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Japan's Economy: Monthly Outlook (Aug 2021)

Economic outlook revised; spread of infection simulated based on status of vaccination and mutant strains

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Summary

- In light of the announcement of the Apr-Jun 2021 GDP 1st preliminary results, we have revised our economic outlook. We now see Japan's real GDP at +3.4% in FY2021, with FY2022 at +3.3%. According to our main economic scenario, around 80% of Japanese citizens will have completed their second dose of the vaccination against COVID-19 by the end of October. The pace of economic recovery is expected to pick up starting in the fall of 2021 when economic activity returns to normal.

- Downside risks to Japan's economy include the spread of the COVID-19 infection and the shortage of semiconductors, which places supply constraints on automobile production and purchasing of certain types of consumer electronic products, as well as the prolonged stagnation of exports. The negative impact of the high price of natural resources on corporate earnings and household income is also a concern. If terms of trade in August and beyond remain flat as they were in July, it is estimated that income outflow overseas from Japan in FY2021 could reach 22 tril yen. There are fears that a decline in income could place restraints on investment in capex and personal consumption.

- With uncertainty running high regarding the future of Japan's economy, trends will depend on the rate of vaccination and the status of mutant strains. If mutant strains of COVID-19 spread further, the fact that vaccines have half as much effectiveness against mutant strains means that the declaration of a fifth state of emergency at the beginning of CY2022 could become unavoidable. If that is the case, economic losses could reach around 3.7 tril yen, exceeding the amount recorded during the first state of emergency. Economic normalization, which has progressed up to this point centering on the advanced nations, could fall significantly behind, and there are fears that economic activity could remain stagnant until a vaccine which is effective against mutant strains of the disease are developed and dissemination progresses.

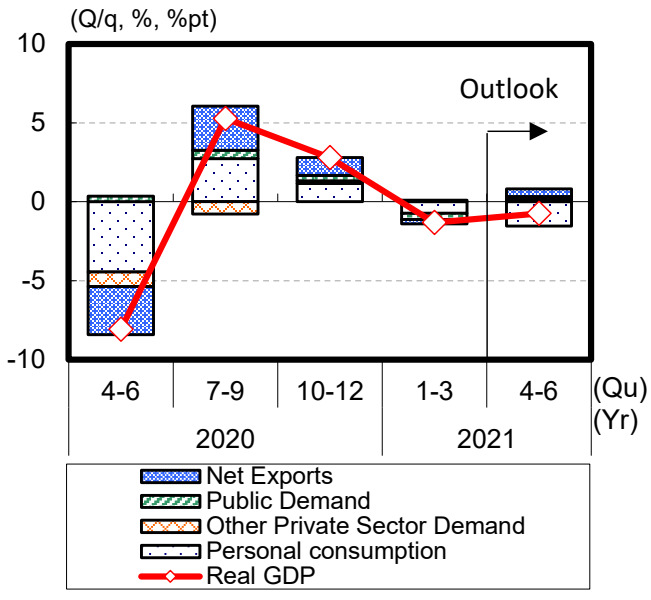
1. Economic Recovery Expected in Fall and beyond, but Uncertainty Regarding Japan's Economy Remains Strong

Jul-Sep period real GDP expected to achieve positive growth for second consecutive quarter

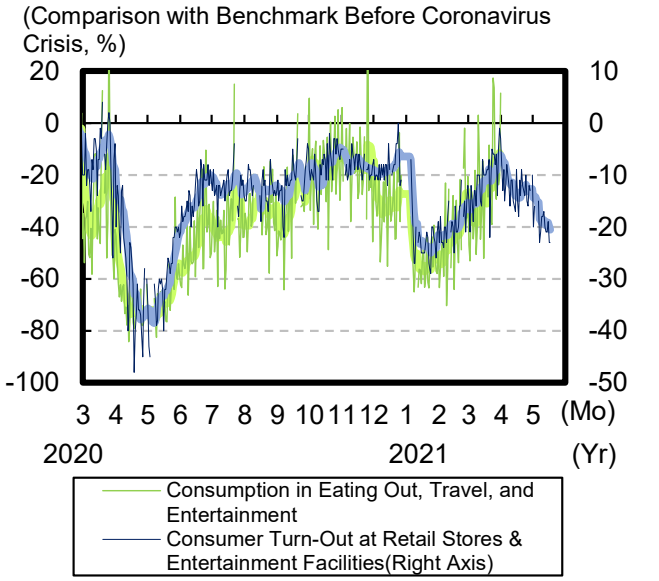
The real GDP growth rate for the Apr-Jun period of 2021 (1st preliminary est) grew by +1.3% q/q annualized (+0.3% q/q) (Chart 1)[1]. A declaration of a state of emergency was announced for the third time during the period due to the spread of COVID-19, but negative growth was avoided for the second consecutive quarter. Looking at results by component, as for the private sector, all categories recorded growth with the exception of private sector inventories. As for the public sector, government consumption grew, while public investment declined. As for overseas demand, both exports and imports grew, but since imports grew more than exports, the contribution of net exports was negative.

