregates (even in current price data).

3.37 In the German NA, the "comparative approach" is applied to calculate growth contributions. This method determines the growth contributions of a specific aggregate as the difference between the current growth rate and a hypothetical GDP growth rate. The latter would be the growth rate if the specific aggregate remained unchanged from the previous period. The advantage of this method is that it can be consistently applied even with the various international quarterly chaining procedures. However, it can be shown that strict additivity of the growth contributions (to the GDP growth rate) is only guaranteed for annual values, not necessarily for quarterly results.

3.38 Furthermore, it is important to emphasize that the growth contributions determined in this way are merely a computational contribution of individual aggregates to GDP development. This does not

involve an economic analysis of the growth impacts of specific demand aggregates (i.e., the negative growth contribution of imports is not redistributed to the other aggregates). Such analyses would need to be conducted separately using input-output tables.

3.39 For external users, these calculations become comprehensible when the results in previous year's prices (i.e., before chaining) are also available. This is ensured in the form of the aforementioned working paper, which contains both unchained and chained volume figures and growth contributions for the major aggregates of the NA. The Federal Statistical Office calculates growth contributions using an Excel macro developed by the Deutsche Bundesbank, which is available to any user free of charge upon request. This program, "KIX," allows the calculation of computational growth contributions using the "comparative approach" as well as the aggregation or disaggregation of chain indices.[5]

3.40 The following box shows the formulaic relationships. This approach can be generalized and also applied to calculation methods with chained time series.

Calculation of growth contribution

Calculation with additive absolute values

(1) $$Y(t) = A_1(t) + A_2(t) + ... + A_n(t) = \sum_i A_i(t)$$

with $Y(t)$ = GDP in period t; $A_i(t)$ = aggregate A_i in period t

(2) $$r(t) = \frac{Y(t) - Y(t-1)}{Y(t-1)}$$

with $r(t)$ = GDP growth rate

(3) $$r(t) = \sum_i \frac{A_i(t) - A_i(t-1)}{Y(t-1)} = \sum_i \frac{\Delta A_i}{Y(t-1)} = \sum_i c_i$$

with c_i = growth contribution of aggregate i

Calculation with „comparative approach “

For the growth contribution c_n of the aggregate A_n equation (3) is to be denoted as

(4) $$c_n = \frac{\Delta A_n}{Y(t-1)}$$

(5) $$c_n = r(t) - \sum \frac{\Delta A_i - \Delta A_n}{Y(t-1)}$$

Equation (5) shows that the growth contribution (c_n) of an aggregate A_n can be determined as the difference of the current growth rate of the GDP [r(t)] and a hypothetical GDP growth rate with an unchanged aggregate compared to the previous period (also $\Delta A_n = 0$).

By this method the growth contribution of any aggeragte can be calculated, e.g. for A_n = changes in inventories or for A_n = external balance.

5 The macro can be made available by the Deutsche Bundesbank on request and used subject to acceptance of and compliance with the relevant terms of use.

3.3.2 Chain-linking and benchmarking

3.41 The issue of benchmarking of QNA and ANA arises only when annual data collections are available for a reporting year, i.e., 18 months after the end of the year. For the initial preliminary QNA for the current year's quarters and the previous year's quarters, this problem does not occur, as no annual accounts have been processed yet. In the German NA, the benchmarking is initially carried out for the values in current prices as part of the annual calculations (see Section 3.2.2). Deriving price adjusted results, the chosen chaining method (annual overlap) also ensures temporal additivity between quarterly and annual data, so no additional benchmarking is required in this regard. The annual-overlap method chain-links the values to their respective annual average of the previous year.

3.3.3 Chain-linking and seasonal adjustment

3.42 In addition to the comparison of quarterly GDP with its production and expenditure aggregates (base values) from the previous year, the German NA present the comparison of these figures with the preceding quarter for more timely economic analysis. Due to varying seasonal effects, this comparison requires seasonal and usually also calendar adjustment.

3.43 Seasonal adjustment in Germany is based on the harmonised base values. Typically, individual components of an aggregate are seasonally adjusted directly, and the aggregates are derived indirectly by summing the seasonally adjusted components.

3.44 The issue of non-additivity of chain indices in the German national accounts is addressed using the Excel macro "KIX," which facilitates both the aggregation and disaggregation of multiple figures as well as the calculation of computed growth contributions (see also Section 3.3.1).

3.4 Seasonal and calendar adjustment

3.45 For seasonal and calendar adjustment, the German QNA use the X13 method. The results of this procedure are published by the Federal Statistical Office in a dedicated publication, "Seasonally Adjusted Quarterly Results According to X13." This publication includes not only the seasonally and calendar-adjusted data for the production and expenditure approaches, as well as the volume of work, but also the seasonally adjusted data for the income approach and employment statistics. The seasonally and calendar-adjusted data using X13 are part of the mandatory data transmissions from the Federal Statistical Office to Eurostat.

3.46 In the German NA, consistency in both substance and timing is ensured by adjusting the quarters to the respective annual total using a uniform factor and aligning the individual sub-aggregates through a so-called derivation schema. This ensures consistency between the sum of the seasonally and calendar-adjusted quarterly values and the calendar-adjusted annual value, as well as between the sum of the seasonally adjusted quarterly values and the unadjusted annual value.

3.47 The Federal Statistical Office and the Deutsche Bundesbank provide users with all information regarding the creation of the seasonally and calendar-adjusted results upon request. This ensures that the results are fully transparent and comprehensible for all data users.

3.4.1 Policy for seasonal adjustment

3.48 The NA use the X13 method for seasonal adjustment with the JDemetra+ software. The Federal Statistical Office works closely and collaboratively with the Deutsche Bundesbank, adhering strictly to the "ESS Guidelines on Seasonal Adjustment."

3.49 Within the X13 method, ARIMA models are used for forecasting at the end of the time series as well as for detecting and replacing outliers. Various diagnostics and tests available in the JDemetra+ software

are employed to optimise the seasonal adjustment. The process requires numerous series-specific settings of various parameters for all directly adjusted series. This includes the specification of the ARIMA model, the reference period, outlier detection and replacement, and the length of the filters for seasonal adjustment. Each time series requires individual parameter settings, which are regularly reviewed and adjusted if necessary.

3.50 All price-adjusted series, as well as the deflators, are generally adjusted directly. Time series in current prices are derived indirectly by multiplying the seasonally adjusted real values with the seasonally adjusted prices. Direct adjustments are typically made at the most detailed level possible, and higher-level aggregates are adjusted indirectly. However, GDP is adjusted directly. The so-called derivation schema provides detailed information on which series are adjusted directly and which indirectly.

3.4.2 Policy for calendar adjustment

3.51 Before applying seasonal adjustment with X13, those unadjusted figures (base values) for which calendar adjustment is deemed appropriate are adjusted using calendar factors. These calendar factors are derived from suitable monthly indicator series, in accordance with the "ESS Guidelines on Seasonal Adjustment." For example, the monthly retail sales index is used as one of the indicators for estimating the calendar factors for household consumption expenditures. The monthly calendar factors derived

3.4.3 Revision policy for seasonally adjusted data

3.52 Both the seasonal adjustment model and other parameters such as outliers and filters are reviewed and, if necessary, adjusted annually in August, in conjunction with the revision of the last four years. At this time, the calendar and seasonal factors are completely recalculated and forecasted for several years ahead. These forecasted factors are generally used for all subsequent quarterly updates. However, they are reviewed at each quarterly update and adjusted for individual series as needed (controlled ongoing adjustment). Seasonal adjustment is usually performed on already calendar-adjusted time series, so for most aggregates, both seasonally and calendar-adjusted series as well as only calendar-adjusted series exist. An update of the seasonal factors can lead to changes in the entire time series.

3.53 During the COVID-19 pandemic, the forecasted factors were initially used if a new estimation was not absolutely necessary. For the first annual review after the beginning of pandemic in August 2020, the factors were estimated using a shortened data basis up to the fourth quarter of 2019, to prevent COVID-related fluctuations from being mistakenly attributed to seasonal patterns. During the subsequent review in August 2021, the outlier detection since the start of the pandemic was carefully modelled for each series. In the following years, this modelling was reviewed and adjusted as necessary.

Chapter 4 GDP components: the production approach

4.01 The gross value added (GVA) of economic sectors according to the International Classification of Economic Activities 2008 (NACE Rev. 2) constitutes the main component of GDP in the production approach. It is calculated by subtracting intermediate consumption from output. To arrive at GDP, taxes on products minus subsidies on products are added to the GVA.

4.02 The calculations of GVA are conducted sector-specifically and separately for market producers (sectors of non-financial corporations, financial corporations, and private households), as well as for non-market producers (sectors of government and non-profit institutions serving households). The sector results are aggregated to form a total result for each NACE division. The addition of individual NACE divisions yields the GVA for the whole economy.

4.03 In the current quarterly accounts of GVA, the previous year's quarters are typically extrapolated using suitable quarterly or (aggregated to quarters) monthly indicator series. Depending on the NACE divisions, the calculation is performed differently:

- at current prices with subsequent price adjustment (deflation)
- in real terms (price adjusted figures) with subsequent inflation adjustment
- at current prices and price-adjusted with implicit determination of a price index (deflator).

4.04 The calculation results of the production approach are reconciled with the expenditure approach within the framework of a macroeconomic balance. Reconciliation adjustments in the production approach are made through changes in intermediate consumption. Once the annual base statistics are available, the quarterly results are adjusted to the new level of the annual results for the respective NACE division, maintaining their intra-annual trend (i.e., with an unchanged seasonal pattern).

4.1 Gross value added of market producers by industries (NACE divisions)

4.1.1 Agriculture, forestry and fishing

4.05 The quarterly calculation is conducted by updating the output and intermediate consumption values from the previous year's quarter for agriculture, forestry, and fishing.

4.06 Plant products are conceptually recorded as work in progress. The annual output is distributed across the quarters using a cost allocation key. For other agricultural products, monthly data on quantities from the slaughter and slaughter weight statistics (EVAS 41331) or poultry statistics (EVAS 41322 and 41323) and other sources are used. This results in price-adjusted data. Intermediate consumption is calculated based on the price-adjusted intermediate consumption ratio[6] of the previous year. For the calculation at current prices, the monthly indices of producer prices for agricultural products (EVAS 61211) or price indices of purchase prices for agricultural inputs (EVAS 61221) are used for updating.

