# Monitoring the economy in real time with the weekly OeNB GDP indicator: background, experience and outlook

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*This study presents the OeNB's new weekly indicator of economic activity, which is based on a demand-side approach to measuring GDP and which relies on real-time data. The weekly OeNB GDP indicator (1) tracks economic development in Austria on a weekly basis; (2) provides estimates of the contributions of the main demand components of GDP; (3) focuses on seasonally adjusted year-on-year changes; and (4) considers shifts from cash to noncash consumer spending, thus taking into account behavioral changes in the use of payment instruments.*

*The OeNB has published weekly GDP estimates since early May 2020 and has thus provided policymakers and the public with important and timely information on the state of the Austrian economy. First benchmarking results indicate that the weekly OeNB GDP indicator generated rather accurate results for aggregate economic activity in the first two quarters after the outbreak of the COVID-19 pandemic in Austria.*

*We describe the construction and the main features of the weekly OeNB GDP indicator, present its results for the period from March to December 2020, discuss the strengths and shortcomings of our approach and draw some lessons from more than eight months of weekly nowcasting with real-time data.*

*Indicator updates will continue to be released during the COVID-19 pandemic at https://www.oenb.at/Publikationen/corona/bip-indikator-der-oenb.html.*

*JEL classification: C53; E01; E27*
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As in most other industrialized countries, the COVID-19 pandemic triggered a deep and abrupt slump in economic activity in Austria. Timely estimates of the economic contraction following the March 2020 lockdown, the subsequent gradual recovery of the Austrian economy and the renewed contraction in November and December 2020 present economic research with substantial challenges. Traditional economic indicators are typically not available on a timely basis given their monthly or quarterly publication schedule. Moreover, the performance of traditional forecasting models might be suboptimal in this special case, as some econometric relationships that are reliable in normal times may have broken down during this severe contraction, e.g. because of sudden behavioral changes and/or nonlinearities.

Against this background, the Oesterreichische Nationalbank (OeNB) developed a weekly economic indicator based on economic data that are measured at

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high frequency. This indicator estimates real GDP via the expenditure approach. The weekly OeNB GDP indicator (1) tracks economic developments in real time[2]; (2) provides estimates of the contributions of the main demand components of GDP; (3) looks at seasonally adjusted year-on-year changes; and (4) incorporates behavioral shifts as e.g. its consumption estimate encompasses cash and noncash expenditure and thus takes account of the surge in the use of payment cards during the COVID-19 pandemic. As such, the indicator accounts for some major points of criticism that have been raised against real-time economic indicators.[3] Overall, the weekly OeNB GDP indicator generated accurate results for aggregate economic activity in the first two quarters after the outbreak of the COVID-19 pandemic in Austria while traditional nowcasting models performed rather poorly. Since the weekly OeNB GDP indicator is available on a weekly basis, it provides policymakers and the public with important and timely information on the state of the Austrian economy, which is particularly important given the rapid changes in economic activity caused by renewed lockdowns, stay-at-home orders or travel restrictions.

The aim of this study is to describe the construction and main features of the weekly OeNB GDP indicator. Also, we present its results for the period from March to December 2020 and discuss some early tests on its validity. The weekly OeNB GDP indicator aligns with a series of international economic indicators based on real-time data. We will therefore also put it in an international perspective and (briefly) compare its main features with those of other approaches. Finally, we discuss the lessons that we draw from more than nine months of nowcasting using high-frequency data, and in particular the strengths, limitations and potential of this approach.[4]

Before we proceed, we would like to point out that the weekly OeNB GDP indicator is based on an experimental approach and represents a "living project," i.e. we continuously work on improving it and implementing additional data. This means that results may be revised, also retrospectively.

## 1 Austrian GDP growth during the COVID-19 pandemic

Chart 1 presents the key results of the weekly OeNB GDP indicator for the period from March to December 2020.[5] The red line shows the change in Austrian real GDP per week against the comparable week of 2019. The value of –5.1 recorded in calendar week (CW) 34 which started on August 17, for example, indicates that real GDP in this week in 2020 was 5.1% below real GDP in calendar week 34 of 2019.[6]

[2] *We will use the term "real-time data" as synonymous with "almost or quasi real-time data," meaning data that are available at a daily or weekly frequency without great delays in publication. Also, our use of the term real-time data differs from the term used in the context of forecast evaluation in the sense that our real-time data can be subject to revisions.*

[3] *See, for example, "Why real-time economic data need to be treated with caution" (The Economist, July 23, 2020). https://www.economist.com/finance-and-economics/2020/07/23/why-real-time-economic-data-need-to-be-treated-with-caution.*

[4] *The OeNB GDP indicator has been published on a regular basis since mid-May 2020 and its results have been made available on the OeNB's website. Each publication comprises a data file (both in English and German) and a German summary of the results.*

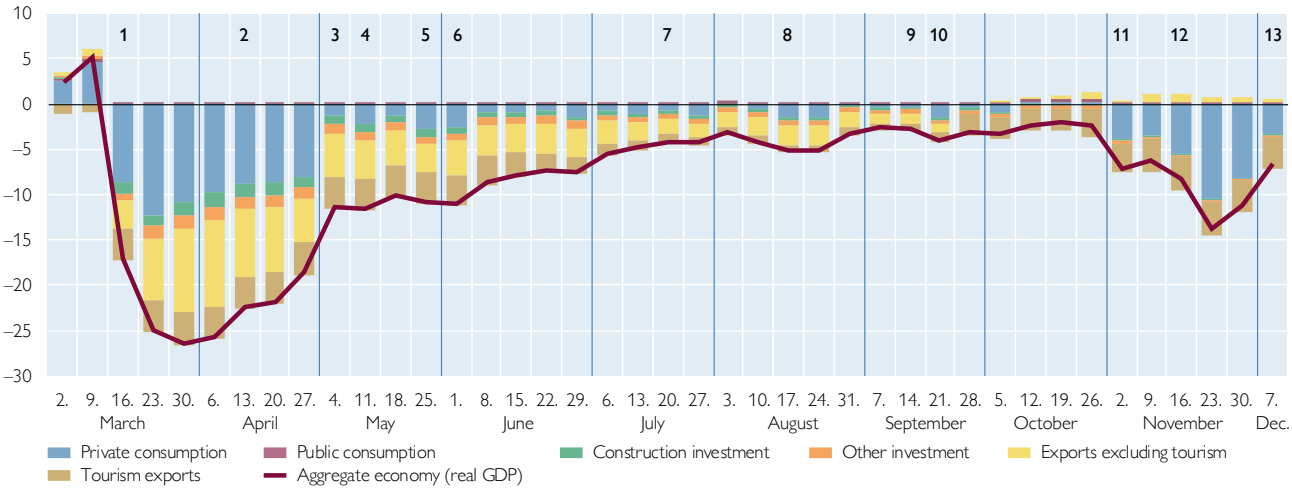
[5] *Cutoff date for data: December 13, 2020.*

[6] *2019 is particularly suitable as a year of comparison as it was a normal business year with growth rates close to the long-term average and a closed output gap.*

Chart 1

**Weekly OeNB GDP indicator for Austria**

*Year-on-year change of real GDP in %; import-adjusted growth contributions in percentage points*




*Source: OeNB.*

*Note: 1: lockdown (March 16, 2020), 2: small shops reopen (April 14, 2020), 3: all shops reopen (May 2, 2020), 4: restaurants reopen (May 15, 2020), 5: hotels reopen (May 29, 2020), 6: borders reopen gradually (June 4, 2020), 7: duty to wear face masks reintroduced (July 24, 2020), 8: travel warnings issued (for Croatia, the Balearic Islands, gradually from August 8, 2020), 9: travel warnings issued for Austria (September 16, 2020), 10: protective measures tightened (September 21, 2020; November 25, 2020), 11: lockdown light (November 3, 2020), 12: lockdown (November 17, 2020), 13: retail shops and personal service shops reopen (December 7, 2020).*

The first lockdown in Austria of March 2020 led to a sudden and steep slump in economic activity – at rates not seen in Austria since the World War II.[7] Our estimates suggest that two weeks after the lockdown was in full effect (CW 14), Austrian GDP was 26% below 2019 values.[8] This gloomy state continued until shops were reopened (smaller shops in CW 16 and larger shops at the end of CW 18). The reopening of restaurants and hotels also supported economic recovery. However, GDP growth remained negative over the summer of 2020 (July began in CW 27) and in early fall.