Looking at consumer turn-out at retailers and entertainment facilities according to Google Maps location information data, we can see that there is clearly a declining trend starting at the end of March just before the decision was made to apply the "Special Stricter Measures" in Osaka, Hyogo, and Miyagi prefectures. However, there was a shift into a recovery trend in mid-May (Chart 2). Reflecting this trend, consumption in the eating out, travel and entertainment categories exhibited a comeback from mid-May through the month of June. Consequently, services consumption marked up +1.5% q/q during the Apr-Jun period. Durable and semi-durable goods recorded growth. Personal consumption exceeded expectations and maintained underlying strength, suggesting the difficulty of declarations of state of emergency and "Special Stricter Measures" to change people's behavior. Evaluation of this trend, therefore, is not necessarily positive. Consumer turnout did not decline that much in July despite the fourth state of emergency having been declared in the Tokyo metropolitan area. Rates of infection reached record-breaking levels during this period due partly to the fact that the original strain of COVID-19 was being rapidly replaced by the highly infectious Delta variant.

Real GDP Growth Rate Results & Outlook **Chart 1**



Consumer Turn-Out and Consumption in Eating Out, Travel, and Entertainment **Chart 2**



Source: Cabinet Office, Ministry of Internal Affairs and Communications, Google, CEIC; compiled by DIR.
Note: The left side chart uses real figures, all seasonally adjusted. The benchmark used in the right side of the chart is the daily median between January 3 and February 6, 2020. The thick lines represent the 7-day central moving average. Eating out, travel, and entertainment related consumption is the total value of eating out, transportation, and culture & recreation services. Data from holidays falling on weekdays and the Obon Festival (8/10-14 2020) and year-end/New Year (12/28 2020-1/4 2021) are excluded.

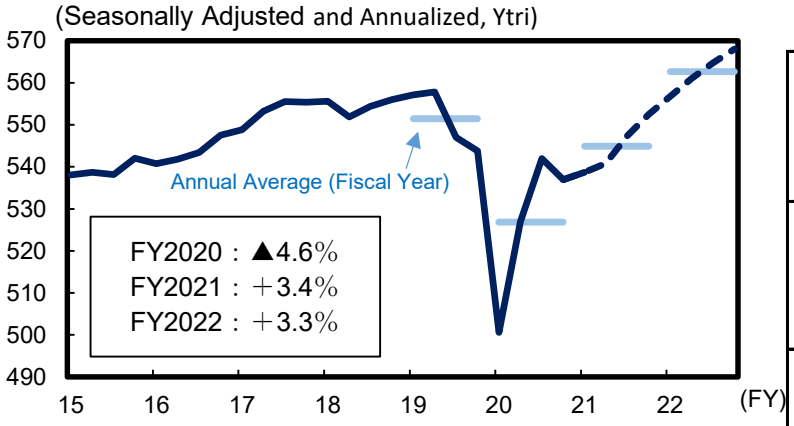
[1] See the DIR report by Keiji Kanda and Wakaba Kobayashi dated 16 August 2021, *Apr-Jun 2021 1st Preliminary GDP Estimate*.

The real GDP growth rate for the Jul-Sep period is expected to be at +1.6% q/q annualized (Chart 1). While personal consumption is expected to decline a bit, exports and capital expenditure, as well as government consumption are expected to give GDP a boost. Although real GDP is expected to achieve its second consecutive quarter of positive growth, its level is still on the low side, and is seen coming in below performance seen in the Oct-Dec period of 2020. The economy is expected to continue marking time centering on personal consumption until the recent spike in COVID-19 infections settles down.