4.07 The output of forestry, according to ESA 2010, corresponds to the growth of wood and is calculated using an annual quantity-price model. The quantity is estimated based on the average growth of the last ten years. For the price development the monthly index of producer prices for logging products (EVAS 61231) is used. Intermediate consumption is calculated based on the price-adjusted intermediate consumption ratio of the previous year.

4.08 A quantity-price model is also applied for fishing. Initial estimates are later replaced by the monthly data from the Federal Office for Agriculture and Food on deep-sea fishing catch quantities. Intermediate

[6] The price-adjusted chained intermediate input ratios are calculated as a quotient of the price-adjusted chained intermediate input and production values based on the previous year

consumption is calculated based on the price-adjusted intermediate consumption ratio of the previous year. For the price development of all fishery products, the consumer price index (EVAS 61111) "Fish, fish products, seafood" is used.

4.1.2 Industry, excluding construction

4.09 The calculations for industry excluding construction are differentiated into four areas: mining and quarrying, manufacturing, energy supply and water supply including waste management and similar activities.

4.10 The results for manufacturing as well as mining and quarrying are calculated by updating the price-adjusted GVA. The corresponding previous year's quarter is updated with the rate of change of the monthly production indices aggregated to quarters for manufacturing, mining, and quarrying (EVAS 42153). The rates of change are adjusted as necessary to account for expected corrections in subsequent publications of the index or later available structural statistics.

4.11 The price-adjusted output is inflated using a currently weighted output price index based on the producer price index for industrial products and the export price index (EVAS 61241, 61421). The price-adjusted intermediate consumption is inflated using a weighted input price index. Here, the indices of producer prices for agricultural and industrial products, the wholesale selling price indices, the consumer price index for Germany, and the import price index (EVAS 61211, 61241, 61281, 61111, and 61411) are weighted together according to the shares of the respective commodity groups based on the results of the input-output calculation. The GVA in current prices is then calculated as the difference between output and intermediate consumption, both in current prices.

4.12 The price-adjusted output and the GVA in section D of the NACE classification, energy supply, are updated with the production index (EVAS 42153) compared to the previous year's quarter. This assumes a short-term constancy of the price-adjusted intermediate consumption ratio. Subsequently, a double inflation of output and intermediate consumption is carried out with detailed, as current as possible, weighted input and output prices from the aforementioned sources of price statistics. Both current price and price-adjusted GVA are derived as the difference between output and intermediate consumption.

4.13 For section E of the NACE classification, water supply, waste management, and similar activities, the quarterly calculation of output and intermediate consumption is performed by keeping constant the results from the latest original calculation in price-adjusted terms, as intra-annual timely official information is not available. To determine the output and intermediate consumption at current prices, the price-adjusted results are inflated using corresponding current input and output prices as described above. The GVA is derived both at current prices and price-adjusted by subtracting intermediate consumption from output.

4.1.3 Construction

4.14 Calculations for construction are carried out for three NACE divisions, namely construction of buildings (NACE 41), civil engineering (NACE 42) and specialized construction activities (NACE 43). The results for the areas of building and civil engineering are updated using the development of hours worked from the monthly report on the main construction industry (EVAS 44111). The inflation of price-adjusted output and intermediate consumption is carried out using weighted output and input prices. The output prices come from the construction price statistics (EVAS 61261), while the input prices are derived from various price information sources in the price statistics, according to the composition of intermediate consumption.

4.15 In the area of specialised construction activities, including site preparation, installation, and finishing trades, the development of turnover from the quarterly reports on crafts (EVAS 53211) (for businesses with 1 to 19 employees) and the quarterly survey in the finishing trades and property developers (EVAS 44131) (for businesses with 20 or more employees) serves as the basis for updating the nominal output

and GVA. To calculate the price-adjusted output, a weighted output price index based on the construction price indices (EVAS 61261) is used for deflation. The inflation of intermediate consumption is carried out using detailed input prices. The price-adjusted GVA is obtained as the difference between the price-adjusted output and the price-adjusted intermediate consumption.

4.1.4 Trade, transport, accommodation and food services

4.16 In the NACE section wholesale and retail trade, the quarterly update is carried out for three areas: NACE 45 motor vehicle trade, NACE 46 wholesale trade, and NACE 47 retail trade. The update measure for all areas is the quarterly GVA at current prices of the respective previous year's quarter. The data basis consists of the rates of change of the monthly turnover indices from the following statistics:

- For NACE division 45 short-term business statistics in the motor vehicle trade (EVAS 45214)
- For NACE division 46 short-term business statistics in wholesale trade and trade mediation (EVAS 45211)
- For NACE division 47 short-term business statistics in retail trade (EVAS 45212)

4.17 The indicators derived from these statistics are adjusted as necessary for expected corrections when transitioning to the more comprehensive annual surveys. Since the monthly turnover indices are available both at current prices and price-adjusted, the price index (deflator) is derived implicitly.

4.18 The hospitality industry is calculated according to the two areas NACE 55 accommodation and NACE 56 food and beverage service activities. The GVA at current prices of the respective previous year's quarter is updated with the rates of change of the monthly turnover indices from the business cycle statistics in the hospitality industry (EVAS 45213). The calculation is otherwise analogous to the trade sector.

4.19 For the quarterly calculation of the areas of transportation and storage (NACE 49 to 53), the GVA of the respective previous year's quarter is updated according to six areas at the current edge. The updating indicators are the corresponding sector-specific rates of change of the turnover index from the monthly business cycle statistics in the service sector (EVAS 47414). The results are then deflated using the corresponding price indices from the price statistics, namely the producer price indices for transportation and logistics services (EVAS 61311) and selected consumer price indices (EVAS 61111).

4.20 To validate the results, all other available intra-annual information is utilised. Sources include, for example, monthly or quarterly data on various transportation services from transportation statistics, toll revenues, business reports of Lufthansa and postal companies. Based on the insights gained from these sources, adjustments to the updating indicators are made as necessary.

4.1.5 Information and communication

4.21 The NACE section I, Information and Communication, includes publishing (NACE 58), the production, rental, and distribution of films and television programmes; cinemas, sound recording, and music publishing activities (NACE 59), broadcasting (NACE 60), telecommunications (NACE 61), information technology services (NACE 62), and information services (NACE 63).

4.22 Except for the telecommunications, the quarterly calculation of price-adjusted GVA is performed using the respective rates of change in the volume of work compared to the corresponding quarter of the previous year. The volume of work is the product of the number of employed persons and the hours worked per employed person, each by industry division. The number of employed persons comes from the NA labour accounting, and the hours worked are provided by the Institute for Employment Research (IAB) of the Federal Employment Agency. In addition to the quarterly volume of work, nominally, there are also monthly turnover indices from the short-term business statistics in the service sector available for the individual industry division of information and communication, although with a time-lag (EVAS 47414).

4.23 The price-adjusted GVA results are then inflated using corresponding price data from the price statistics, such as producer prices for business services (EVAS 61361) and the consumer price index (EVAS 61111), to obtain nominal GVA data.

4.24 For telecommunications, the quarterly GVA at current prices is updated based on the rates of change in the turnover index compared to the corresponding quarter of the previous year from the monthly short-term business statistics in the service sector (EVAS 47414). For deflating the results at current prices, suitable price data from the producer prices for business services (EVAS 61361) are used.

4.1.6 Financial and insurance services

4.25 The industry section of financial and insurance services comprises the NACE division 64 Financial Services, NACE division 65 Insurance, Reinsurance, and Pension Funds, and NACE division 66 Activities Auxiliary to Financial Services and Insurance.

4.26 The GVA of financial service providers (NACE 64) consists of FISIM on the one hand, and the services directly charged to customers on the other. To calculate FISIM, monthly data from the Deutsche Bundesbank on the assets and liabilities of credit institutions (EVAS 841), differentiated by sector of borrowers or depositors, as well as interest rates (EVAS 843), are used. Other revenues from banking activities are estimated at the current edge using the development of the balance sheet totals of domestic banks. Intermediate consumption is determined using an intermediate consumption ratio derived from the most recent annual profit and loss accounts. For calculating price-adjusted FISIM values, the price-adjusted sum of loans and deposits is used as a volume indicator. Other service charges and intermediate consumption are deflated using appropriate price indices.

4.27 The output of insurance, reinsurance, and pension funds (NACE 65) consists of the service charge, which is updated based on the most recent original data from the Federal Financial Supervisory Authority (BaFin), using information and forecasts from the German Insurance Association on premium income. This also applies to other services provided by insurers and intermediate consumption. As an indicator of volume development, the deflated sum of payments to policyholders is used, as in the annual accounts. This is used to update the price-adjusted values.

4.28 The sector of activities auxiliary to financial services and insurance (NACE 66) is very heterogeneous, and there are no intra-annual data sources available. The output is estimated using indicators of industry expectations. The most recently available original intermediate consumption ratio is retained at the current edge to determine the GVA.

4.1.7 Real estate activities

4.29 The NACE section L, Real Estate Activities, comprises both housing services, including owner-occupied dwellings, and all other real estate activities.

4.30 The annual and quarterly calculation of housing services is based on a stratification model in accordance with Regulation (EC) No 1722/2005. This is a quantity-price model according to different strata. The aggregated strata currently include the federal states and two construction age classes, each separately for rented and owner-occupied housing. Based on a base year, the quantity progression is initially based on the building permits statistics (EVAS 31111) and later, after availability, on the statistics of building completions (EVAS 31121) and the statistics of building removals (EVAS 31141). Since the construction statistics only provide annual data, an intra-annual progression of completed residential area is determined using a model. Subsequently, the inhabited residential area is valued at a price per stratum. These prices, the net basic rents, are also based on original data for a starting year and are updated with appropriate monthly price indices from the consumer price statistics (EVAS 61111). For each stratum, the quantity multiplied by the price gives the output. Intermediate consumption is determined using intermediate consumption ratios, which are derived from household surveys and data from the housing industry. The same intermediate consumption ratio is used for all quarters of a year.

4.31 For the quarterly calculation of GVA in the other sub-sectors of real estate activities, the price-adjusted results of the previous year are updated using the results on the volume of work, which consist of the components of employed persons and hours worked per employed person. The latter is provided by the Institute for Employment Research of the Federal Employment Agency. The price-adjusted GVA results thus determined are then inflated using price indices from the price statistics to obtain the GVA results at current prices.