New restrictions were imposed in response to the renewed surge in COVID-19 cases in October 2020. First, Austria issued travel warnings for other countries. Then, other countries issued travel warnings for Austria. In early November 2020, a partial lockdown was imposed in Austria, essentially shutting down restaurants, hotels, cinemas, fitness studios, etc. These measures were tightened on November 17, 2020, with nonessential retail shops and schools being temporarily closed (second lockdown). On December 7, 2020, retail shops and personal service shops were allowed to reopen.

While short-term economic developments are discussed regularly in the reports published on the OeNB's website www.oenb.at/Publikationen/corona/bip-indikator-der-oenb.html, in this study, we focus on the broader results that emerge from the OeNB GDP indicator estimates:

[7] *Containment measures were imposed from March 9, 2020, onward. Monday, March 16, 2020, (calendar week 12) was the first working day when shops remained closed. A timeline is provided at https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Austria (retrieved on September 24, 2020), for example.*

[8] *Table A2 in the annex lists calendar weeks and the corresponding calendar dates.*

- In the early stages of the COVID-19 crisis, consumption, nontourism exports and tourism exports contributed most to the decline in Austria's economic activity. This changed over time, as nontourism exports have returned toward normal levels. For the second lockdown period of November 2020, we find that consumption and tourism exports drove the economic downturn.
- Our estimates show that consumption remained subdued even after the containment measures were lifted in May 2020. This development reflects elevated unemployment rates, a partial continuation of short-term work at lower incomes, increased economic uncertainty and precautionary savings as well as, possibly, a certain extent of spending restraint motivated by fears of contracting the coronavirus.
- Exports also remained subpar for an extended period of time; this shows how important international developments are for a small open economy. At the beginning of October (CW 40), growth rates in non-tourism exports started to turn positive, which was a positive signal in an overall gloomy economic environment.
- Tourism exports, which contribute around 7.5% to GDP in Austria, almost completely collapsed during the first and second lockdowns and gradually recovered over the summer months of 2020, mainly by virtue of domestic and German tourists (Fenz et al., 2020).
- While recovery was fast after the first lockdown in March 2020, over the summer and fall the slope of the recovery increasingly took the shape of a check mark with an increasingly flatter right arm, with real GDP levels ranging between 2% and 5% below 2019 levels.
- The second lockdown has caused a renewed decline in economic activity in Austria. However, the drop is less sharp than in spring, mainly because production and exports have remained largely unaffected.
- Altogether, COVID-19-related GDP losses in Austria (measured as the difference to 2019 GDP levels) are substantial. During the first lockdown, losses amounted to about EUR 2 billion per week. Over the weeks of fall (before the second lockdown), losses came to about EUR 0.5 billion. The fall lockdown led to a renewed increase in weekly GDP losses to about EUR 1 billion. Overall, GDP losses accumulated to EUR 27 billion from March 16 to December 13, 2020. If we also consider the level of GDP that was forecast before the outbreak of the COVID-19 pandemic, losses amount to EUR 31 billion or 7.8% of 2019 GDP.

## 2 Methodological background

In this section, we discuss why the COVID-19 crisis required the development of new economic activity indicators. Then, we discuss our approach of measuring the demand components of GDP with real-time data.

### 2.1 The case for new real-time indicators

What forecasters usually like to do, especially in the course of nowcasting exercises, is the following: feed the data into the model, run the model, take the results at face value (after some cross-checking) and – this last point is typically less popular – write a forecast report. As the models are typically highly sophisticated and well validated, this procedure usually leads to results with high nowcasting accuracy (in the sense that they only deviate slightly from final GDP data).

While this well-established and well-tested procedure works well in normal times, it tends to fail in times of severe crises. Most models (factor models, time series models, bridge equations, vector autoregressive models, etc.) are estimated on the basis of historical data and are validated in a pseudo out-of-sample way, with the most recent data being used for validation but not for estimation. This approach to modeling may be quite appropriate as long as there are no structural breaks and the assumption can be maintained that the data follow the same stochastic process during the entire sample period. The problem is that the data sample typically contains no, or at best only a few, episodes of severe economic crises. Furthermore, each crisis has its unique features. Therefore, autoregressive terms, which tend to increase the forecast accuracy in nowcasting models in normal times, can give rise to substantial forecast errors in crises times. Moreover, nonlinearities may not matter much in normal times but can be crucial in crisis times, e.g. if economic agents change their behavior in response to unprecedented events.

Another, and even more important, weakness of traditional approaches to nowcasting is their low time frequency. The typical target variable is GDP, data on which are available only on a quarterly basis, and many short-term economic indicators used in traditional nowcasting models are published with a considerable time lag. The flash estimate for GDP is available 30 days after the respective quarter; the publication lag of foreign trade variables or industrial production is up to two months. If economic activity plunges within a few days or weeks, quarterly models cannot meet policymakers' high demand for timely information.

Thus, the extraordinary circumstances of the COVID-19 pandemic generated an urgent need for short-term indicators that meet the following requirements:

- They are measured at high frequency (daily or weekly) and are available without much of a delay (almost in "real-time");
- They are not prone to behavioral changes, not biased by fiscal or monetary policy measures or other measures taken to contain the crisis;
- They exhibit a direct (linear) relationship to one of the main components of GDP;
- They are available for a period of time long enough to account for seasonal patterns and to apply standard econometric tools.

The availability of data and their characteristics determine the nowcasting method that can be applied. If researchers observe enough indicators for a sufficiently long time period, time series approaches like principal components analysis can be applied and are the prime choice (e.g. for the Weekly Economic Index by the Federal Reserve Bank of New York or Aprigliano et al. 2019). If – as in our case – most of the real-time indicators are only available for a short time period, a more data-driven approach seems appropriate.

Table A1 lists – without any claim to completeness – a set of possible economic indicators that are available for Austria. Our real-time data set of weekly or daily indicators comprises detailed information on labor market developments at a regional and a sectoral level and broken down by socioeconomic characteristics; daily mobility data – for Austria as a whole and for the individual provinces; data on freight volumes, at a detailed regional level, and flight data; weekly debit and credit card transaction data according to country of issue and/or use and spending category; information on cash shipments, ATM withdrawals and bank transfers;

various financial market data; information on electricity consumption, air pollution and internet activity.

Not all of these indicators fulfill all the requirements listed above. For example, data on financial markets are currently biased by fiscal or monetary policy decisions; air pollution data are strongly influenced by idiosyncratic events like wind and weather conditions, which are difficult to control for; the higher number of people working from home affects internet activity data, etc. We therefore do not use these data in estimating weekly economic activity.

Beyond that, and this is of particular importance, many of the available real-time indicators cover only a short period of time – often less than two years. This limits the possibilities of applying standard econometric tools. Therefore, we pursue a more "data-driven" approach, for which we use only a few particularly informative real-time indicators. As most of these indicators are directly linked to one of the main demand components of GDP, we estimate weekly economic activity via the expenditure approach.

Another obstacle when using daily or weekly data is seasonal adjustment. The standard statistical tools currently do not support the seasonal adjustment of daily or weekly data, although new procedures are being developed (Ollech, 2018). However, these new procedures require sufficiently long time series. Given that the available indicators are only observed for a short period of time, we have to seasonally adjust the data "by hand."[9] Specifically, care is required in choosing the appropriate reference week of the previous year when calculating year-on-year growth rates, i.e. for moving holidays, beginning-of-the-month effects, etc. In this sense, seasonal adjustment is truly "hand-made" and involves considerable judgment.

In the next sections, we present detailed information on how we estimate weekly growth in private consumption and exports as these are the two most important demand components. In contrast, we will only briefly touch upon the other demand components and the aggregation of all subcomponents to overall GDP.