Outlook for overseas economies in 2021: US revised downward, while Eurozone sees upward revision

Chart 3 shows real GDP according to our main economic scenario and assumptions behind our outlook for the overseas economies. Our outlook for overseas economies is based on the latest research performed by DIR's own in-house expert as of August 20, 2021.

Outlook for Japan's Real GDP and Assumptions Regarding Overseas Economies **Chart 3**



US, Europe & China Real GDP Growth Rate

US	2020 : ▲3.5% 2021 : ＋6.3% 2022 : ＋4.6%
Eurozone	2020 : ▲6.5% 2021 : ＋4.6% 2022 : ＋4.2%
China	2020 : ＋2.3% 2021 : ＋8.8% 2022 : ＋6.0%

Source: Produced by DIR based on data from Cabinet Office and various countries.
Note: The dotted line in the chart represents predicted values as estimated by DIR. Outlooks for the US, Europe and China are based on predictions by DIR's in-house expert.

The real GDP growth rate in 2021 is expected to be +6.3% in the US, +4.6% in the Eurozone, and +8.8% in China. As was the case for the outlook according to our previous report in May, the world's two major economies – the US and China – are expected to achieve a growth rate exceeding that of the global economy overall (+6.0% according to the IMF). However, in the case of the US, the growth rate has been revised downwards by 1.0%pt in comparison to the outlook in our previous report. This is because the real GDP growth rate fell below the outlook for the Apr-Jun period, while automobile sales declined due to supply constraints, and downward pressure was experienced by corporate activities and housing investment. Conversely, the outlook for the Eurozone's growth rate was revised upwards by 0.7%pt based on the fact that normalization of economic activities has progressed more than expected. Meanwhile, there was no change in the outlook for China's economy.

The real GDP growth rate in 2022 is expected to be +4.6% in the US, +4.2% in the Eurozone, and +6.0% in China. As for the US and the Eurozone, high growth exceeding that of the potential growth rate is expected to continue, while the outlook for China's economy sees a growth rate at around the level seen in 2019. The export environment is expected to continue its positive tone in 2022, which is good for Japan, and this should provide a tailwind for economic recovery.

GDP expected to exceed level recorded before spread of COVID-19 began by Oct-Dec period of 2021, but consumption will take until Jan-Mar period of 2022

Based on this outlook for the overseas economy, our main scenario sees Japan's real GDP growth rate in FY2021 at +3.4%, with +3.3% seen in FY2022 (Chart 3).

As was mentioned above, the real GDP growth rate for the Jul-Sep period is expected to be at +1.6% q/q annualized, which is positive growth but on the low side due to the effects of the state of emergency and "Special Stricter Measures." In the Oct-Dec period, when the vaccine will have likely reached all the people who want to be vaccinated, the options for economic activities that are compatible with preventing the spread of infection will expand, and consumption of services such as eating out, travel, and entertainment is expected to recover beginning in autumn. If the vaccination rate rises to about 80% by the end of October, real GDP in the Oct-Dec period is expected to exceed the level before the spread of the infection (Oct-Dec 2019). Japan is expected to recover at a slightly higher pace than Europe, with the Eurozone expected to exceed this level in the Jan-Mar period of 2022, and the UK in the Apr-Jun period of the same year.

However, looking at Japan's real GDP by component, we see that periods in which pre-pandemic levels are expected to be exceeded differ greatly depending on the component. Government consumption and public investment have already exceeded pre-pandemic levels, and exports are expected to do so by the Jul-Sep period of 2021, with capital investment following in the Oct-Dec period, at the same time as GDP. Personal consumption will lag behind these areas and exceed past performance by the Jan-Mar period of 2022. It is expected to be Jan-Mar 2023 before personal consumption reaches the levels recorded during the Jul-Sep period of 2019 just before the consumption tax was raised to 10%. In that sense, it should be noted that according to our main scenario, full-scale recovery of economic activity will be after FY2022, and recovery is expected to be more moderate than the level of real GDP suggests.

Three downside risks: spread of COVID-19, high price of natural resources, and prolonged shortage of semiconductors

The greatest downside risk faced by the Japanese economy is the continued spread of COVID-19 (details covered in Chapter 2). In addition, supply constraints due to the shortage in semiconductors could cause prolonged stagnation in the purchase and export of motor vehicles and some consumer electronics products.