4.1.8 Market Producers in business activities, education, human health and social work activities, arts, sports, recreation and other service activities

4.32 The quarterly calculation of GVA for market producers in the NACE sections M – Professional, scientific and technical activities, N – Administrative and support service activities, P – Education, Q – Human health and social work, R – Arts, entertainment and recreation, S – Other services activities, T – Activities of households as employers, follows the same calculation procedure as described in Chapter 4.1.5 Information and Communication. The base data for the quarterly updating of price-adjusted GVA are the industry-specific results on the development of the volume of work. For inflation, industry-specific price developments, such as producer prices for business services (EVAS 61361) and developments from the consumer price statistics (EVAS 61111), are used.

4.33 The industry-specific growth rates determined based on the volume of work are adjusted with surcharges and deductions as needed for expected corrections when transitioning to more complete annual base statistics.

4.34 Additionally, further information is used to validate the calculation approach, such as the expenditure trends of health insurance funds in the healthcare sector. For business service providers (NACE sections M and N), there is a continuous comparison with the monthly turnover figures from the short-term business statistics in the service sector.

4.35 In the NACE division 94 Economic and Employers' Associations, Professional Organisations, and NACE section T Private Households with Domestic Personnel, GVA at current prices is updated with the appropriate quarterly compensation of employees from the national accounts. The price-adjusted calculation in NACE division 94 is carried out by updating with the corresponding development in the number of employed persons. The deflator is obtained as the ratio of nominal to price-adjusted results. In NACE division 97, the price-adjusted GVA is determined using relevant price indices from the consumer price index (services of domestic help) and wage tariff information.

4.1.9 Extrapolation GVA of market producers during the covid-19 pandemic

4.36 Estimating the economic impacts of the COVID-19 pandemic and the infection control measures was particularly challenging for the flash estimate (t+30 days), as discussed in Chapter 8. By the publication date for the more detailed results after t+55 days, the short-term business statistics data were available on time and of good quality, allowing the use of the usual procedures in most cases.

4.37 During the lockdowns, production activity was significantly reduced. Assuming that many fixed costs remained unchanged for companies, the price-adjusted intermediate consumption ratios were increased based on models. This approach deviates from the usual assumption during updates that the IC ratios in the individual industry sectors remain constant at the current edge. However, later, when incorporating the annual structural statistics, it became apparent that these assumptions did not hold to the same extent for every industry, leading to corresponding revisions of the results.

4.38 Due to COVID-19-related restrictions, in some particularly hard-hit industries, especially those where the volume of work serves as an update indicator, expert assessments were used to apply surcharges or deductions to the update indicator. This became necessary, as the development of the statistically derived volume of work deviated from the actually presumed development based on research.

4.2 Gross value added of non-market producers

4.2.1 Government

4.39 The GVA of the government within the framework of non-market production is calculated separately for the subsectors of the federal government, states, municipalities, and social security, divided in up to 12 economic sectors.

4.40 In the non-market production of the government, the GVA consists of compensation of employees, depreciation, and other production taxes paid, minus other subsidies received. The basis for compensation of employees are the quarterly cash results of the core budgets and extra budgets of the federal government, states, and social security (EVAS 71512) and the quarterly cash results of the core budgets and extra budgets of municipalities and municipal associations (EVAS 71517), supplemented by information from the accounting results of the core budgets, extra budgets, and other funds, institutions, and enterprises of the federal government, states, and social security (EVAS 71712) and accounting results of the core budgets, extra budgets, and other funds, institutions, and enterprises of municipalities and municipal associations (EVAS 71717). For government extra budgets, data from the quarterly university finance statistics (EVAS 21372) and quarterly data from extra budgets that implement commercial accounting (EVAS 71611) are also used. Other subsidies on production received are derived from the interim reports of the Federal Employment Agency. Other taxes on production paid are derived from the quarterly cash statistics.

4.41 The calculations during the COVID-19 pandemic had some peculiarities. The extent of the change in price-adjusted GVA due to the closure of state-run leisure facilities was small, as data from the Institute for Employment Research of the Federal Employment Agency suggested. For public education (schools, universities), the switch from in-person to online instruction did not lead to a change in GVA. However, the shut-down of day-care facilities for children led to a reduction in GVA in this area. Based on data from the Robert Koch Institute, a day-care opening rate indicator was estimated quarterly for the years 2020 and 2021 in the national accounts. This significant special effect noticeably influenced the development of price-adjusted government GVA and price-adjusted government consumption expenditures.

4.2.2 Non-profit institutions serving households

4.42 For the quarterly calculations of the gross value added (GVA) of non-profit organizations serving households, no direct information from surveys is available. Instead, estimates are made using indicators. Price-adjusted figures are derived by extrapolating the previous year's quarter using the volume of work, which is calculated as the product of sector-specific employee numbers and the average working hours per employee. In current prices, the extrapolation is done using the growth rate of sector-specific employee compensation. The deflator is implicitly derived from the nominal and price-adjusted results.

4.43 Similar to the government sector, there were special considerations in calculating the real GVA for the non-profit organizations serving households during the COVID-19 pandemic. This applies particularly to the education sector due to the temporary closures of childcare facilities. In this case, deductions were made for closed childcare facilities based on data from the Robert Koch Institute.

4.3 FISIM[7]

4.44 Unlike most other economic sectors, financial service providers do not charge their customers directly for all of the services they provide. A significant portion of their revenue is generated by paying lower interest on customer deposits than they charge their borrowers. Assuming that interbank transactions are conducted at an interest rate that does not include a service fee (known as the reference rate), the imputed service charge from transactions with other sectors can be calculated using a differential calculation. The imputed service charge for depositors is thus calculated as the stock of deposits multiplied by the reference rate, minus the same stock valued at the actual interest rate paid on the deposits. Along the same lines, the FISIM for borrowers is calculated as:

(stock of loans x actual interest rate) – (stock of loans x reference rate).

4.45 The data base for the quarterly calculation of FISIM is the monthly information provided by Deutsche Bundesbank on assets and liabilities of monetary financial institutions (EVAS 841) and on interest rates (EVAS 843). This information is available both for interbank transactions and for sectoral transactions with non-banks. Furthermore, loans and deposits can be broken down according to their maturities. Calculations are carried out in detail according to sectors of creditors and borrowers. Moreover, for the private household sector information can be broken down by the type of loan (mortgage loans or loan for consumption). This approach ensures that together with the calculation of FISIM production by financial intermediaries, the allocation to user sectors as well as the use of FISIM as intermediate consumption or final consumption is available.

4.4 Taxes less subsidies on products

4.46 The net taxes on products are taxes on products less subsidies on products. In the production account, GVA is reported at basic prices, i.e. it does not include taxes on products such as VAT, insurance tax or excise duties on energy, spirits or tobacco, but it does include the subsidies on products paid by the government or the European Union (EU) such as EU premiums and environmental bonus for electric vehicles. For the transition from the total GVA over all industries at basic prices to GDP at market prices, net taxes on products are added.

4.47 The taxes on products comprise value-added tax, import duties and other taxes on products. Import duties include excise duty on imports, customs duty on imports and levies and monetary compensatory amounts. Other taxes on products include the excise duties from domestic production, the EU taxes and entertainment tax, insurance tax, fire protection tax, property transfer tax, betting and lottery tax, aviation tax, casino levy and contributions payable to the German National Petroleum Stockpiling Agency.

4.48 Taxes on products are determined from the monthly tax reports of the Federal Ministry of Finance on community taxes and on federal and state taxes. The local government taxes are derived from the quarterly results of the financial statistics (EVAS 71211). Where necessary, the cash figures are time-adjusted by one or two months for accrual accounting, depending on the payment deadlines specified in the respective tax laws. The backdating of the tax revenue aims to align the recording of tax revenue with the point at which the tax liability arises. For taxes payable to the EU, the results of the balance of payments statistics of Deutsche Bundesbank are used.

4.49 The taxes on products at current prices are defined by public finance statistics. The deflator results from either the change of the tax rates or separate calculations. These separate calculations reflect changes in the composition of the assessment basis and, for value-dependent taxes on products, their price changes. The price-adjusted results are then calculated by deflating the partly time shifted cash figures with the relevant deflators. Excise duties are distinguished into excise duties on energy, tobacco, spirits,

7 Financial Intermediation Services Indirectly Measured.

alcopops, intermediate products, coffee, electricity, sparkling wine and beer. For the calculation of the deflator for the excise duties on tobacco (cigarettes, fine cut, pipe tobacco etc.) and energy (petrol, diesel oil, biodiesel, light and heavy fuel oil etc.), a more detailed breakdown by types of products is made to take account of the different tax rates. For the other excise duties, the deflators are calculated exclusively from the change of the tax rates.

4.50 Information about subsidies on products of the federal government and the EU is obtained from the cash figures of the federal government budget and the extra-budgets (EVAS 71512). The sources used for the states and local government are cash figures of the public finance statistics (EVAS 71512 and 71517). Currently, subsidies on products are assigned to the industries agriculture, food industry, wholesale and retail trade. These subsidies are paid in the relevant quarter, based on quantities or values, for goods or services produced, traded or exported. For the calculation, the price-adjusted results by industries for the previous year's subsidies on products are extrapolated with the rates of change of quarterly price-adjusted output available for these industries. Where an output value is not available, the rate of change of a production index or a rate of change based on quantities is used alternatively. The total of the results by industries yields the quarterly result for all industries.

4.51 The government measures taken during the COVID-19 pandemic to mitigate the economic consequences had a special effect on the accrual-based recording of product taxes. One of the relief mechanisms in the Corona tax package was the waiver of enforcement measures for tax debts and tax deferrals of up to three months. As a result, the cash figures and the date of incurrence of the tax liability fell unusually far apart. As part of the quarterly accounts, the accrual-based allocation was adjusted using a model based on special analyses by the tax administrations. In addition, the loss estimate due to tax revenue deferred at the end of 2020 varied by type of tax on product.