### 2.2 Consumption

Private consumption is, next to exports, the single most important expenditure-side component of Austrian GDP (accounting for a share of 51%, see table 1). As in many other international approaches, our nowcasting estimate of private consumption rests on measuring consumer spending via payment card expenditure (e.g. Andersen et al., 2020; Aprigliano et al. 2019; Baker et al., 2020; Bounie et al., 2020; Brown et al., 2020; Chetty et al., 2020; Carvalho et al., 2020; González Mínguez et al., 2020; INSEE, 2020; Kraenzlin et al., 2020). Given the importance of cash in Austria, we also account for a broad estimate of cash expenditure (see box 1).[10]

The sum of (estimated) cash and (measured) payment card spending by Austrian residents in Austria comprises about 55% of consumer spending, as derived from

[9] *Some seasonal adjustment occurs by focusing on year-on-year changes. Beyond that, seasonalities are mainly introduced by moving holidays and beginning-of-the-month effects.*

[10] *The importance of including cash into estimating consumption is also highlighted in Ardizzi et al. (2020) for Italy and Brown et al. (2020) or Kraenzlin et al. (2020) for Switzerland.*

national accounts data. About 25% of private consumption in Austria refer to expenditure for housing and insurance. Travel expenses abroad account for almost 5% of total consumer spending. Our estimate of Austrian private consumption relies on the 55% of "discretionary" (cash and payment card) consumer spending we observe on a weekly basis. We assume that consumption expenditure for housing and insurance remains constant relative to the previous year. Travel expenses abroad (i.e. tourism imports) are estimated on the basis of payment card information (see section 2.4 for more details). For the remaining share of consumer expenditure (about 15%), for which we do not have any proxy variable, we assume a growth rate similar to the one observed for the above-mentioned 55% of "discretionary" spending. Overall, once we have an estimate of weekly cash and card transactions, the estimate of private consumption is obtained from a simple summation and extrapolation. The essential task is to estimate the weekly value of cash and card transactions.

Estimating "discretionary" weekly consumer spending requires information on the following components:

- the value of domestic face-to-face debit and credit card spending of Austrian residents;
- the value of domestic cash spending of Austrian residents;
- the value of remote (online) transactions of Austrian residents; These transactions can be conducted via credit or debit card, by online transfers via online banking accounts, by ordinary bank transfers, by cash, by gift cards, by mobile phone bills, etc.

As regards domestic face-to-face payment card transactions, we have data on close to 100% of the weekly value of spending via debit cards issued by Austrian banks. Also, we receive data from several credit card-issuing banks in Austria that, taken together, have a dominant market share. We use information on market shares to compute projections for overall credit card spending.

As the weekly OeNB GDP indicator rests on a year-on-year comparison, we could derive annual changes in consumption only from annual changes in payment card spending if the payment cards-cash ratio remained constant. However, in Austria – like in many other countries – the COVID-19 pandemic has caused behavioral changes in the use of payment instruments (see box 1), which are motivated, inter alia, by the fear of contagion, by merchants promoting the use of payment cards or by changes in consumption baskets. Neglecting changes in the use of cash would result in a biased consumption estimate.

The main problem in measuring weekly cash consumption is that it is unobserved and can only be estimated indirectly, e.g. via the value of cash shipments or cash withdrawals at ATMs. If merchants or banks receive cash, it will be shipped to cash-handling companies or to the OeNB. As the organization of the cash cycle in Austria is rather centralized, it takes a relatively short period of time for a banknote to be shipped back to the OeNB (Schautzer and Stix, 2019). For this institutional peculiarity, our estimate relies heavily on data on the weekly return flow of cash to the OeNB.[11]

This means that we make the somewhat heroic assumption of a velocity of one, meaning that each banknote is only used once before it is returned to the OeNB,

[11] *We exclude data on cash shipments by international wholesale cash dealers from our estimations.*

when estimating the absolute value of cash transactions in Austria per week (e.g. to derive the percentage of overall private consumption paid in cash). To assess year-on-year changes in consumption, which is required for estimating the weekly OeNB GDP indicator, we must make the somewhat weaker assumption of a constant velocity. Actual velocity will be somewhat higher than one, e.g. because automated cash recycling machines can check banknote fitness and put banknotes into recirculation without them being delivered back to the OeNB or because merchants directly use their cash receipts for consumption. On the one hand, we will thus underestimate cash consumption. On the other hand, we will overestimate it because cash shipments to the OeNB comprise banknotes that were not used for consumption. This is the case, for instance, when a person receives a cash payment and deposits the respective amount with a bank and the bank ships back this amount of cash to the OeNB or when people reduce their hoarded stocks of cash. Despite these biases, we presume that cash deliveries to the OeNB are highly correlated with actual cash consumption in Austria.[12]

It is not possible to provide a comprehensive test for these assumptions. Some degree of validation can be obtained by comparing data on ATM withdrawals, which can be considered a close proxy for cash consumption, with our measure of cash shipments.[13] Overall, the correlation of the value of weekly cash shipments and of ATM withdrawals has been very high in Austria since March 2020, with a correlation coefficient of above 0.9. Furthermore, we compute the implied share of cash from the total of cash, debit card and credit card expenditure, as shown in box 1. The implied share of cash obtained for the time before the COVID-19 pandemic is similar to the respective share of cash obtained in the payment diary study conducted in Austria in 2019 (European Central Bank, 2020; see box 1). Overall, these two checks suggest that our cash shipment measure provides for a reasonably appropriate measure of weekly cash spending in Austria.[14]

An alternative to using information on banknote (return) shipments to the OeNB would be to use information on banknote shipments from the OeNB or to use data on ATM withdrawals. We consider banknote shipments from the OeNB less appropriate as these also comprise cash held for hoarding. This was of particular importance in the early weeks of the COVID-19 crisis when cash withdrawals soared (such a surge was also observed in other countries, see Deutsche Bundesbank, 2020; Goodhart and Ashworth, 2020). Data on the value of ATM withdrawals would be more promising but these are not available on a weekly basis. Moreover, hoarding could have similarly influenced ATM withdrawals in the early days

[12] *Another subtle issue arises as cash shipments also comprise cash spending by tourists and cash exported by domestic residents when traveling abroad. We have attempted to estimate these components (as best we can, given available data and using ad hoc assumptions) and find that their quantitative importance is not large relative to the overall amount of cash that is shipped from or to the OeNB.*

[13] *Unfortunately, we cannot use information on ATM withdrawals directly because we observe only a relatively small share of all ATM withdrawals in Austria.*

[14] *Moreover, our interpretation is continuously vetted and discussed with experts in the OeNB's Cashier's Division and adjusted if necessary. For example, our year-on-year comparison of banknote shipments is biased in certain weeks as the issuance of the new EUR 100 banknote series in 2019 resulted in an above-average return flow of old EUR 100 banknotes. In such cases, we adjusted return flow data on a judgmental basis, utilizing data on changes in ATM withdrawals.*

of the COVID-19 crisis.[15] Cash shipments to the OeNB, in turn, which we consider, predominantly reflect cash spending (with some contribution from nonconsumptive purposes, e.g. dissolved hoarding stocks).

The final ingredient needed for our consumption estimate is the value of remote (online) transactions. We use data from debit and credit card issuers as well as from providers of secure transfers via online banking accounts. Unpublished survey information shows that these means of settling online transactions comprise the major payment methods for online transactions. However, we have no information on the market shares of the various payment instruments used for online purchases to compute projections for the entire online payment market. An additional problem arises as not all online payments can be assigned to domestic and foreign purchases. Given this situation, we take a pragmatic approach and just record an unadjusted sum of remote transactions. This should nevertheless provide a reasonable estimate of year-on-year changes in online spending as long as there are no large changes in the market shares of the various payment instruments and as long as there is no large shift between domestic and foreign retailers. Moreover, these data limitations are not overly important – from a quantitative perspective – for our consumption estimate, as remote transactions still account for only a modest share in overall private consumption.