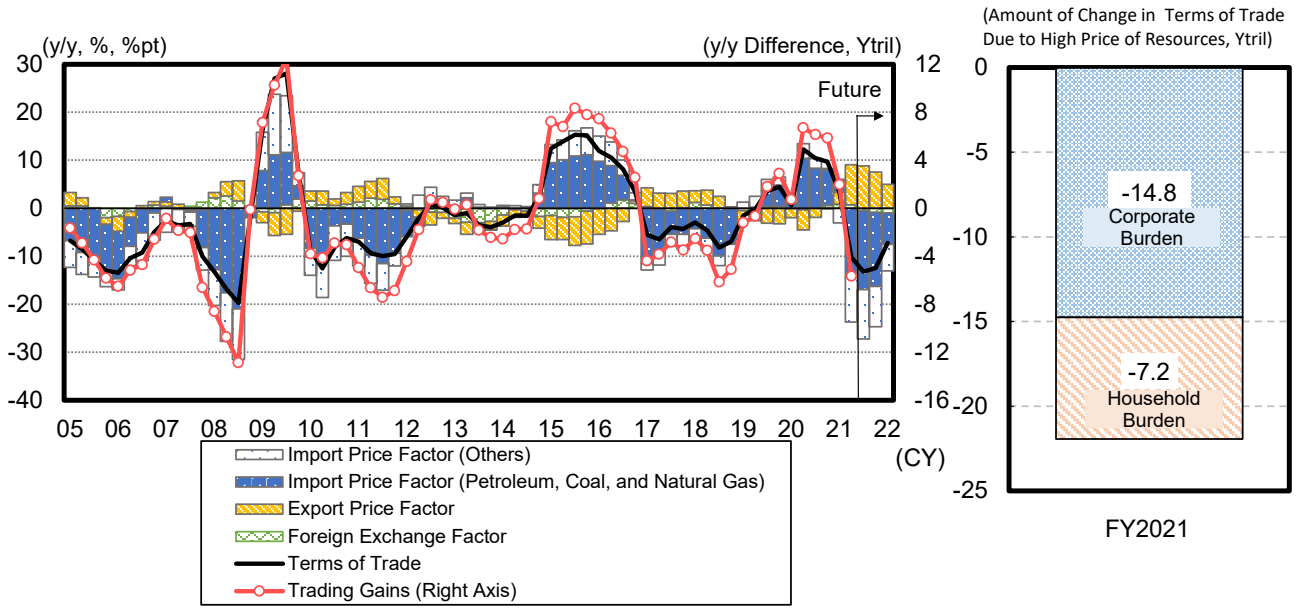
There are also concerns that the high price of natural resources could have a negative effect on corporate earnings and household income. In addition to crude oil, a broad range of commodities including non-ferrous metals such as copper and gold, grains such as corn and wheat, and lumber, are on the increase. Since Japan depends on imports for most of the natural resources it uses, when prices rise, it can easily lead to an increase in import prices. This can in turn lead to the deterioration of the terms of trade (export prices ÷ import prices), and indirectly bring downward pressure on GDP via the decline in trading gains (income outflow overseas).

The left side of Chart 4 is a factor analysis of terms of trade on a y/y basis since the year 2005. The chart examines three major factors: the foreign exchange factor, the export price factor, and the import price factor. The import price factor is broken down further into petroleum, coal and natural gas,which are especially susceptible to changes in these factors, and other commodities. According to this chart, the rise in import prices around 2005-2008, 2010-2011, and 2017-2018, led to the deterioration of terms of trade.

If terms of trade in August and beyond remain flat as they were in July, it is estimated that income outflow overseas (range of change in trading gains due to high price of resources) from Japan in FY2021 could reach 22 tril yen (Chart 4, right). If this happens, the burden will be carried by corporations and

households. If the extent of the burden experienced in 2002-2008 when the terms of trade deteriorated is mechanically applied to the current case, this would mean that corporations would carry a burden of approximately 15 tril yen, while households would suffer a burden of around 7 tril yen. There are fears that a decline in income could place restraints on investment in capex and personal consumption.