Table 4-1: Data bases production approach

(simplified representation)

Industry	Method applied	Sources; indicators (m = monthly, q = quarterly)	Level of detail of calculation	I. = inflating; D. = deflating
Agriculture, forestry and fishing (section 4.1.1)	Estimate; indicators	slaughter quantities (m), milk production (q), egg production (q), vegetable production (q), fish catches (q)	3 branches	I. with indices of producer prices for agricultural products, I. with consumer price index for selected products, I. with indices of purchase prices for agricultural machinery and materials, I. with producer price index of products from wood felling, I. with consumer price index for fish and fish products
Industry, excluding construction (section 4.1.2)				
Mining and quarrying	Indicators	production index (m)	1 branch	I. with producer prices and other price indices
Manufacturing	Indicators	production index (m)	1 branch	I. with producer prices and other price indices
Energy supply; water supply, sewerage, waste management and remediation activities	Indicators	production index (m)	2 branches	I. with producer prices and other price indices
Construction (section 4.1.3)	Indicators	hours worked (m), turnover (q)	2 branches	I. in primary construction with construction prices, D. in finishing trades with construction prices
Trade, transport, accommodation and food services (section 4.1.4)				
Wholesale and retail trade; repair of motor vehicles and motorcycles	Indicators	turnover (m)	3 branches	D. with (back-calculated) wholesale and retail price indices (including motor vehicles and motorcycles) and other price indices
Transportation and storage	Indicators	short-term statistical surveys in the service sector (q)	6 branches	D. with price series of consumer price index or. D. with price series of producer price indices for transport and logistics services
Accommodation and food services	Indicators	turnover (m)	2 branches	D. with (back-calculated) price indices for food and beverage serving services

Industry	Method applied	Sources; indicators (m = monthly, q = quarterly)	Level of detail of calculation	I. = inflating; D. = deflating
Information and communication (section 4.1.5)				
Publishing, audio-visual and broadcasting activities	Estimate	employees (q), hours worked per person in employment (q)	3 branches	I. with consumer price indices or producer price indices
Telecommunications	Indicators	short-term statistical surveys in the service sector (q)	1 branch	D. with price series of producer price index
Computer programming, information service activities	Estimate	employees (q), hours worked per person in employment (q)	2 branches	I. with producer price indices
Financial and insurance services (section 4.1.6)	Alternative indicators, estimate	banking statistics of the Deutsche Bundesbank on assets and liabilities and on interest rates (m), (FISIM-production)	Breakdown by FISIM and other service charge for financial services, by insurance segments and estimations e.g. Deutsche Bundesbank (German Federal Bank), exchanges	D. with deflated sum of loans and deposits as volume indicator, D. with deflated sum of benefits paid to policy holders
Real estate activities (section 4.1.7)				
Dwelling services	Stratification model	quantity extrapolation using building permissions statistics, price indices (m)	32 strata each for owner-occupied and let dwellings	D. with consumer price indices
Residual real estate activities	Estimate	employees (q), hours worked per person in employment (q)	1 branch	I. with consumer price indices
Business services (section 4.1.8)	Estimate	employees (q), hours worked per person in employment (q)	13 branches	I. with consumer price indices or producer price indices
Public services, education, health (section 4.1.9)				
Public administration and defence; compulsory social security; and general government units in the other industries	basic statistics (supplemented by estimates for state government, local government and	public finance statistics (q), accounting results of social security funds (q), higher education finance statistics (q), statistics for public funds, institutions and enterprises	4 subsectors of general government, by market and non-market output	D. by using input method (not for units of the general government sector in division education NACE/NACE 85)

Industry	Method applied	Sources; indicators (m = monthly, q = quarterly)	Level of detail of calculation	I. = inflating; D. = deflating
	parts of social security funds)	(only for units of general government) (q)		
Education	Estimate	employees (q) hours worked per person in employment (q)	1 branch	I. with consumer price indices
Human health and social work activities	Estimate	employees (q) hours worked per person in employment (q)	3 branches	I. with consumer price indices
Other services (section 4.1.10)	Estimate	employees (q) hours worked per person in employment (q)	7 branches	I. with consumer price indices
Trade, employers' and professional associations	indicators	employees (q), compensation of employees (q)	1 branch	nominal and price-adjusted figures extrapolated separately
Private households	indicators	compensation of employees (q)	1 branch	D. with price series of the consumer price indices
For information: non-profit institutions serving households	Indicators	employees (q), compensation of employees (q)	10 branches	nominal and price-adjusted figures extrapolated separately
FISIM (section 4.2)	Indicators	banking statistics of the Deutsche Bundesbank on assets and liabilities and on interest rates (m)	by sectors and financial instruments (41 items)	volume extrapolation using price-adjusted trend figures of loans and deposits
Research and development	Estimate	expert knowledge in consideration of development of NACE/NACE 72 (research and development)	overall and by NACE Rev.2	nominal and price-adjusted figures extrapolated separately
Taxes on products (section 4.3)	Indicators	reports of Federal Ministry of Finance (m), financial statistics (q), balance of payments statistics (m), EU-budget (q)	by types of taxes	D. with tax rates and (partly) product prices
Subsidies on products (section 4.3)	Indicators	reports of Federal Ministry of Finance (q), financial statistics (q)	overall and by NACE Rev.2	nominal and price-adjusted figures extrapolated separately

GDP components: the expenditure approach

5.01 Under the expenditure approach, a country's economic performance is determined from the perspective of its usage. This approach is based on the final use of domestic goods and services. The categories of consumption expenditure, gross capital formation, and net exports thus determine the value of GDP from the expenditure side.

5.1 Household final consumption expenditure

5.02 In the German NA, household final consumption expenditure (HFCE) is calculated using the supplier approach. The results are reconciled by using results from household budget surveys. The supplier approach is based on the turnover of suppliers of goods and services to private households. For this purpose, all available statistics on suppliers are evaluated. The suppliers are broken down into 'supply sources' which generally correspond to the economic activities in NACE Rev. 2.

5.03 These results are supplemented by special assessments for certain products e.g. tobacco products, energy, fuel, rents for dwellings which are calculated by means of quantities price models.

5.04 Basis for the calculation of quarterly HFCE are the monthly turnover results in retail trade (EVAS 45212), in trade of motor vehicles (EVAS 45214), in the hotel and restaurant industry (EVAS 45213) and the service activities (EVAS 47414) and the quarterly turnover results of crafts (EVAS 53211). Another important statistical source is the Federal Motor Transport Authority. It publishes monthly data concerning new registrations and changes of ownerships of motor vehicles. The prices for cars are provided by the Deutsche Automobil Treuhand GmbH. The figures for the consumption of heating fuel is based on quarterly data published by the Federal Office for Economic Affairs. The Federal Network Agency delivers data in the consumption of gas.

5.05 The quarterly estimates for certain service industries, such as health services, are using data on compensation of employees derived from monthly results of the Federal Employment Agency and information from various collective agreements.

5.06 The expenditure for dwellings rented is based on the quarterly dwellings stock (measured in living space) and an extrapolation of rental prices using data from the consumer price index (see chapter 4.1.7). Expenditures on financial and insurance services are estimated by tracking changes in the production value of these sectors. Purchases by private households from the government are calculated based on the government’s quarterly revenues.

5.07 Data on consumption expenditures of resident private households abroad and the consumption of non-resident households on the domestic territory are derived from the monthly Balance of Payments Statistics provided by the Deutsche Bundesbank.

5.08 For price adjustments, the monthly price indices from the consumer price statistics are used. HFCE are published according Classification of Individual Consumption According to Purpose 2018 (COICOP 2018).

5.2 Government final consumption expenditure

5.09 Government final consumption expenditure is defined as government non-market output that is provided to the general public without special charge. It is calculated from the government non-market output (total of gross value added of general government in the field of non-market output plus intermediate consumption used), less sales from non-market output and less output produced for own final use and plus the social benefits in kind which are provided but not produced by general government. Final consumption expenditure is calculated separately for the government subsectors.

5.10 For the calculation of intermediate consumption, sales and social benefits in kind, the same statistical sources are used as for the determination of gross value added of general government (see Chapter 4). Own produced research and development as well as software as part of government non-market output for own final use are estimated via models; the latter within the context of the investment calculations.

5.11 With the exception of the education sector, government final consumption expenditure is deflated using the input method. In the education sector, output is deflated based on volume measures. Price-adjusted value added is obtained by deducting deflated intermediate consumption (so-called direct measurement of output).

5.12 Government final consumption expenditure is split into actual collective and actual individual consumption by using information from the functional breakdown of the annual results of the public finance statistics.

5.13 The COVID-19 pandemic led to numerous exceptional developments in the government sector. The intermediate consumption increased sharply during the Covid-19 pandemic due to the purchase of medical protective equipment, COVID-19 tests and vaccines, and the payment of the lump sum for reserving intensive care beds for COVID-19 patients. Social benefits saw a sharp decline, as non-essential medical procedures were postponed. Government sales fell sharply because truck toll revenue, that is recorded as sales of the federal government, declined noticeably and ticket revenue at the closed state-run leisure facilities collapsed. The data on the toll revenues are very timely available. Other data was initially estimated on the basis of Internet research and then replaced by data from the financial statistics. The special effect of the children's daycare center closures described in the chapter of GVA also has an impact on the price-adjusted production value of the state. As a result, it has a significant downward effect on the derived price-adjusted government consumption.

5.3 NPISH final consumption expenditure

5.14 The quarterly extrapolation of final consumption expenditure of the non-profit institutions serving households (NPISHs) is analogous to GVA of this sector determined using the production approach (see Chapter 4.2).

5.4 Gross capital formation

5.15 Gross capital formation consists of gross fixed capital formation (GFCF), changes in inventories and acquisitions less disposals of valuables. GFCF is further subdivided in buildings and structures, machinery and equipment and other products.

5.4.1 Gross fixed capital formation in buildings and structures

5.16 The calculation of GFCF in buildings and structures is based on the data from companies and businesses that provide construction services and other services attributable to GFCF in buildings and structures. The calculation can be divided into the following areas: firstly, construction activities / civil engineering (main construction industry), secondly the finishing trades, thirdly manufacturing services, own-account output and ancillary construction services (services provided by architects, real estate agents and similar).

5.17 To estimate the quarterly results for the main construction industry by type of construction the number of monthly working hours from the monthly report on main construction industry (EVAS 44111) is used.

Price-adjusted results are obtained, which are inflated with price indices from construction price statistics (EVAS 61261) to obtain results in the current prices.

5.18 For finishing trades, turnover results are available for businesses with 20 or more employees from the quarterly survey in the finishing trades and property developers (EVAS 44131) as well as from the craft reporting (EVAS 53211). Additionally, results for the services of the manufacturing industry are available from the quarterly production statistics (EVAS 42131). There are no quarterly data available for ancillary construction services and own-account output; therefore, these are based on the results for the main construction industry and the finishing trades.

5.19 To adjust the results in current prices, the Construction Price Statistics (EVAS 61261) provide the appropriate construction price indices on a quarterly basis. The price adjustment is carried out using a matrix with eight types of construction and seven categories of construction service providers.