Box 1

### Cash use first declined but then recovered in Austria during the COVID-19 pandemic

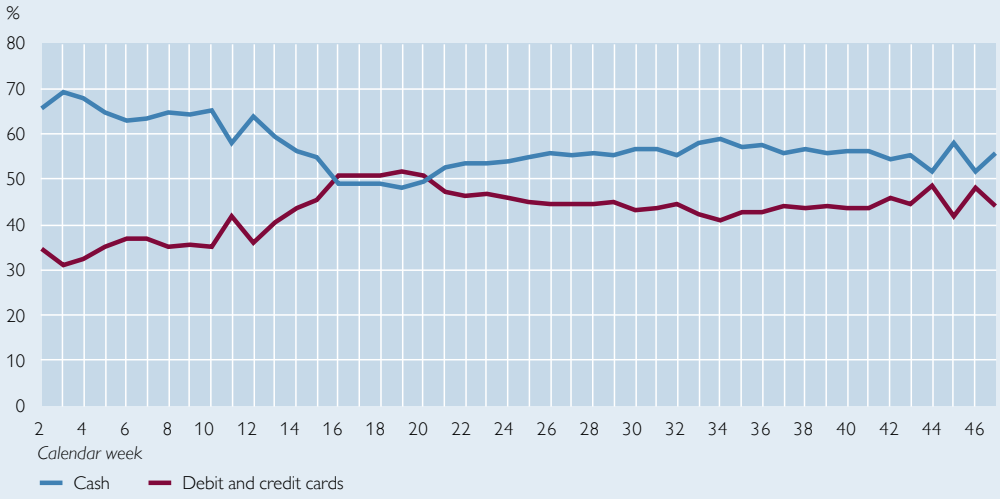
*Austria has a high cash intensity. According to the most recent payment diary study conducted in 2019 (European Central Bank, 2020), cash payments in Austria accounted for about 58% of the value of consumer purchases excluding recurrent payments, while card payments accounted for 28% and other payment instruments for 13%. Among payment cards, debit cards are most frequently used in Austria. European Central Bank (2020) does not report separate shares for debit and credit cards, but if we draw on the results of an earlier study on the situation in Austria, debit cards can be assumed to have a share of around 21% and credit cards a share of around 7% in consumer spending (Rusu and Stix, 2016). If we rebase the shares reported in European Central Bank (2020) and only consider transactions conducted using cash, debit cards and credit cards, cash transactions in Austria have a value share of 67%.*

*Chart B1 shows our estimate of the implicit shares of cash in point-of-sale (face-to-face) payment transactions before and during the COVID-19 pandemic in Austria. Although these estimates rely on strong assumptions and should therefore be treated as approximations only (see the discussion in the text), the implicit pre-COVID-19 shares are broadly comparable with the results obtained from the above-mentioned payment diary survey studies.*

[15] *Hoarding behavior could, to a small extent, also exist for ATM withdrawals, e.g. around pay-day, when people replenish their cash reserves and store cash for later purchases (Brown et al., 2020b).*

Chart B1

**Estimated share of payment instruments in payments at the point of sale**




*Source: Payment card issuers, OeNB.*

*Note: The chart shows an estimate of the value share of cash and of debit and credit cards in point-of-sale transactions in Austria. Shares sum up to 100. Payment cards comprise only cards issued in Austria.*

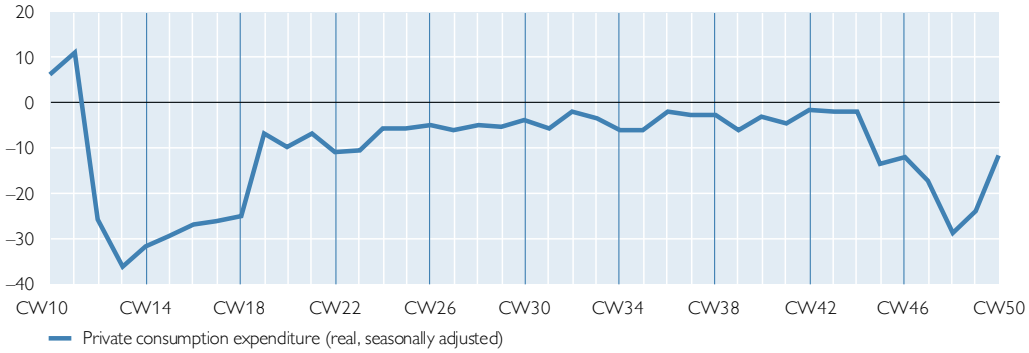
*The share of cash in payment transactions declined strongly after the spring 2020 lockdown measures were imposed in Austria, from around 65% to slightly below 50% – which means that EUR 5 out of EUR 10 spent in domestic face-to-face transactions were paid in cash. The increase in card spending was driven by debit cards, and by contactless debit card payments in particular. For the latter, the limit for payments not requiring a PIN has been raised from EUR 25 to EUR 50. Credit cards temporarily lost ground in Austria during the March 2020 lockdown, given that a significant share of credit card spending is related to travel-related payments (Rusu and Stix, 2016), and recovered after the lockdown. Until the end of summer, cash use recovered to a share of about 55%, on average. In the most recent weeks, with the new lockdown in place in Austria since early November 2020, the share of cash payments in total payment transactions has remained roughly constant (if we abstract from short-run fluctuations).*

*Studies on the use of different payment instruments have shown that consumer behavior tends to change only slowly over time. Bearing this in mind, the swift change in cash use observed during the COVID-19 pandemic is indeed remarkable. However, the fact that cash use recovered also shows that some consumers have slowly returned to their pre-crisis payment behavior and/or that consumption behavior has returned to its pre-crisis state. The results of an OeNB survey conducted in the summer of 2020 indicate that the greatest drop in the use of cash, on average, can be observed for consumers who previously used cash a lot – mainly older persons, persons with lower incomes or persons who tended to not use digital banking or payment products. This survey also shows that 30% of the Austrian population (aged 14 years or older) were concerned about the possible transmission of the coronavirus via banknotes. 64% said they were not concerned and 6% answered that they did not know. Survey results are summarized in German at https://www.oenb.at/Presse/thema-im-fokus/bargeldnutzung-in-oesterreich.html (September 25, 2020).*

Chart 2

**Weekly indicator for private consumption expenditure**

*Change on comparable week in 2019 in %*




*Source: OeNB.*

*Note: CW = calendar week.*

Overall, our estimate of weekly private consumption expenditure shows the strongest decline at the beginning of the first lockdown in spring 2020 (–35% in CW 13 compared to the same week of 2019) and indicates that consumption remained subdued even after the restrictive measures were lifted. The second lockdown, which started in CW 47, triggered another slump in expenditure which so far has remained less significant than during the first lockdown. Given its large share in GDP, weekly consumption significantly shapes the overall GDP growth pattern.

### 2.3 Goods exports

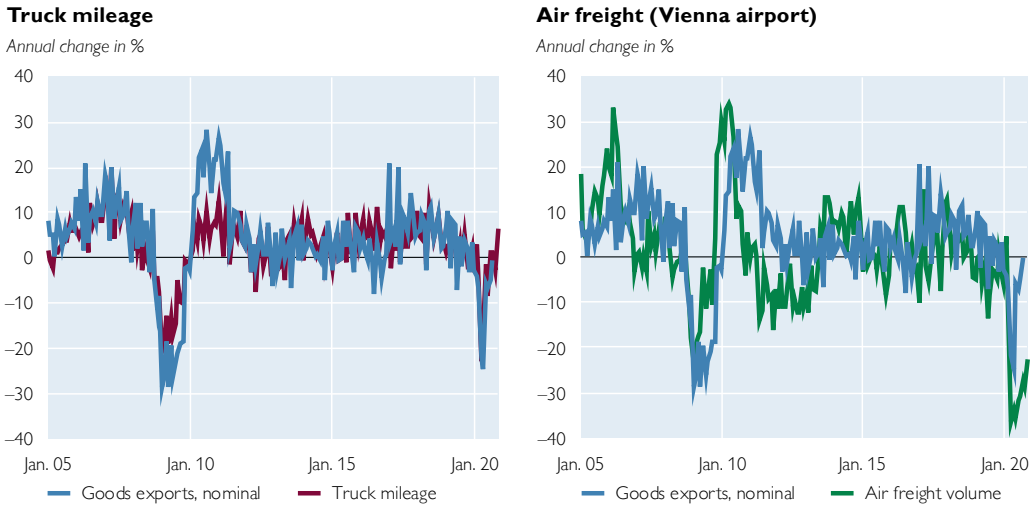
Business activity is closely related to freight performance. The high correlation between freight growth and economic growth has been emphasized in numerous international studies (e.g. OECD, 2004; Fenz and Schneider, 2009), with the linkage being particularly evident in small open economies.

For Austria, weekly information on truck mileage and rail transport is available on a real-time basis.[16] Weekly data on air traffic (passengers and freight volume) are provided for analytical purposes but for reasons of confidentiality only monthly data are approved for publication. Among all means of transportation, truck mileage shows the closest relationship to export activity (see chart 3).