Factor Analysis of Terms of Trade & Trading Gains (Left), Income Outflow Overseas in FY2021 (Right) **Chart 4**



Source: Cabinet Office, Bank of Japan; compiled by DIR.
Notes: 1) The Import/Export Price Index was used in producing this factor analysis. The foreign exchange factor refers to the yen-based index and the contract currency-based index. The export/import price factors made use of the contract currency-based index. Future of all factors assumes continuation of marking time from July and beyond. Terms of trade are annualized.
2) The chart on the right assumes that terms of trade in August and beyond remain flat as they were in July, with share of income outflow at around the same extent as 2002-2008.

The actual burden suffered by corporations (households) could ultimately be less (more) than shown in the right side of Chart 4, since there will likely be growth in stay-at-home demand with the increase in COVID-19 infections, accompanied by an increase in consumer preference for high-priced food products (petit luxury), making it easier for corporations to pass on the rise in raw materials prices to retail prices. Given that household savings increased by nearly 40 tril yen in FY2020, households are expected to be able to absorb the increase in burden due to high resource prices, but it is also possible that the recovery of consumption in the area of services will slow down after the infection situation improves.

Outlook for personal consumption and exports, which Japan's economy depends on;

Personal consumption in the area of services expected to enter a recovery phase during the Oct-Dec period due to progress in vaccination

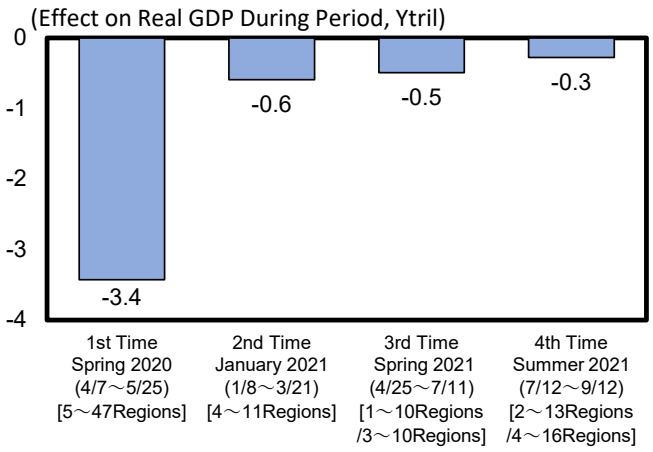
Recovery in personal consumption has been lagging due to the spread of COVID-19 due to the repeated declaration of states of emergency and application of "Special Stricter Measures." However, it has become clear since the announcement of the Apr-Jun 2021 GDP 1st preliminary results that personal consumption has exceeded expectations and maintained underlying strength. The growth rate during the Jan-Mar period when Japan's second state of emergency was declared was revised upwards to -1.0% (-1.5% before revision), and during the Apr-Jun period when the third state of emergency was declared, personal consumption actually grew by +0.8%.

The results of a recalculation of the effects of states of emergency on Japan's economy based on economic performance as described above are shown in Chart 5. In these new results, the monetary

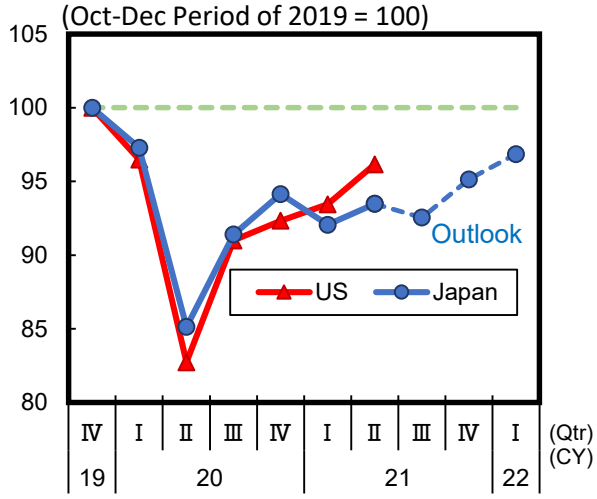
effects of the second and third states of emergency have been significantly reduced in comparison to the original estimate[2]. Results for the second state of emergency were around -0.6 tril yen (original estimate around -1.1 tril yen), and for the third around -0.5 tril yen (original estimate around -1.3 tril yen). When the latest estimate was performed using public statistics and Google Maps location information data available as of the writing of this report, effects of the current state of emergency lasting from July 12 to September 12 (4th time in the chart) were estimated to reach around -0.3 tril yen. Regions affected by the state of emergency, length of time in effect, and details of restrictions have differed each time. However, the effects on the economy have shrunk each time a new state of emergency has been called. This suggests that the effectiveness of states of emergency in changing people's behavior has declined.