5.4.2 Gross fixed capital formation in machinery and equipment, military weapons

5.20 The calculation of GFCF in machinery and equipment is based on the commodity flow (CF) method, where the domestic availability of goods determines first. The domestically produced goods, categorized by product groups, are supplemented by the imports, exports are subtracted. Subsequently, an investment ratio is determined for each product group, along with some conceptual adjustments such as trade and transport margins or value-added tax, to arrive at GFCF in machinery and equipment.

5.21 The commodity flow method relies on sources that are available quarterly or monthly. The calculation of quarterly domestic production is based on production statistics (EVAS 42131), and the calculation of exports and imports is based on monthly foreign trade statistics (EVAS 51141, 51231). Since no up-to-date results are available for adjustments and investment ratios, they are largely held constant.

5.22 Deviating from the CF approach, the monthly capital formation data on passenger cars are directly derived from the quarterly registration figures, categorized by owner groups, provided by the Federal Motor Transport Authority (EVAS 46251). The number of registered passenger cars is valuated with quarterly prices which are recorded from the Deutsche Automobil Treuhand GmbH.

5.23 In this way, the results for capital formation in machinery and equipment are initially available in current prices. Price adjustment is carried out using price indices from producer price statistics (EVAS 61242) and price indices from the import and export price statistics (EVAS 61411, 61421).

5.24 Data for military weapons systems are aggregated with GFCF in machinery due to confidentiality reasons. Their quarterly calculation is conducted similarly to the calculation of government consumption expenditures.

5.4.3 Gross fixed capital formation in other products

5.25 GFCF in other products includes capital formation in intellectual property products (research and development (R&D), software and databases, entertainment, literary and artistic originals, mineral exploration) and capital formation in cultivated biological resources. The GFCF in R&D and software and databases have a share of more than 95% of the GFCF in other products.

5.26 The annual results for research and development are divided into quarters using a fixed seasonal pattern and are extended to the current period based on the time series. The annual results for software and databases are divided into quarters based on the intra-year shares of investments in corresponding hardware, particularly data processing equipment and soft-ware-related industrial machinery. The extension is based on historical growth rates, both nominally and in real terms.

5.4.4 Changes in inventories

5.27 For the sub-annual distribution of the changes of inventories (of output and input goods) no data is available. Therefore, the distribution of annual results to quarters is done by a fixed seasonal pattern. For the extension to the current period, various indicators are used: Key insights into the current development of inventory levels are obtained from the difference between monthly production and turnover indices in manufacturing (EVAS 42153, 42152) and from the monthly results of qualitative analyses on inventory developments, especially the so-called ifo inventory assessment and the HCOB Purchasing Managers' Index (EMI). [8] The results are then adjusted within the framework of reconciling the production and expenditure approaches to GDP, in conjunction with other GDP aggregates. Price information from the price statistics and the input-output accounts is used for deflation.

5.4.5 Acquisitions less disposals of valuables

5.28 For the quarterly estimation of the acquisitions less disposals of valuables, neither short-term statistics nor intra-year indicators are available. Therefore, the valuables of the respective previous year's quarter are extrapolated based on four subcategories derived from the time series. Depending on the category of valuables, producer price indices or the consumer price index are used for deflation.

5.5 Exports and imports

5.29 Exports and imports comprise goods and services transactions between residents and non-residents. Source statistics for calculating exports and imports of goods and services are available on a monthly basis and the methods for calculating quarterly and annual accounts coincide. Main source statistics for exports and imports of goods is the foreign trade statistics (EVAS 51141 intra-EU trade, EVAS 51231 extra-EU trade). Main source for esports and imports is the balance of payments statistics (EVAS 831) provided by the Deutsche Bundesbank. Source data from foreign trade statistics are not fully consistent with the methodology of NA. In particular goods transactions have to be shown in NA when a change of economic ownership between residents and non-residents has taken place. This may happen regardless of goods crossing a border physically. However, a physical cross-border transaction of goods is essential for recording goods transactions in foreign trade statistics. This is why source statistics are being modified in NA as well as in balance of payments statistics.

5.30 For the calculation of price-adjusted figures, the values of goods exports and imports in current prices and a granular disaggregation by products are mainly deflated with the price indices of the import and export price statistics (EVAS 61411, 61421) while for the exports and imports of services various producer price indices and the consumer price index is used.

5.31 The same sources are used to derive the figures in a geographical breakdown (European Union, European Monetary Union, Third Countries).

[8] Hamburg Commercial Bank (HCOB) Purchasing Managers' Index (EMI), see also Dashboard Deutschland: https://www.dashboard-deutschland.de/indicator/tile_1667982123933

Table 5-1 Data bases expenditure approach

(simplified representation)

Use-side aggregates	Method applied	Sources, indicators (m = monthly; q = quarterly)	Level of detail of calculation	I. = inflating; D. = deflating
Household final consumption expenditure (section 5.1)	Source statistics, indicators	Statistics on turnover in trade and hotel and restaurant industry (m) or crafts (q)	368 consumption purposes	D. with consumer price indices
Government final consumption expenditure (section 5.2)	Source statistics	Financial statistics (q), calculation results of the social insurance branches (q)	Subsectors, actual individual and collec-tive consumption	D. using input method (direct output measurement in education sector)
Final consumption expenditure of NPISHs (section 5.3)	Estimate	Employees (m), compensation of employees (q)	5 industries	Nominal and price-adjusted results extrapolated separately
Gross fixed capital formation (section 5.4				
- Gross fixed capital formation in construction (section 5.4.1.a)	Source statistics, estimate	Hours worked (m), turnover (q)	7 construction producers	I./D. with construction price indices by 8 construction types and 7 types of producers
- Gross fixed capital formation in machinery and equipment (section 5.4.1.b)	Source statistics, indicators (commodity flow method)	Production statistics (q), turnover surveys (m), foreign trade statistics (m)	2100 types of products	D. with producer and import price indices, approx. 230 combinations of products
- Other products (section 5.4.1.c)	Extrapolation, decomposition	No specific statistical sources		D. R&D with specific price index based on production factors D. Software with specific price index based on IT-providers
Changes in inventories and acquisitions less disposals of valuables (section 5.4.2)	Indicators, estimate	Production and turnover index in manufacturing (m), ifo inventory assessment (m)		Nominal and price-adjusted results estimated separately
Exports and imports (section 5.5)	Source statistics	Foreign trade statistics (m), balance of payments statistics (m)	Goods and services	D. with import and export price indices, consumer price index, producer price indices

Chapter 5 GDP components: the income approach

6.01 In contrast to the production and the expenditure approach, the income approach is not based on transactions in products but rather on the types of income. These include compensation of resident employees, gross operating surplus, mixed income, and government income in the form of taxes less subsidies. The sum of these components constitutes the GDP according to the income approach. Gross national income (GNI) can be derived by adding the balance of cross-border income flows. Because the information about entrepreneurial income is only very fragmentary in Germany, independent calculation of GDP or GNI via the income approach is not possible. Gross operating surplus and mixed income are calculated as the residual after subtracting compensation of employees from the gross value added determined by the production approach.

6.1 Compensation of employees

6.02 Compensation of employees comprises all monetary and in-kind compensations provided by an employer to an employee as remuneration for work performed. It therefore serves as a measure of remuneration or of the costs of labour as a production factor. It consists of wages and salaries as well as the actual and imputed social contributions paid by employers. According to the national concept (place of residence concept), the compensation of employees includes the remuneration received by residents from both domestic and foreign employers, while under the domestic concept (workplace location concept), it includes inbound commuters to Germany and excludes outbound commuters. Compensation of employees is published quarterly broken down by eleven industries (A10 plus manufacturing).

6.1.1 Wages and salaries

6.03 Gross wages and salaries constitute the largest component of compensation of employees. They include base wages and salaries as well as allowances for difficult working conditions, additional monthly payments, vacation pay, commissions, daily allowances, tips, and similar items. In-kind benefits, such as the monetary value of discounted or free provision of goods and services—including private use of company vehicles, discounts in canteens, and meal or transport vouchers—are also included.

6.04 Wages and salaries are calculated by multiplying the number of employees by average earnings (wages and salaries per employee). The number of employees used is based on the data collected for each quarter in the employment accounts, broken down by industry. The primary source for employment data is the employment statistics (EVAS 13111) of the Federal Employment Agency.

6.05 The average earnings for the relevant quarter are estimated through the ongoing extrapolation of wage levels from the four-yearly labour cost survey, which is also differentiated by economic sectors and employee groups. Nominal wage indices, differentiated by industry, are generally used as extrapolation indicators. For certain sectors, other indicators are applied, such as data from the monthly reports on mining and quarrying, wage agreements for private households and non-profit organisations serving households, and for marginally employed workers, the development of the lump-sum tax.

6.06 The calculation of quarterly gross wages and salaries for the government sector deviates from the general method described: for the government sector (S.13), compensation of employees is first determined based on the quarterly cash and accounting results of public budgets. Gross wages and salaries are then derived by subtracting employer social contributions from compensation of employees.

6.1.2 Employers' social contributions

6.07 Employers' social contributions reflect the expenditures made by employers to ensure their employees' entitlement to social benefits. These contributions cover risks such as old age, illness, long-term care, and unemployment. Employers' social contributions include both actual and imputed social contributions.

6.08 Actual social contributions are paid to statutory social security institutions as well as to private social protection schemes, such as pension funds and direct insurance plans.

6.09 Imputed social contributions represent the value of social benefits directly paid by employers to beneficiaries without the involvement of third parties and for which no reserves have been set aside. The majority of imputed employer contributions relate to civil servant pensions (healthcare benefits and pensions). Additionally, contributions to support funds are also considered imputed social contributions. Beneficiaries may include current or former employees or other eligible individuals, such as dependents.

6.10 The majority of actual social contributions are determined using monthly and quarterly data from the German Pension Insurance, the Federal Ministry of Health and the Federal Employment Agency. These data are supplemented by additional, sometimes annual sources, which are then broken down into quarterly figures based on the distribution of gross wages and salaries.

6.11 The results are based, on the one hand, on the actual allowances and benefits paid as reported in the quarterly financial statistics and, on the other hand, on the imputed social contributions for civil servants' pensions calculated in proportion to their salaries. Outside the government sector, imputed social contributions are also determined quarterly, mainly in proportion to the corresponding gross wages and salaries.

6.12 The calculation of social contributions had to be adjusted during the COVID-19 pandemic. The lockdowns imposed to contain the pandemic led to a sharp increase in the number of employees on short-time work. This changed the burden of the actual social security contributions. The calculations were adjusted accordingly to reflect the distribution between employers and employees as well as across different industries.