[16] *Road transport is by far the single most important means of freight transport. In 2018, road transport accounted for 75% of total freight performance in Austria when measured in tons and 56% when measured in million ton-kilometers. Rail transport is second-most important, accounting for a share of 14% and 24%, respectively. Air transportation (<1%) and transportation via waterways (1%) are much less important in Austria. Pipelines account for the remainder of the overall transportation volume (10% and 19%, respectively).*

Chart 3

**Goods exports and means of transportation**




*Source: ASFINAG, Vienna International Airport, Statistics Austria OeNB.*

Fenz and Schneider (2009) document the good leading indicator properties of truck mileage data for goods exports in Austria. On the basis of their results, they developed the OeNB's Export Indicator – a monthly indicator of export performance published regularly (in German only) on the OeNB's website.[17]

To calculate the weekly OeNB GDP indicator, we update the estimations presented in Fenz and Schneider (2009) to determine the growth contributions of real exports of goods and services excluding tourism. The complementary relationship between goods and services exports is an empirically well-supported fact (Ariu et al. (2020) and Walter (2017) for Austria). Tourism exports are analyzed separately here (see section 2.4) while for exports of other services we make the simplifying assumption that they are closely linked to goods exports.

For our estimation, we aggregate truck mileage data on a quarterly basis and use this variable as the only explanatory variable in a simple regression for real exports of goods and services excluding tourism according to the national accounts. Both variables are seasonally adjusted. We refrain from using autoregressive terms, which would increase the overall fit of the equation but would worsen the nowcasting and forecasting performance during crises, as experience from past crises has shown. The estimated coefficient of truck mileage is 1.18 and it is highly significant. To nowcast weekly export activity, we assume that these estimation results at the quarterly level also hold at the weekly level.[18] Alternatively, we could have estimated an unobserved component model in state space form but this is left to future work.

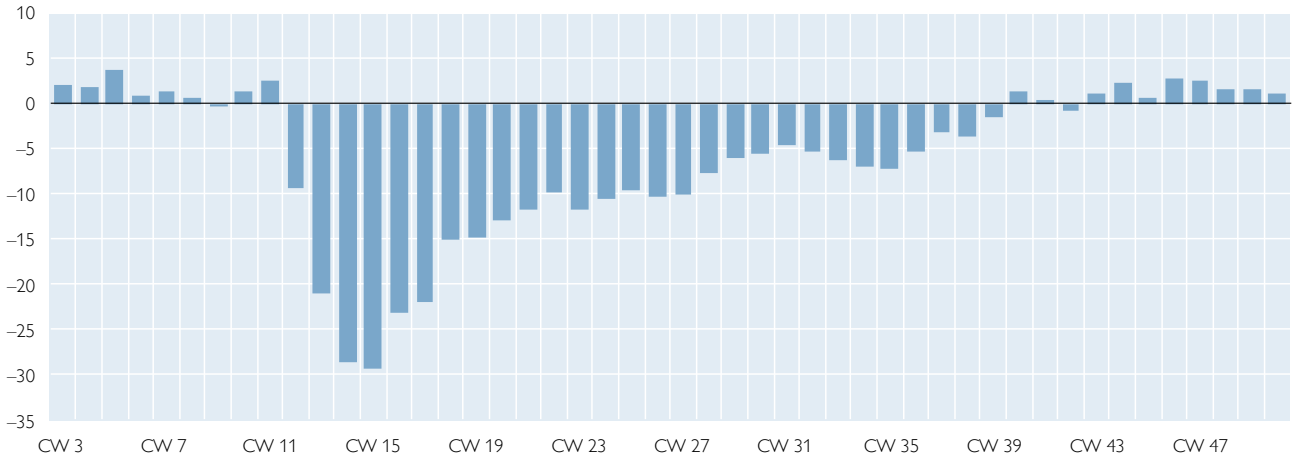
[17] *See www.oenb.at/Geldpolitik/Konjunktur/prognosen-fuer-oesterreich/oenb-exportindikator.html.*

[18] *To refine our estimations further, we use regional truck mileage data. From the beginning of 2019, the Austrian highway authority ASFINAG has provided detailed information on the border sections of the Austrian highway system. These data should be even more closely linked to export activity. Our weekly estimates are adjusted for the differences between the growth rate of truck mileage on the whole highway network and the growth rate of truck mileage in the border sections.*

Chart 4

**Truck mileage on Austrian highways (border sections)**

*Year-on-year change in %, seasonally adjusted*




*Source: ASFINAG, OeNB.*

*Note: CW = calendar week.*

## 2.4 Tourism exports

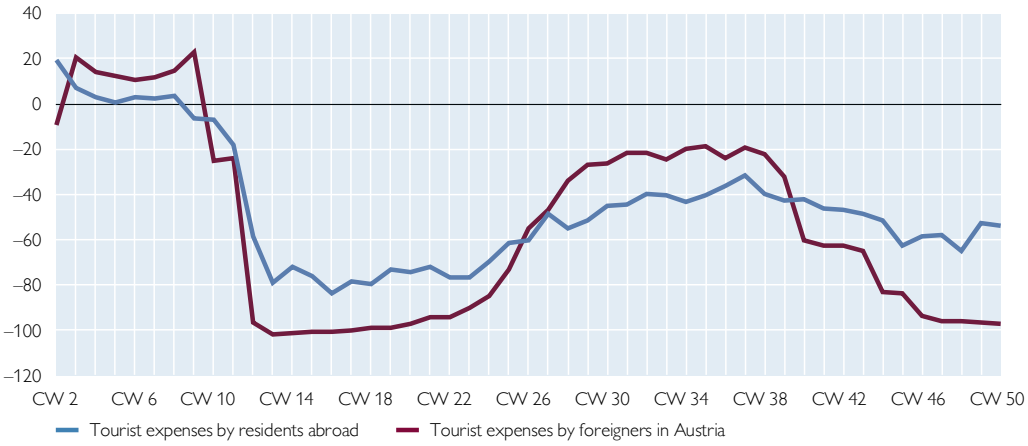
We analyze the tourism component of Austrian exports (and imports) separately for several reasons. First, tourism has been hit particularly hard by the COVID-19 crisis. Moreover, tourism exports account for more than 7% of total value added in Austria, which is well above the EU average, and their import share (19%) is significantly lower than that of total exports (45%). Finally, tourism services are obviously less closely linked to transport activity than goods exports and nowcasting them should therefore be based on other indicators.

We use data provided by payment card service providers to separately estimate tourism expenditure by foreigners in Austria (tourism exports) and by domestic residents abroad (i.e. tourism imports, which are also part of private consumption expenditure). Information on the respective expenses has been available on a weekly basis since the beginning of 2019. Payment card data are broken down by country of origin and several categories of goods and services. We use data on cardholders' expenses on typical tourist activities such as overnight stays, restaurants or traveling as a proxy for their overall tourism expenditure. Data are adjusted for moving holidays and inflation developments. Year-on-year changes are used to calculate the respective contributions to total GDP growth.

Chart 5

**Tourism expenditure**

*Change on comparable week in 2019 in %*




*Source: Payment service providers, OeNB.*

*Note: CW = calendar week.*

For a more detailed discussion of developments in Austrian tourism during the COVID-19 pandemic, see Fenz et al. (2020).

### 2.5 Other GDP components

The remaining demand components of GDP include investment activity (construction and nonconstruction investment), government consumption and changes in inventories (including the statistical discrepancy).

The development of construction investment is estimated using weekly data on the number of registered unemployed persons in the construction sector. When using weekly labor market data, the effects of short-term work schemes during the COVID-19 pandemic has to be taken into account. We do this on a judgmental basis since timely information is available only on the number of applications for short-term work schemes per economic sector but not on the actual utilization of these schemes – typically, actual utilization is substantially lower than the number of applications. Information about the actual utilization only becomes available with a considerable time lag. Other investment (nonconstruction investment) includes equipment investment and investment in R&D.[19] Since no suitable real-time indicator is available, we make the assumption that the weekly pattern of other investment follows the weighted average of the other demand components.[20] Public consumption is assumed to grow constantly at an annual growth rate of

[19] *Other investment (nonconstruction investment) comprises equipment investment, at a share of 60%, and investment in R&D, at a share of 40%. Equipment investment is very sensitive to the business cycle and is characterized by a high import share of almost 70%, while investment in R&D is less sensitive to the business cycle and is characterized by a relatively low import share of 20%.*

[20] *This approach led to reasonable results for the weeks until the end of the second quarter of 2020. From the beginning of the third quarter of 2020, the estimated recovery in "other investment" has been assessed to be too positive, given the steep rise in corporate debt. The latter should cause investment activity to be dampened more strongly than overall economic activity. We therefore adjusted the weekly pattern of "other investment" activity judgmentally, in line with the OeNB's June 2020 forecast.*

1.5%.[21] Finally, the growth contributions to GDP by inventory changes (including the statistical discrepancy) are assumed to be zero for all weeks considered.