The most recent spike in COVID-19 infections may not be brought under control by September 12. But on the other hand, vaccination is progressing quickly in comparison to other countries. In the advanced nations of Europe and the US which are ahead in vaccination rates, even in cases where new infections are increasing, the number of severely ill and the number of fatalities are maintaining a low level. If the pace of vaccination in Japan increases further, there will be that much more margin for the normalization of economic activities.

Economic Losses Due to States of Emergency **Chart 5**



Real Consumption of Services in the US **Chart 6**



Source: Bank of Japan, Cabinet Office, Ministry of Internal Affairs and Communications, Ministry of Economy, Trade and Industry, Google, CEIC, Haver Analytics; compiled by DIR.
Note: The chart on the left excludes effects of normally practiced voluntary self-restraint. The third state of emergency continued in Okinawa until Sept. 12. Third and fourth states of emergency include effects of "Special Stricter Measures". Number of regions affected during the third and fourth times include all regions where the state of emergency/ "Special Stricter Measures" were applicable.

In fact, the pace of recovery in real consumption of services in the US picked up during the Apr-Jun period (Chart 6). Accommodations and eating & drinking services recovered significantly, with the Jan-Mar period of 2021 up by 85% in comparison to the Oct-Dec period of 2019, and the Apr-Jun period of 2021 improving significantly by 97% in comparison with the same period. Meanwhile, entertainment and transportation were up by around 80% during the Apr-Jun period. Although the US has not regained its pre-corona daily routine, the environment surrounding service consumption has improved significantly compared to Japan. In light of this development, consumption of services in Japan is expected to shift into a recovery phase in the Oct-Dec period when the vaccine reaches all of the people who want to be vaccinated.

Although this is not one of the factors taken into consideration in our main scenario, if the COVID-19 situation improves significantly, the Go To Campaigns, which was temporarily suspended, could get

[2] The original estimate appeared in the DIR report dated 2021 June 22, *Japan's Economy: Monthly Outlook: June 2021*, by Keiji Kanda, Akane Yamaguchi, Wakaba Kobayashi, and Kazuma Kishikawa. (This report is in Japanese only.)

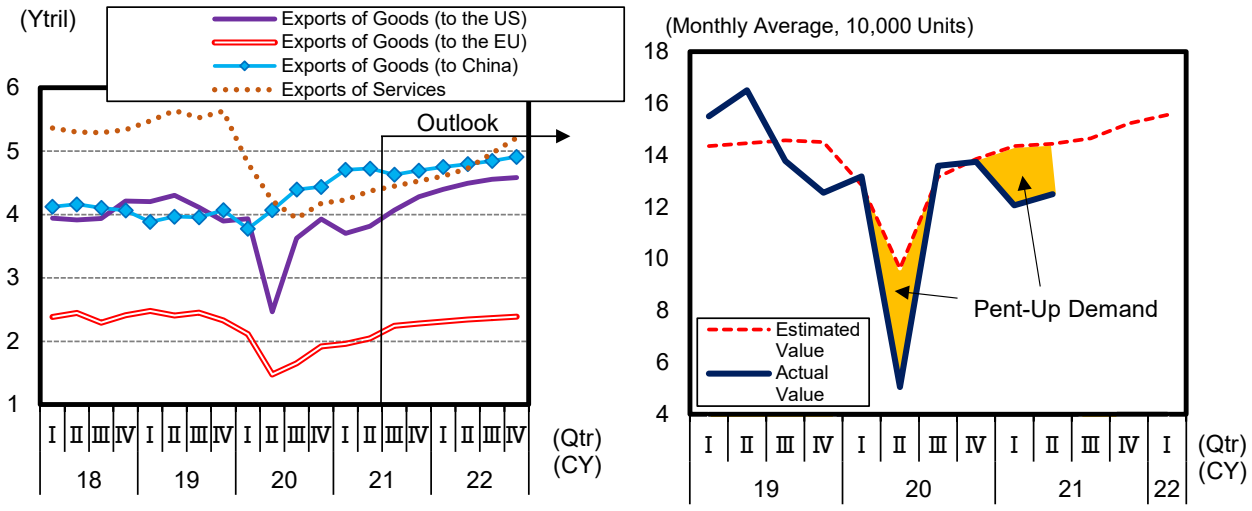
started again. However, it will likely be necessary to review the program and make changes such as gradual expansion of regions effected, use of different discount levels for weekdays and holidays, and including the requirement that vaccination be completed.