6.2 Other taxes on production less other subsidies on production

6.13 Other taxes on production paid to general government less other subsidies paid by general government represent other net taxes on production. Both items are calculated separately.

6.14 Taxes on production are determined based on the monthly tax reports of the Federal Ministry of Finance for community taxes and for pure central government and states taxes. Pure local government taxes are obtained from the quarterly cash results of the core budgets and of the extra-budgets using cameralistic/double-entry accounting of the municipalities/associations of municipalities (EVAS 71517). Where necessary, the cash figures are time-adjusted by one month for accrual accounting, depending on the payment deadlines specified in the respective tax laws. Since 2013, licence for public broadcasting is included in the other taxes on production. The corresponding data is derived from the annual accounts of the public broadcasting institutions.

6.15 The Information on the government subsidies is obtained from the quarterly cash results of the federal government (including EU shares), the states, and social security for their core budgets and cameralistic/double-entry extra-budgets (EVAS 71512) and quarterly cash results of the municipalities/associations of municipalities for their core budgets and of the extra-budgets using cameralistic/double-entry accounting (EVAS 71517).

6.3 Gross operating surplus and mixed income

6.16 Gross operating surplus and mixed income are determined as residual values. This applies to the calculation by both industries and institutional sectors. From the perspective of the production approach, gross operating surplus represents the portion of GVA that accrues to the production factors capital and the entrepreneurial labour. The gross operating surplus of the national economy consists of the gross operating surplus of the sectors non-financial (S.11) and financial corporations (S.12), general government (S.13), private households (S.14) and non-profit institutions serving households (S.15). In the quarterly accounts, the household sector and non-profit institutions serving households are reported together.

6.17 Gross operating surplus is calculated by subtracting the compensation of employees paid and other net taxes on production (chapter 6.2) from GVA. In the private household sector including non-profit institutions serving households (S.14/S.15), a distinction is made between gross operating surplus and mixed income. Gross operating surplus is calculated from gross operating surplus from owner-occupied dwellings plus gross operating surplus of non-profit institutions serving households (S.15).

6.18 Mixed income is generated from legally unincorporated market producers which are assigned to the household sector, provided they are not quasi-corporations. In Germany, these market producers include sole proprietors, self-employed freelancers, self-employed farmers and types of cooperative forms below the level of a partnerships, such as civil law associations and joint practices of physicians, lawyers, architects and others. In the case of sole proprietorships, it is not possible to distinguish between the renumeration for labour and the return on the capital employed. Furthermore, mixed income includes the rental income by private households, non-market production for own final use, such as agricultural production in home gardens and the own-account construction work.

6.4 Consumption of fixed capital

6.19 Consumption of fixed capital is determined using the internationally recommended perpetual inventory method (PIM) by adding up by years the consumption of fixed capital of all investments still in stock in the reporting year. This is done separately for machinery and equipment by 13 product groups and for military weapons systems, for structures by eight types of buildings and structures as well as for four types of intellectual property products. On the basis of

- long investment series at volume terms of a reference year;
- estimates of the average economic service life of the fixed assets;
- an assumed retirement function for the distribution of the actual retirements of fixed assets around the average economic service life (gamma function); and
- the application of a straight-line method of depreciation;

the annual consumption of fixed capital at volume terms of the reference year is determined first. The distribution to quarters is done by using an empirical formula that produces a smooth trend. [9] After that, the quarterly volume figures are converted into current prices and previous year's prices by using the quarterly price indices of the investments, with the product disaggregation described above. These can be used to form all necessary aggregations and to chain-link the resulting growth rates.

9 1) $Q1_t = (12\,D_t + 5\,D_{t-1} - 1\,D_{t+1}) : 64$ 2) $Q2_t = (20\,D_t - 1\,D_{t-1} - 3\,D_{t+1}) : 64$

3) $Q3_t = (20\,D_t - 3\,D_{t-1} - 1\,D_{t+1}) : 64$ 4) $Q4_t = (12\,D_t - 1\,D_{t-1} + 5\,D_{t+1}) : 64$

Q1 to Q4: Quarterly figures of the first to fourth quarter, D: annual figures, t: reporting year

Table 5-1: Data bases income approach and cross-border primary income

(simplified representation)

Distribution aggregates/ Cross border income flows	Method applied	Sources, indicators (m = monthly; q = quarterly)	Level of detail of calculation	I. = inflating; D. = deflating
Compensation of employees (section 6.1)				
Wages and salaries	Indicators, extrapolation model	Statistics of industry (m), collective agreements, financial statistics (q)	45 industries, 2 statuses in employment	-
Employers' social contributions	Indicators, estimate	Federal Ministry of Health, Verband deutscher Rentenversiche-rungsträger, Federal Employment Agency (BA), financial statistics (q)	2 statuses in employment	-
Net taxes on production to general government (section 6.2)	Indicators	Tax reports by the Federal Ministry of Finance (BMF) (m), financial statistics (q)	Taxes on production paid to general government, subsidies paid by general government	-
Consumption of fixed capital (section 6.4)	Model calculation (perpetual inventory method, PIM)	Perpetual inventory method (PIM) for the annual national accounts, empirical formula for distribution to quarters	4 types of products, 5 sectors, 7 sub-sectors; for 2 sectors and 4 sub-sectors by 16 industries	I. with the price indices for gross fixed capital formation
Balance of primary income between residents of Germany and the rest of the world				
Balance of income from employment (section 8.1)	Indicators, estimate	BMF reports (m), information on in-commuters (border workers and seasonal workers) by BA (q)	In-commuters and out-commuters by types for number, earnings, employers' social contributions	-
Balance of property income (section 8.2)	Indicators	Balance of payments statistics (m)	Property income received and paid	-
Balance of taxes on production and imports and subsidies (section 8.3)	Indicators	Balance of payments statistics (m), BMF reports (m)	Taxes on production and imports and subsidies	-

Chapter 6 Population and employment

7.01 For the observation and analysis of the economic situation, the national accounts provide key macroeconomic indicators, including per capita figures and data on employment. From the results on employed persons and the average hours worked, it is possible to calculate the total volume of work and, in relation to the gross domestic product, the overall labour productivity.

7.02 The population figures are based on the results of the most recent census and ongoing population projections. Employment data is sourced from the employment accounts within the national accounts, which consider various appropriate data sources. The hours worked and the total labour volume are determined by the Institute for Employment Research of the Federal Employment Agency in collaboration with the Federal Statistical Office.

7.1 Population

7.03 The representation of the population according to the European System of Accounts (ESA 2010) is based on the results and methods of official population projections. The starting point for these projections is the population figure determined by the most recent census. In 2024, the results of the 2022 Census became available for the first time.

7.04 In official population statistics, the updating of the population count considers births, deaths, and migration movements (inflows and outflows across Germany's borders). The fundamental data for birth and death statistics are provided by civil registry offices, while the results of migration statistics are based on data from registration authorities. The legal basis for these statistics is the Population Statistics Act. Since the data sources used for official population projections (EVAS 12411) are full counts, sampling errors are excluded.

7.05 In the context of national accounts, the population count is presented not as a specific point in time but as an annual or quarterly average. To determine these averages, arithmetic means are calculated from the point-in-time data of the official population projections.

7.2 Employment: persons

7.06 The employment accounts provide monthly, quarterly, and annual data on the development of employment in Germany. The definitions of employment according to ESA 2010 are largely aligned with the standards established by the International Labour Organization (ILO) for the creation of comparable labour market statistics.

7.07 In the national accounts, employed persons include all individuals engaged in an economic activity aimed at earning income, whether as employees or as self-employed individuals (including contributing family workers). It is also irrelevant whether the employment constitutes the primary source of livelihood. Individuals with multiple concurrent jobs are counted only once, based on their main employment.

7.08 The number of employed persons is presented for Germany as a whole and differentiated by employment status according to either the domestic concept (place of residence) or the national concept (place of work). For transition from the domestic concept to the national concept, cross-border commuters into Germany are added, while commuters from Germany to the rest of the world are subtracted. The quarterly and annual figures for employment by industry are provided by the employment accounts only according to the national concept.

7.09 The monthly, quarterly, and annual results of the employment accounts are based on a detailed calculation by industry for each group of employed persons. These groups include employees subject to full social insurance contributions, marginally employed and short-term employees, individuals in

employment opportunities, civil servants, soldiers, voluntary social service workers, self-employed persons, and contributing family members.

7.10 Approximately 60 distinct statistical sources, gathered through various reporting channels, are currently evaluated for industry-specific calculations. Among the most important sources, in addition to industry-specific statistics, are the statistics from the Federal Employment Agency on employees subject to social insurance contributions and marginal employment (EVAS 13111), the civil service personnel statistics, which are available only annually (EVAS 741), the results of the Microcensus (EVAS 122), the data from the Business Register (EVAS 521), and other reports from specific institutions (e.g., monthly reports from the Federal Ministry of Defence on the number of soldiers), as well as the Federal Employment Agency's data on additional jobs under employment opportunities according to the German Code of Social Law (SGB II)

7.11 In the calculations, the employment data sources are continuously checked for consistency. Furthermore, the results are validated against other national accounting aggregates, particularly the production and income accounts.

7.12 The calculations regarding the number of employees (including contributing family members) could mostly be carried out in the usual manner and quality even during the COVID-19 pandemic (see also Chapter 8.2). However, determining the number of self-employed persons proved more challenging in the reporting years 2020 and 2021, as the Microcensus was affected both by survey disruptions and by a methodological adjustment. As a result, it is difficult to attribute observed effects specifically to the changed methodology, survey issues (e.g., in-person interviews were temporarily impossible), or economic effects caused by the pandemic. The significant drop in levels observed in the first quarter of 2020 appeared hardly plausible when compared with all available alternative sources and indicators. Therefore, more deviation from the Microcensus figures than usual was necessary for a realistic representation. Instead, the results were derived based on a mix of sources and indicators, and, where appropriate, econometric methods were applied. These included, for example, the use of VAT statistics, the Federal Employment Agency's establishment statistics, business registration and deregistration data, insolvency statistics, the Socio-Economic Panel (DIW), and the trends in the number of self-employed individuals in other countries during the pandemic. Since the reporting year 2022, the rates of change in the number of self-employed persons from the Microcensus have been used again.

7.3 Employment: hours worked

7.13 The Working Time Measurement Concept conducted by the Institute for Employment Research (IAB) of the Federal Employment Agency complies with the requirements of ESA 2010 and is integrated into the German national accounts.[10] The average number of hours worked per employed person is calculated using a highly differentiated model, separately for employees and for the self-employed and contributing family members.