Table 1

**GDP and import shares of final demand components**

| | Share in GDP | Share in imports | Import-adjusted share in GDP |
|---|---|---|---|
| | % | | |
| Private consumption | 51 | 27 | 37 |
| Government consumption | 19 | 11 | 17 |
| Investment | 24 | 37 | 15 |
| *of which: construction* | *11* | *22* | *8* |
| Exports | 57 | 45 | 31 |
| *of which: tourism exports* | *5* | *19* | *4* |
| Imports | 53 | x | x |
| *of which: tourism imports* | *3* | *x* | *x* |

*Source: Statistics Austria, authors' calculations.*

### 2.6 Putting all subcomponents together

To infer weekly GDP growth from the estimated weekly demand components, two more steps are needed. First, we adjust each demand component for its import content according to the latest input-output table for Austria. Import contents vary considerably from 11% for public consumption to 45% for exports. Specific subcomponents like investment in vehicles even reach import content shares of more than 80% (Fenz and Schneider, 2019). Second, each demand component is weighted with its share in GDP to derive the import-adjusted GDP shares shown in table 1. The sum of the import-adjusted demand components corresponds to total GDP.

The import-adjusted GDP shares of the demand components we model in detail – private consumption, exports and construction investment – account for more than 75% of GDP. With an import-adjusted share of 37%, private consumption is the single most important GDP component. Possible changes in the import shares of the main demand components induced by the COVID-19 pandemic are taken into account at least partly by explicitly modeling tourism exports characterized by a below-average import share and tourism imports with an import share of 100%.[22]

### 2.7 How does the weekly OeNB GDP indicator compare internationally?

Over the past months, a plethora of real-time indicators has been developed and analyzed. These indicators refer to consumption, industrial production, exports, economic sentiment and overall economic activity. These indicators have greatly contributed to an understanding of how the economy and specific economic sectors have evolved in response to the COVID-19 shock (see e.g. Indergand, Kemeny and Wegmüller, 2020).

As the weekly OeNB GDP indicator focuses on overall economic activity, we briefly put it into perspective with other real-time indicators that focus on GDP. Specifically, we focus on selected, publicly available indices and neglect proprietary sources.

The Weekly Economic Index (WEI) of the Federal Reserve Bank of New York measures real economic activity on a weekly basis (Lewis, Mertens and Stock, 2020a, 2020b). The WEI is based on a principal component analysis of ten high-

[21] *This assumption follows the assessment of the OeNB's fiscal experts in their biannual macroeconomic projection exercise.*

[22] *Tourism imports are modeled not only as a subcomponent of imports but also as a subcomponent of private consumption. Changes in the consumption of tourism services abroad therefore have no direct effect on overall GDP as their import share amounts to 100%.*

frequency series, which is scaled to annual GDP growth. As mentioned above, such approaches have the advantage that they can provide nowcasts for a longer time period – back until 2008 in the case of the WEI. This makes it possible to conduct robustness tests that enhance the credibility of such indices. The downside of this principal component approach is that it does not provide information on the subcomponents of GDP. The WEI displays a sharp recession in the USA that reaches its lowest value in a –11.5% drop in real GDP (as of end-April 2020).

The nowcasts of the French National Institute of Statistics and Economic Studies (e.g. INSEE, 2020) are based on detailed and comprehensive assessments of the subcomponents of French GDP. This approach is based on the production side of GDP as well as on a broad range of real-time indicators and provides a disaggregated sectoral analysis. The respective nowcasting report is updated (at irregular intervals) about every second month, and GDP estimates refer to a monthly period. The deepest slump was recorded in April 2020 at about –30%, and the shape of the recovery is very similar to that observed in Austria: first, a strong recovery, and then a prolonged period featuring subpar GDP levels. We note that the estimate by INSEE (2020) of the size of the decline in household consumption as well as in GDP during the first lockdown in spring 2020 is rather similar to our estimate.

There are other informative and interesting nowcasting indicators of GDP that are based on time series methods and the extraction of a trend component, e.g. GDPNow of the Federal Reserve Bank of Atlanta (Higgins, 2014) and the Weekly activity index for the German economy (WAI) published by the Deutsche Bundesbank (Eraslan and Götz, 2020). GDPNow is a "running estimate" of real GDP growth in a specific quarter. It uses newly available data to update the forecasts of the current quarter's GDP growth. GDPNow provides information on the subcomponents of GDP. The WAI is based on a principal components analysis of high-frequency indicators, including pedestrian activity, Google search terms, etc., and presents changes over 13-week averages. The WAI does not reveal information on the state of the economy in the most recent weeks and is thus not directly comparable to the other indices. Finally, we note that the Austrian Institute of Economic Research WIFO developed a weekly GDP indicator for Austria based on a time series approach. This indicator has been computed since March 2020 but was published only in October 2020 (Baumgartner et al., 2020). Therefore, we do not discuss this informative indicator in more detail. The GDP growth path of this indicator is rather similar to that of the OeNB's. In November 2020, the Swiss State Secretariat for Economic Affairs (SECO) released a new weekly indicator that is broadly comparable to the other indicators and that is also based on a time series approach (SECO, 2020).

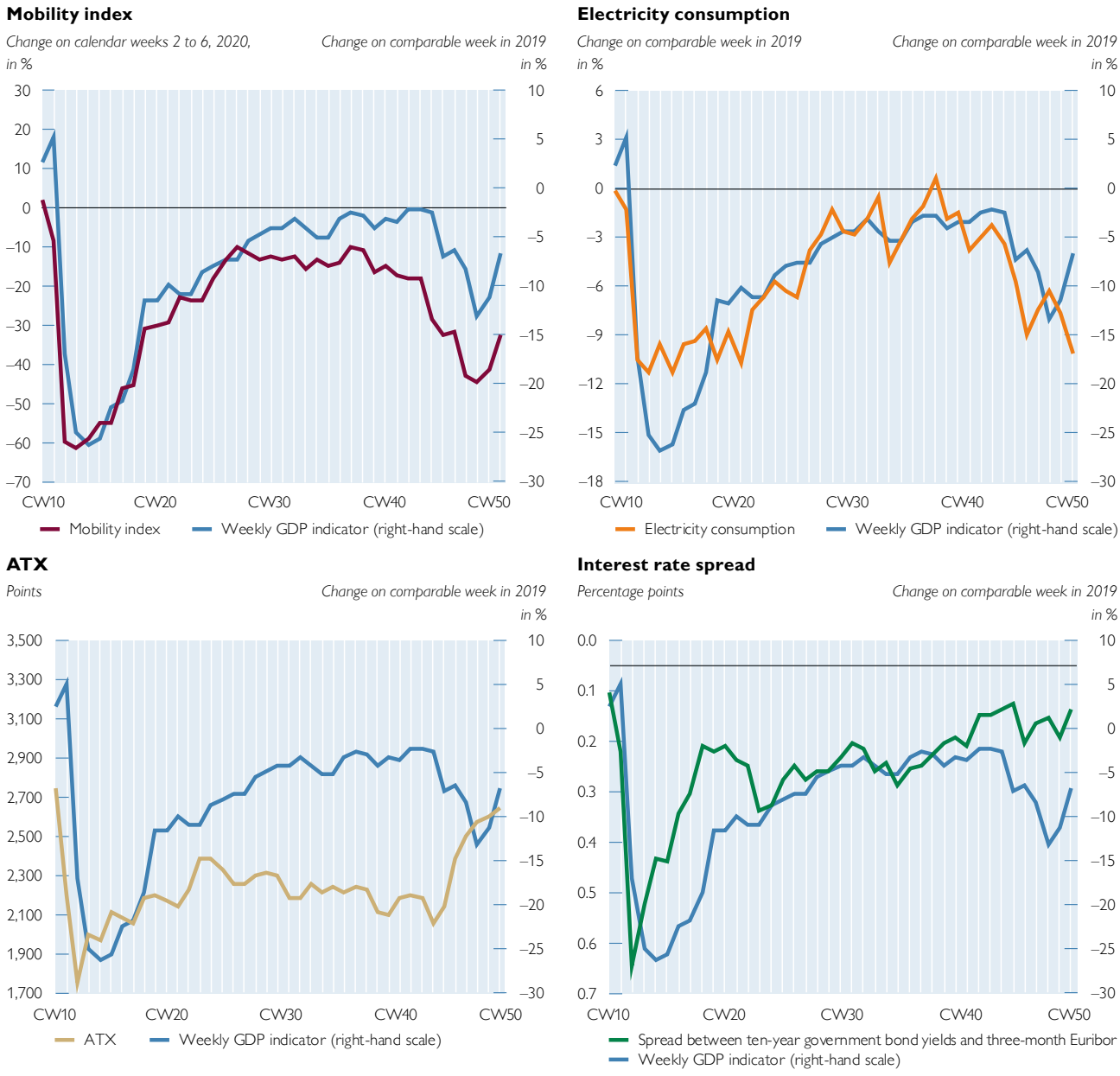
## 3 Plausibility and benchmarking checks