Exports of goods expected to achieve growth centering on Europe and the US, with services seen picking up in FY2022

Exports of goods are expected to continue growth centering on Europe and the US (Chart 7, left). Meanwhile, exports to China are also expected to grow, though at a more moderate pace. As demand gradually shifts from goods to services, the pace of growth in exports of goods will likely be moderate in comparison to pace of recovery in overseas economies. Inbound tourism consumption which disappeared in the spring of 2020 (reached nearly 5 tril yen in 2019, recorded as export of services) is expected to shift into a recovery phase in FY2022.

Looking at exports of goods by region, exports to the US are expected to continue to be favorable, centering on motor vehicles and parts of motor vehicles, with domestic demand expanding in that country due to progress in vaccinations and large-scale economic measures. During the first half of 2021 exports of motor vehicles were stagnant due to the shortage in semiconductors. This is considered to have been an opportunity loss, with demand shifting to the used car market. However, some of this is expected to be recovered in the form of pent-up demand which is seen to have accumulated (Chart 7, right), and as supply constraints are gradually resolved, exports of motor vehicles are expected to achieve growth lagging somewhat behind the economic recovery in the US.

Outlook for Japan's Real Exports (Left); Export Volume of Motor Vehicles to the US (Right) **Chart 7**



Source: Bank of Japan, Ministry of Finance, Ministry of Internal Affairs and Communications, National Bureau of Statistics of China, BEA, FRB, Autodata Corp., University of Michigan, Eurostat, Haver Analytics; compiled by DIR.

Note: Seasonal adjustment by DIR. Estimated figures of US motor vehicle sales volume on the right side of the chart were extrapolated from the growth rate in estimates of motor vehicle sales volume in the US. The period covered by our estimate of motor vehicle sales volume is from the Jan-Mar period of 1996 to the Oct-Dec period of 2019. The calculation used is shown below.
US motor vehicle sales volume (y/y basis) = 1.19 x US real compensation of employees (y/y) -2.26 x US real interest (y/y difference) +0.13 x US consumer sentiment (employment, y/y difference) -0.41 x US financial institution lending attitude
All coefficients have a significance of 1%. The coefficient of determination is 0.68.

Exports to Europe are seen picking up the pace of recovery during the second half of 2021. Most countries in the region are easing up on restrictions on movement and on entering the country in stages, with 70% of adults expected to have completed vaccination by the end of summer 2021. It appears that achieving the EU goal is in sight. Normalization of economic activity is progressing, and exports to the EU will likely be back on their feet by the Jul-Sep period. Exports are expected to continue favorably

after that point, with recovery to the level experienced before the pandemic anticipated around the middle of 2022.

As for exports to China, as the global economy recovers China's domestic production is activated, hence moderate growth is seen centering on intermediate goods and capital goods. At this time growth in China's retail sales and industrial production has been slowing down, hence it is possible that exports to China will mark time during the Jul-Sep period. In addition, it will be important to keep an eye on the effects of the government's tightening of investment in real estate development on demand for infrastructure investment. However, as has been mentioned previously, there is plenty of room for policy response in China, hence it is expected that China will maintain its recovery and that Japan's exports to China will generally maintain a growth trend.

2. Simulation: Delays in Vaccination and Infections from New Mutant Strains

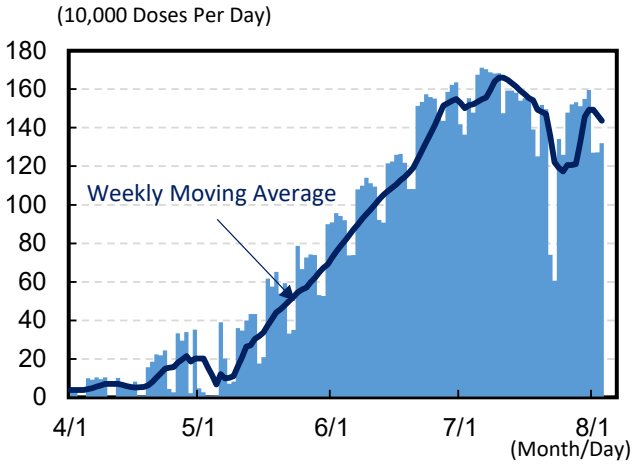
As the effectiveness of declaring states of emergency declines along with expectations that consumer turn-out can be successfully brought under control, hopes are being invested in vaccination efforts as the means of making major improvements in the COVID-19 situation. In this chapter, we provide an outlook for the COVID-19 situation which is consistent with our main scenario, while at the same time performing simulations based other assumptions, including the case where vaccination does not progress as expected, and the case where mutant strains of the disease spread which vaccines are less effective against.