7.14 The number of hours worked is influenced by a variety of factors, all of which are incorporated into the model. These include contractual or company-specific regulations on weekly working hours and

10 For futher details see: Wanger, Susanne (2013), *Arbeitszeit und Arbeitsvolumen in Deutschland – Methodische Grundlagen und Ergebnisse der Arbeitszeitrechnung*. In: AStA Wirtschafts- und Sozialstatistisches Archiv, 2013, vol. 7, issue 1. DOI: 10.1007/s11943-013-0127-0 and

Wanger, Susanne, Tobias Hartl & Markus Hummel (2022): *Überarbeitung der IAB-Arbeitszeitrechnung im Rahmen der VGR-Sommerrechnung 2022*. (IAB-Research Report 13/2022), Nürnberg, 2022. DOI:10.48720/IAB.FB.2213

holidays, as well as calendar effects and the economic situation, which manifest in short-time work, paid and unpaid overtime, and working time accounts. Additionally, the model considers factors such as sickness absence, parental leave, part-time work, phased retirement in the release phase, labour disputes, and multiple employment. These components together determine the average actual hours worked per employed person. Data for the individual factors are sourced from more than 20 different official statistics and surveys (see Wagner 2013).

7.15 The Working Time Measurement Concept is a quarterly assessment. It is performed "bottom-up" for almost all components of working time, meaning that the calculations are based on industry-specific statistics for each component. When this is not feasible, a "top-down" approach is used, wherein the overall economic aggregate is distributed across industries using suitable key statistics (e.g., for components such as overtime, working time accounts, and sickness absence). The calculation depth is based on the A38 classification of NACE Rev.2. Additionally, various indicators and time series models for interpolations and current estimates are utilised when data sources are delayed or not available in the required frequency.

7.16 The course of the COVID-19 pandemic, in particular the measures taken to contain it, had a significant impact on working hours. The effects influenced several components of the working time calculation. Short-time working rose sharply in almost all industries, and some employees' vacation entitlement was also reduced. This was compounded by increased employee absences as a result of lockdowns ordered by the authorities, the closure of schools and childcare facilities and travel restrictions. These absences were partly covered by employees by the use of holiday entitlements, by reducing overtime and working time accounts, while some employees were also able to fall back on extended statutory leave entitlements (e.g. for childcare). Furthermore, an increased sickness absence and individual absences due to the various quarantine and access regulations contributed to reduced working hours.

7.17 The development of working hours was subject to volatile influences during the acute phase of the pandemic in 2020 and 2021, as the framework conditions changed at very short notice depending on the pandemic situation. This led to increased estimation inaccuracies of the models used. Novel factors such as widespread school and childcare closures, quarantine regulations, and restrictions on cross-border commuters could not be captured through regular data sources. Consequently, sample surveys, interviews, and well-founded assumptions were employed. Overall, this posed challenges for the quarterly labour time calculation and subsequently led to an increased need for revisions (see Wagner et al. 2022).

Chapter 7 Flash estimates

8.1 GDP flash estimate

8.01 According to the current publication practice, the initial release of the quarterly GDP is made no later than 30 days after the end of the quarter. This is referred to as a "flash estimate." At this early stage, some indicators for the continuation of the quarterly results are not yet fully available, particularly for the third month of the most recent reporting quarter. Therefore, a structured procedure has been developed for the flash estimation of quarterly results, which consists of the components expert estimation, econometric estimation, and reconciled estimation.

8.02 The **expert estimation** comprises of the estimates by the experts responsible for the production and expenditure aggregates, with a wide variety of methods being used (see chapter 3.2.4).

8.03 The **econometric estimation** yields purely quantitative estimates for the price-adjusted original values of the aggregates for the production and expenditure approaches to GDP based on the data that are available approximately 27 days after the end of a quarter. The forecasting procedures utilise the SARIMAX[11] models. Depending on the data base, these procedures known from the time series analysis are used to forecast monthly or quarterly indicators, which are then used to determine the trend of an aggregate, or to forecast the aggregate itself.

8.04 The **reconciled forecast** is based on the estimation results of both the expert and the econometric forecasts. The differing estimates for individual aggregates as well as for the total GDP are reconciled in a multistage process, producing a forecast for the year-on-year development of the price-adjusted values. The GDP flash estimate thus combines the established calculation methods of the national accounts with econometric approaches for forecasting economic data. The chosen approach deliberately aligns with the procedure of the subsequent "regular" GDP calculation to avoid methodologically induced breaks and to comprehensively utilise the existing expertise of all experts.

8.05 During economic crises, it is particularly challenging to produce accurate flash estimates of overall economic development. This is especially true for estimates made using econometric or time-series analysis methods. While such model-based estimates generally rely on a wide range of highly current economic indicators, they also depend on past data or time series. The COVID-19 pandemic highlighted that sudden and unexpected crises are difficult to capture using these models.

8.06 Private household consumption expenditures were particularly affected by the impacts of the pandemic. In this context, highly current indicators were used to estimate the effects. For travel, which largely came to a halt due to the pandemic, very timely data was provided by Deutsche Bahn for rail travel and Fraport for air travel at Frankfurt Airport. Regarding revenues in the hospitality industry, very current data was available from the German Hotel and Restaurant Association (DEHOGA) as well as the table reservation platform "Open Table." These indicators were also used in calculating GVA for market producers.

8.07 The inaccuracy of econometric models during the pandemic was significantly minimized through the interaction with expert estimates. As a result, the outcomes of the coordinated estimation during the quarters impacted by the COVID-19 pandemic were more accurate than purely econometric models, though still less accurate than before the COVID-19 crisis.

[11] Seasonal Autoregressive Integrated Moving Average with exogenous regressors

8.2 Employment flash estimate

8.08 The Federal Statistical Office publishes a total employment figure for Germany approximately 30 days after the end of each quarter. The employment figures are the result of the employment calculation integrated into the national accounts, which is based on a monthly accounting system (see Chapter 7.2).

8.09 This accounting system combines traditional national accounts methods, such as calculations based on employment statistical data and expert estimates, with mathematical-statistical forecasting methods. The independently determined results obtained through different approaches are harmonized, incorporating primarily statistical data such as the mid-year microcensus, and are then consolidated into the final result. Similar to the GDP flash estimates, the results are derived in a structured procedure consisting of an expert forecast, on an econometric forecast and a reconciliation.

8.10 In the first step, an **expert estimate** is employed in a top-down approach to derive the overall employment figures according to occupational status (self-employed, assisting family members, workers and employees, marginally employed, temporary employees, people in job creation schemes, civil servants, and soldiers).

8.11 For the **econometric forecast**, the employment accounts use two types of mathematical and statistical estimation methods: On the one hand, ARIMA (Autoregressive Integrated Moving Average) is used, which creates a forecast from its own data series by identifying patterns. On the other hand, regression models, known as indicator-based ADL forecasts (Autoregressive Distributed Lag), are also used in the employment accounting system, incorporating information from other (labour market) indicators. Both methods involve one-step forecasts that can be carried out in the short term and independently of the availability of employment statistical data sources.

8.12 In the final **reconciliation** step, the independently determined results of the expert estimation and the forecast are evaluated and combined into a final result. This process considers the specific characteristics of the mathematical and statistical forecasting methods, as well as overall assessments of the general economic situation and current labour market trends. This reconciled employment figures are published t+30 days after the end of the reporting month.

8.13 Since model-based methods such as the econometric estimation or extrapolation methods described above show increasing inaccuracy in unprecedented situations like the COVID-19 pandemic, the calculation of flash estimates were particularly challenging in 2020 and 2021. Therefore, greater emphasis was placed on labour market indicators such as short-time work figures, short-term business barometers, job advertisements, data from new digital sources like business social networks, and particularly the development of available unemployment figures.

Chapter 8 Main data sources used

9.1 Official data sources

EVAS no.	Name of survey	Relation to EU surveys	Periodicity	Provision of the results	Key characteristics for the quarterly accounts	Adjustments of the data collected
12211	Microcensus basic programme	Labour Force Survey	quarterly	t+3 months	Regular or occasional activity, marginal employment, status in employment, hours worked	
13111	Employment statistic		monthly, quarterly at end of quarter, annual	t+6 months Annual results via remunerations t+2 years	Employees subject to social insurance contributions	
13231	Labour market and unemployment statistics in accordance with the ILO concept	Labour Force Survey	monthly	t+1 month	Persons in employment	
21371	Finance statistics of institutions of higher education		yearly	t+17 months	Third party funds; Expenditure; Income or expenses; Income and expenditure by species; Income and expenditure or expenditure, income and expenditure on investments by species	
21372	Finance statistics of institutions of higher education		quarterly	t+4 months	Expenses and income or expenses, income and investment expenditure; Name of the university; University type.	
31111	Statistics of building permits	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly	t+2 months	Builders; Residential building; Living space; Usable area; Predominantly used heating energy; Space content; Construction of new buildings; Non-residential buildings; Predominantly used building material; Construction work on existing buildings; House type; Estimated cost of the building; Full floors; Number of rooms; Type of heating	

EVAS no.	Name of survey	Relation to EU surveys	Periodicity	Provision of the results	Key characteristics for the quarterly accounts	Adjustments of the data collected
31121	Statistics of construction work completed		yearly	t+9 months	Builders; Residential building; Living space; Usable area; Predominantly used heating energy; Space content; Construction of new buildings; Non-residential buildings; Predominantly used building material; Construction work on existing buildings; House type; Estimated cost of the building; Full floors; Number of rooms; Type of heating	
41322	Poultry statistics: survey in poultry Slaughterhouses	Reg. (EC) No 1165/2008 on livestock and meat statistics and repealing Directives 93/23 / EEC, 93/24 / EEC and 93/25 / EEC	monthly	t+1 months	Number of slaughtered poultry; Slaughter weight.	
41323	Poultry statistics: survey in holdings with laying hen husbandry	Reg. (EC) No 1234/ 2007 establishing a common organization of agricultural products and specific provisions for certain agricultural products (Uniformed CMO Reg.), as amended by Reg. (EC) No 513/2010	monthly	t+2 months	Eggs, hens	
41331	Statistics of slaughtering and slaughtering weights	Reg. (EC) No 1165/2008 on livestock and livestock statistics and repealing Directives 93/23 / EEC, 93/24 / EEC and 93/25 / EEC	monthly	t+2 months	Pigs; Sheep; Cattle; Horses; Slaughtering; Slaughter weight; Goats	
42111	Monthly report including orders received survey for enterprises in the field of manufacturing, mining and quarrying	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly	t+2 months	Turnover, number of employees, hours worked, total wages and salaries, orders received	
42131	Quarterly production survey in the field of manufacturing, mining and quarrying		quarterly	t+3 months	Production, repairs, assembling and processing	