### 3.1 Plausibility checks with alternative real-time indicators

Some real-time indicators that are not directly included in the estimation of the weekly OeNB GDP indicator, such as data on electricity consumption, mobility behavior, short-term work and financial market variables, are used for plausibility checks. The Google mobility index (calculated as the average of the Google subindices "supermarket and pharmacy", "public transport", "workplaces",

Chart 6

## Plausibility checks




*Source: Bloomberg, Google, OeNB.*

"retail and recreation") and the OeNB's GDP indicator move almost completely in parallel. Even if the extraordinarily high correlation of 0.95 results from the specific features of the COVID-19 crisis and the government's containment measures, it nevertheless indicates that these new indicators will play an increasingly important role in economic monitoring in the future. The link to electricity consumption and financial indicators, on the other hand, is recognizable, but much less pronounced.

### 3.2 First benchmarking results are promising

After individual data announcements, such as overnight stays and production indices, confirmed results for some subcomponents of the weekly OeNB GDP indicator , it successfully passed its first real "elk test" when national accounts (NA) data for the second quarter of 2020 were released. The results of the latest release of NA data (published on September 28, 2020) show that Austrian GDP fell by 14.5% (real, seasonally and working-day adjusted) in the second quarter of 2020 compared to the same period in 2019, which is remarkably close to the estimate provided by the weekly OeNB GDP indicator of 14.4%. Regarding Austrian GDP in the third quarter of 2020, the first release of NA data (published on November 30, 2020) suggests that it was 4.2% lower than in the third quarter of 2019. Our estimate based on the weekly OeNB GDP indicator was a GDP growth rate of –4.4%.[23]

Table 2 shows that the estimates of the individual demand components (for the second quarter of 2020) were also quite accurate, albeit less so than the estimate for overall GDP. The deep slump in private consumption expenditure, notably, was predicted well (second quarter of 2020: –14.9% according to the weekly OeNB GDP indicator versus –15.8% according to the NA; third quarter: –4.3 versus –4.7%), which is reassuring given that we had to make many assumptions when constructing our consumption index. Our estimates for exports and investment, by contrast, deviate farther from the preliminary NA figures. In general, we

Table 2

**National accounts data for the second and third quarter of 2020**

**Second quarter of 2020**

| | OeNB GDP indicator (July 10, 2020) | New release of NA data (September 28, 2020) | First release of NA data (August 28, 2020) | NA flash estimate (July 30, 2020) |
|---|---|---|---|---|
| | *Change on comparable quarter of 2019* | | | |
| GDP | –14.4 | –14.5 | –12.9 | –13.3 |
| Private Consumption | –14.9 | –15.8 | –14.5 | –15.0 |
| Public Consumption | +1.5 | +1.1 | +1.6 | +1.6 |
| Investment | –14.2 | –10.9 | –10.5 | –10.3 |
| of which: construction | –12.0 | –8.1 | –9.6 | x |
| Exports | –24.6 | –17.5 | –19.7 | –18.1 |

**Third quarter of 2020**

| | OeNB GDP indicator (October 10, 2020) | | First release of NA data (November 30, 2020) | NA flash estimate (October 30, 2020) |
|---|---|---|---|---|
| | *Change on comparable quarter of 2019* | | | |
| GDP | –4.4 | | –4.2 | –5.3 |
| Private Consumption | –4.3 | | –4.7 | –5.5 |
| Public Consumption | +1.5 | | +0.4 | x |
| Investment | –6.3 | | –2.3 | –5.8 |
| of which: construction | –3.9 | | –1.8 | x |
| Exports | –8.3 | | –9.5 | –9.1 |

*Source: Statistics Austria, WIFO, OeNB.*

*Note: NA = national accounts, x = data not available.*

[23] *We compute quarterly growth rates by taking the average of the weekly growth rates of a given quarter, adjusting for endpoints if calendar weeks overlap with months.*

must note, however, that the assessment of the individual demand components is hampered by the significant negative contribution of the statistical discrepancy to GDP growth in the second quarter of 2020 (–2.3 percentage points) in the latest release of NA data.[24] Past experience indicates that this signals future revisions mainly of the investment and foreign trade components.

## 4 Summary and conclusions

Each crisis has its very specific and unique features, drivers and transmission channels. The COVID-19 crisis and the ensuing containment measures triggered simultaneous supply and demand shocks, had very heterogenous sectoral impacts and caused the economic downturn to proceed at an unprecedented speed. This extraordinary situation generated the need for real-time information on various economic sectors that is typically not provided by traditional nowcasting models or short-term forecasting models.

In response to this situation, we have developed an experimental weekly estimate of economic activity which focuses on seasonally adjusted year-on-year changes. The weekly OeNB GDP indicator, which has been published regularly since May 2020, has provided policymakers and the public with timely and reliable information on the state of the Austrian economy.

Our choice of an estimation approach was governed by the availability and characteristics of real-time indicators for the Austrian economy. As many indicators are directly linked to one specific demand component, we estimate economic activity via the expenditure side of GDP. Moreover, the experimental nature of many indicators and the fact that they cover only a short period of time made the application of traditional econometric methods impossible. We therefore opted for a data-driven approach rather than a more conventional model-based approach. Our approach requires a lot of qualitative assessments and adjustments, e.g. the treatment of moving holidays, working day adjustments or the identification of outliers in cash shipment data. These adjustments often require further analyses, in-depth expert discussions, etc. – all in all, an extra effort that would not be necessary when applying a purely model-based approach. Moreover, our data-driven approach relies on the availability of suitable high-frequency data and on some institutional peculiarities (e.g. with regard to cash logistics) which might limit its applicability to other countries (Matheson, 2013).

By publishing a weekly estimate of economic activity, we have entered new grounds. This always entails some risks. In particular, it was not possible to validate in advance the accuracy of the OeNB GDP indicator. Reassuringly, the indicator turned out to be very accurate in nowcasting aggregate quarterly economic activity for the second and third quarters of 2020 (while the performance of traditional models with regard to these two quarters was rather weak). But more observations are needed for a final assessment, and it remains to be seen whether the new indicator also performs in times when economic activity is closer to normal. The results for some subcomponents of the weekly OeNB GDP indicator, such as exports of goods or construction investment, can be assessed on a monthly basis

[24] *Growth contributions of the statistical discrepancy are assumed to be zero in the weekly OeNB GDP indicator. Moreover, the latest NA data also show that changes in inventories made a significant negative contribution to GDP growth (–1.3%). Changes in inventories are not explicitly modeled in the weekly OeNB GDP indicator and are assumed to be growth neutral.*

using foreign trade data or production indices.[25] Some additional validation arises from comparisons with high-frequency indicators from other institutions and for other countries. For example, our estimates of private consumption and of GDP during the first lockdown in spring 2020 are rather similar to those reported for France (INSEE, 2020), where comparable stay-at-home orders and other protective measures had been imposed. Our consumption estimates for the weeks of the first lockdown period are rather close to estimates by Brown et al. (2020) for Switzerland or by Bank of Israel (2020) for Israel. The evolution of our weekly GDP estimates over the post-lockdown period is rather similar to those of the Austrian Institute of Economic Research (Baumgartner et al., 2020), which are based on a time-series approach. While these are (promising) bits and pieces, clearly a more systematic and profound validation analysis will need to be carried out.