EVAS no.	Name of survey	Relation to EU surveys	Periodicity	Provision of the results	Key characteristics for the quarterly accounts	Adjustments of the data collected
42152	Indices of turnover in the field of manufacturing, mining and quarrying	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly	t+1.2 months	Turnover index	
42153	Indices of production in the field of manufacturing, mining and quarrying	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly	t+1.3 months	Production index	If necessary, added estimate due to expected correction
42251	Cost structure survey in the field of manufacturing, mining and quarrying		annual	t+18 months	Overall output by components, costs by cost types, number of employees	
43111	Monthly report on energy and water supply		monthly	t+1.5 months	Persons in employment, wages and salaries	
43311	Monthly report on electricity supply	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly, annual	t+2 months	Electricity balance - industry (external procurement from public grid)	
44111	Monthly report in the building industry proper (incl. indices of orders received)	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly	t+50 days	Persons in employment, wages and salaries, hours worked, turnover	
44131	Quarterly survey in the finishing trade and with property developers	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	quarterly	t+2 months	Number of employees, wages and salaries, hours worked, turnover	
44141	Statistics on order book levels in primary construction		quarterly	t+2 months	Volume index order book	
44211	Annual survey of investment on main construction industry		annual	t+18 months	Turnover, persons in employment, wages, investment	
44252	Structural survey of small enterprises in construction		annual	t+18 months	Turnover, persons in employment, type of costs, investments	
45253	Cost structure survey of enterprises in construction and property developer		annual	t+18 months	Turnover, persons in employment, capitalised production, inventories, costs, value added tax, subsidies, R&D	

EVAS no.	Name of survey	Relation to EU surveys	Periodicity	Provision of the results	Key characteristics for the quarterly accounts	Adjustments of the data collected
45211	Monthly statistics of wholesale trade and commission trade	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly	t+2 months	Turnover, number of full-time and part-time workers	
45212	Monthly statistics of retail trade	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly	t+1 months	Turnover, number of full-time and part-time workers	
45213	Monthly statistics of the hotel and restaurant industry	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly	t+1.5 months	Turnover, number of full-time and part-time workers	
45214	Monthly statistics of motor vehicle sales including motor vehicle maintenance and repair	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly	t+2 months	Turnover, number of full-time and part-time workers	
46141	Long-distance passenger transport statistics of the railways	Reg. (EC) no. 91/2003, as amended by Reg. (EC) no. 219/2009	quarterly	t+3 months	Passengers, passenger-kilometres	
46181	Quarterly statistics on commercial short-distance passenger transport and long-distance coach transport	Reg. (EC) no. 91/2003, as amended by Reg. (EC) no. 219/2009	quarterly	t+3 months	Passengers, transport performance (passenger-kilometres), regular line traffic	
46251	Statistics on number of motor vehicles and trailers in use, vehicle defects		monthly	t+1.5 months	Changes of ownership, new registrations	
47414	Short-term statistical surveys in the service sector	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	quarterly	t+2.3 months	Sales or revenue; Number of persons employed; Economic focus	
51141	Intra-Community trade	Reg. (EC) no. 638/2004, as amended by Reg. (EC) no. 659/2014	monthly	t+1.5 months	Import, export, arrival, dispatch	
51231	Extra-Community trade	Reg. (EC) no. 471/2009, as amended by Reg. (EC) no. 2119/2016	monthly	t+1.5 months	Import, export, arrival, dispatch	
52111	Business Register		annual	t+21months	Turnover, employees subject to social insurance contributions, economic activity	

EVAS no.	Name of survey	Relation to EU surveys	Periodicity	Provision of the results	Key characteristics for the quarterly accounts	Adjustments of the data collected
53211	Quarterly crafts report		quarterly	t+2.5 months	Persons in employment; Sales; Economic activity; Business	
61111	Consumer price index for Germany	Reg. (EC) No 2016/792 on harmonized indices of consumer prices and the House Price Index, and repealing Council Reg. (EC) No 2494/95	monthly	t+15 days	Rent; Remuneration; Fees; Prices; Lease; Price-defining characteristics.	
61131	Retail price index		monthly	t+15 days	Price index	
61141	Price index for the hotel and restaurant industry		monthly	t+15 days	Price index	
61211	Index of producer prices for agricultural products		monthly	t+1 months	Prices for agricultural products	
61221	Index of purchase prices for agricultural machinery and materials		quarterly	t+1 months	Prices and charges for works and services	
61231	Producer price index of products from wood felling		monthly	t+4 months	Prices for raw wood designated according to type, grade, quality and trading conditions.	
61241	Index of producer prices for industrial products	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly	t+1.2 months	Prices; Description of goods; Sales conditions	
61261	Price indices for the construction industry	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	quarterly	t+10 days	Prices for works and services marked by type and characteristics	
61281	Index of selling prices in wholesale trade		monthly	t+36 days	Prices; Description of goods; Sales conditions	
61311	Producer price indices for transport and logistics services	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	quarterly	t+3 month	Prices; Price-defining characteristics.	
61361	Producer price indices for business services	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	quarterly	t+3 months	Prices; Price-defining characteristics.	

EVAS no.	Name of survey	Relation to EU surveys	Periodicity	Provision of the results	Key characteristics for the quarterly accounts	Adjustments of the data collected
61411	Index of import prices	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly	t+27 days	Prices; Purchasing conditions; Description of goods; Country of origin.	
61421	Index of export prices	Reg. (EC) no. 1165/98 short-term economic statistics, as amended by Reg. (EC) no. 461/2012	monthly	t+28 days	Prices; Description of goods; Country of destination; Sales conditions.	
62321	Quarterly survey of earnings		quarterly	t+2 months	Gross earnings, hours of work paid, economic activities	
71211	Tax budget		quarterly	t+5 months	Tax revenues, tariffs	
71512	Quarterly cash results of the core budgets and of the extra budgets using cameralistic/ double entry accounting of the Federation (incl. EU shares), the Länder and social insurance		quarterly	t+3 months	Revenue; Expenditure; Construction expenditures; Cash on hand	Harmonisation with final calculation results
71517	Quarterly cash results of the core budgets and of the extra budgets using cameralistic/ double entry accounting of the Federation (incl. EU shares), the Länder and social insurance		quarterly	t+2.5 month	Revenue; Expenditure; Construction expenditures; Cash on hand	Harmonisation with final calculation results
71611	Quarterly data of extra budgets using commercial accounting	Reg. (EC) No 549/2013 on the European System of National and Regional Accounts in the European Union	quarterly	t+3 month	Actual revenue by types; Actual expenditure by types; Expenditure on investment by types; Liabilities due to creditors; Financial transactions by types	

EVAS no.	Name of survey	Relation to EU surveys	Periodicity	Provision of the results	Key characteristics for the quarterly accounts	Adjustments of the data collected
71712	Accounting results of the core budgets, of the extra budgets using cameralistic/double-entry accounting and of other public funds, institutions and enterprises using cameralistic/ double entry accounting of the Federation (incl. EU shares), the Länder and social insurance		yearly	t+23 months	Revenue and expenditure by types and scope of tasks; Annual result; Function plan; Section; Chapter; Grouping plan.	
71717	Accounting results of the core budgets, of the extra budgets using cameralistic/double-entry accounting and of other public funds, institutions and enterprises using cameralistic/ double entry accounting of the municipalities/ associations of municipalities		yearly	t+21 months	Product groups and accounts according to product framework and account framework; Duties and groupings according to kameral household system.	
71811	Annual accounts of extra budgets using commercial accounting and of other public funds, institutions and enterprises using commercial accounting		yearly	t+23 months	Expenditure; Balance sheet total; Year gain / loss; Plant proof; Balance sheet profit / loss; Fixed assets; Income; Current assets; Equity; Accruals; Liabilities.	
73311	Turnover tax statistics		yearly	t+16 months	Turnover, value added tax, legal form, fiscal unity, input tax, prepayment period, NACE	
74111	Public service personnel statistic		yearly	t+6 months	Information about personnel of the public sector	
79911	Statistics of excise duties on tobacco products		quarterly	t+3 weeks	Purchase and issue of fiscal stamps	
83111	Balance of payments statistics		monthly	t+2 months	Import and export of goods and services, freight income (sea freight)	

EVAS no.	Name of survey	Relation to EU surveys	Periodicity	Provision of the results	Key characteristics for the quarterly accounts	Adjustments of the data collected
841	Foreign exchange statistics		monthly	t+1 month	Official exchange rates	
843	Interest rates statistics		monthly	t+2 months	Average, effective interest rates	

9.2 Other data sources

Ser. no.	Name of data source	Organisation, and purpose of the data collection	Periodicity	Provision of the results	Key characteristics for the quarterly accounts	Adjustments of the data collected
1	Tax report	BMF	monthly	t+ 0.5 month	Taxes	
2		Zementverband (cement association)	monthly	t+ 1.5 months	Domestic sales of cement	
3	Quarterly statement	Lufthansa AG	quarterly	t+ 0.9 months	Turnover	
4	Quarterly statement	Telekom group	quarterly	t+ 1.3 months	Turnover trend	
5	Quarterly statement	Post AG	quarterly	t+ 1.3 months	Turnover trend	
6	Quarterly statement	Fraport AG	quarterly	t+ 1.5 months	Turnover trend	
7	Toll		monthly	t+ 0.5 months	Income trend	
8	Travel agencies index	Chamber of Commerce and Industry Hannover	monthly	t+ 0.5 months	Turnover trend	
9	Petroleum data	Petroleum trade association (Mineralölwirt-schaftsverband)			Domestic supply of diesel, gasoline and heating oil	
10	Ifo stock assessment	Ifo-institute Munich			Change in inventories	Averaging
11	Inventories of the Petroleum Stockpiling Association	Petroleum Stockpiling Association (EBV)	quarterly		Inventories	
12		Bundesvereinigung Deutscher stahlrecyling- und Entsorgungsunternehmen e.V. (BDSV)	monthly		Scrap prices	
13	Cows' milk delivery to German dairy companies	Federal Ministry of Food and Agriculture	monthly	t+ 3 months	amount	