The seemingly high accuracy of the weekly OeNB GDP indicator vis-à-vis traditional nowcasting models raises the question whether it should be a regular tool in nowcasting GDP. The answer is "probably not." In normal times, traditional models have proven to be rather precise for nowcasting and short-term forecasting while high-frequency real-time data might only provide additional explanatory content in times of crises (Delle Chiaie and Perez Quiros, 2020). Thus, the presumably low marginal benefit in normal times needs to be weighed against the cost and effort of collecting and processing the necessary data on a weekly basis as well as carrying out the required qualitative assessments of the results. Clearly, more research will be necessary to assess the corresponding costs and benefits, taking into account the results of further validation analyses. While this is beyond the scope of this paper, our conjecture is that the main benefits from integrating real-time data into the existing model toolkit arise mainly from their contribution in times of larger economic downswings or outright crises.

In general, the economics profession has shown creativity and swiftness in utilizing real-time data to provide urgently needed empirical evidence. Our experience with alternative data on transport activity during the last crisis, the Great Recession of 2008/2009, led to the development of the OeNB's monthly Export Indicator. During the COVID-19 crisis, it has been mainly real-time data on payment transactions which have created new possibilities in analyzing consumption and tourism activities. We think that these new data will be informative also in normal times, e.g. for policy analyses such as the assessment of the economic impact of fiscal transfers (see Chetty et al., 2020; Baker et al., 2020) or the change in (online) consumption patterns (Brown et al., 2020). In times of steady digital innovation, ever more information will be available, also at the disaggregated level and for small geographical areas. Clearly, this will open up new possibilities to economic modeling and forecasting. Apart from economic expertise, the increasing availability of new data will require new forms of collaboration, e.g. with data scientists. Economic institutions that run models and conduct forecasts will need to adjust to this development.

[25] *At a conceptual level, it will never be possible to validate the weekly estimates as GDP is measured only at a quarterly frequency. However, further validation tests are possible for some economic indicators that are published monthly.*

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# Annex

Table A1

## Real time indicators on a daily or weekly basis

| | Frequency | Scope | Publication lag | Lenght of time series | Target variable | Use | Data source |
|---|---|---|---|---|---|---|---|
| **Labor market** | | | | | | | |
| Unemployed | d/w | Sectoral/ regional | < 1 week | < 1 year | General/sectoral economic developments | Plausibility check | AMS |
| Unemployed, sectoral | d/w | Sectoral/ regional | < 1 week | < 1 year | Construction investment | Estimation | AMS |
| Vacancies | d/w | Sectoral/ regional | < 1 week | < 1 year | General/sectoral economic developments | Plausibility check | AMS |
| Training sheme participants | d/w | Sectoral/ regional | < 1 week | < 1 year | General economic developments | Plausibility check | AMS |
| Short-term work | w | Sectoral/ regional | < 1 week | < 1 year | General/sectoral economic developments | Estimation | AMS |
| **Mobility** | | | | | | | |
| Mobile phone location data | d/w | Regional | < 1 week | < 1 year | General economoc developments | Plausibility check | Google, Apple |
| **Transportation** | | | | | | | |
| Truck milage | d/w | Regional | < 1 week | > 5 years | Exports, investment, general economic developments | Estimation | ASFINAG |
| Railway | w | Regional | < 1 week | > 5 years | General economic developments | Plausibility check | Austrian Federal Railways |
| Flight data | w | | < 1 week | > 5 years | General economic developments, tourism | Plausibility check | Vienna International Airport |
| **Payment transactions** | | | | | | | |
| Cash | d/w | | < 1 week | < 2 years | Private consumption, tourism | Estimation | OeNB, payment service providers |
| Debit cards | d/w | Sectoral | < 1 week | < 2 years | Private consumption, tourism | Estimation | Payment service providers |
| Credit cards | d/w | Sectoral | < 1 week | < 2 years | Private consumption, tourism | Estimation | Payment service providers |
| Online transfers | w | | < 1 week | < 2 years | Private consumption | Estimation | Payment service providers |
| Bank transfers | w | | < 1 week | < 2 ears | General economic developments | Not used | Payment service providers |
| **Financial market data** | | | | | | | |
| Stock price indices, yield curve, CDS, risk premia, etc. | d | | | > 5 years | General economic developments | Plausibility check | Various data providers |
| **Miscellaneous indicators** | | | | | | | |
| Electricity consumption | 15 min | Sectoral | < 1 week | > 5 years | Industrial sector | Plausibility check | APG, E-Control |
| Gas consumption | d | | < 1 week | > 5 years | Industrial sector | Not used | |
| Air pollution data | d | Regional | < 1 week | > 5 years | General economic developments | Plausibility check | Environment Agency Austria |
| Google trends, tweets, tag clouds | d | | < 1 week | > 5 years | General economic developments | Not used | Various data providers |
| Tax data and/or social security contributions | w/m | | < 1 week | > 5 years | General economic developments | Not used | Tax authorities |
| Webscraping | d | | < 1 week | < 1 year | General economic developments | Not used | |
| Internet activity | d | Regional | < 1 week | < 2 years | General economic developments | Not used | |

*Source: OeNB.*

*Note: d = daily; w = weekly; CDS = credit default swaps; AMS = Public Employment Service Austria; APG = Austrian Power Grid.*

Table A2

## Calendar weeks and corresponding calendar dates

| Calendar weeks in 2020 | | | |
|---|---|---|---|
| CW1 | December 30 | – | January 5 |
| CW2 | January 6 | – | January 12 |
| CW3 | January 13 | – | January 19 |
| CW4 | January 20 | – | January 26 |
| CW5 | January 27 | – | February 2 |
| CW6 | February 3 | – | February 9 |
| CW7 | February 10 | – | February 16 |
| CW8 | February 17 | – | February 23 |
| CW9 | February 24 | – | March 1 |
| CW10 | March 2 | – | March 8 |
| CW11 | March 9 | – | March 15 |
| CW12 | March 16 | – | March 22 |
| CW13 | March 23 | – | March 29 |
| CW14 | March 30 | – | April 5 |
| CW15 | April 6 | – | April 12 |
| CW16 | April 13 | – | April 19 |
| CW17 | April 20 | – | April 26 |
| CW18 | April 27 | – | May 3 |
| CW19 | May 4 | – | May 10 |
| CW20 | May 11 | – | May 17 |
| CW21 | May 18 | – | May 24 |
| CW22 | May 25 | – | May 31 |
| CW23 | June 1 | – | June 7 |
| CW24 | June 8 | – | June 14 |
| CW25 | June 15 | – | June 21 |
| CW26 | June 22 | – | June 28 |
| CW27 | June 29 | – | July 5 |
| CW28 | July 6 | – | July 12 |
| CW29 | July 13 | – | July 19 |
| CW30 | July 20 | – | July 26 |
| CW31 | July 27 | – | August 2 |
| CW32 | August 3 | – | August 9 |
| CW33 | August 10 | – | August 16 |
| CW34 | August 17 | – | August 23 |
| CW35 | August 24 | – | August 30 |
| CW36 | August 31 | – | September 6 |
| CW37 | September 7 | – | September 13 |
| CW38 | September 14 | – | September 20 |
| CW39 | September 21 | – | September 27 |
| CW40 | September 28 | – | October 4 |
| CW41 | October 5 | – | October 11 |
| CW42 | October 12 | – | October 18 |
| CW43 | October 19 | – | October 25 |
| CW44 | October 26 | – | November 1 |
| CW45 | November 2 | – | November 8 |
| CW46 | November 9 | – | November 15 |
| CW47 | November 16 | – | November 22 |
| CW48 | November 23 | – | November 29 |
| CW49 | November 30 | – | December 6 |
| CW50 | December 7 | – | December 13 |
| CW51 | December 14 | – | December 20 |
| CW52 | December 21 | – | December 27 |
| CW53 | December 28 | – | January 3 |