According to the main scenario, approximately 80% of Japan's entire population will have completed vaccination by the end of October

Looking at the number of vaccinations in Japan, the government's initial target of 1 million doses per day was exceeded in early June, with vaccination accelerating to an average of about 1.6 million doses per day (1-week average) in early July (Chart 8). However, after that, due to supply restrictions, vaccination temporarily slowed down to about about 1.2 million doses per day (1-week average). Taking into account the fact that efforts are accelerating again, it is assumed that vaccination will continue at about 1.3 million doses per day (1-week average) in the main scenario of this forecast, and that about 80% of all people in Japan will complete vaccination by the end of October (Chart 10, left). This is the pace of vaccination according to the government's goal of "completing vaccination of all people who want it between October and November this year[3]."

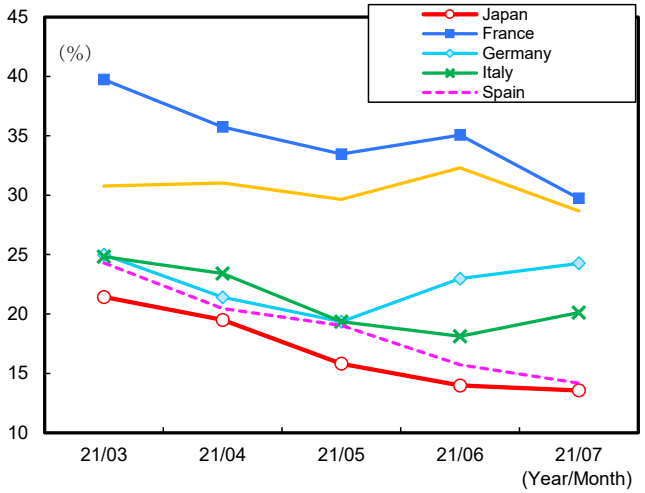
[3] Prime Minister's Office website "About the supply schedule of COVID-19 Vaccines" (Japanese only; translated by DIR.)

Number of Daily Vaccinations in Japan
Chart 8



Source: Ministry of Health, Labour, and Welfare, Prime Minister's Office; compiled by DIR.
Note: Data from most recent two weeks has been excluded, as it tends to be revised after initial reporting.

Percentage of People Who Do Not Want to Be Vaccinated
Chart 9



Source: The University of Oxford "Our World in Data"; compiled by DIR.

Chart 9 shows the results of a survey carried out by Imperial College London in various countries focusing on persons aged 18 and older (results were compiled by the University of Oxford). In comparing the number of people in Japan, Europe and the US who answered "unvaccinated and do not wish to be vaccinated," it was found that as of July, Japan was at 14%, a lower figure than the other countries surveyed[4]. (As of June, this figure is no longer being made public in the UK and Canada, hence data on those two countries are not shown.) In a domestic survey carried out in Japan, it was found that around 10% of the total surveyed did not wish to be vaccinated[5].

The percentage of people in Japan, Europe and the US who do not wish to be vaccinated is considered to have declined between spring and summer. Behind this development lies the fact that progress in vaccination has led to the accumulation of knowledge about its effectiveness and adverse events, and a sense of security has spread. Meanwhile, the situation has worsened and infections have increased due to the spread of mutant variants such as the Delta variant, and the number of people who want to get vaccinated in order to avoid a serious case of the disease has increased. In Japan also, where the infection situation has rapidly grown more serious since late July, the number of people who want to be vaccinated appears to be increasing.

According to the July survey carried out by Imperial College London, 15% of the respondents in Japan answered that they had not yet made up their minds about the vaccine. There are many people who are hesitant regarding vaccination because of the fear of adverse events or general uneasiness not only in Japan but in other countries as well. In order to realize our main scenario's expectation that 80% of Japan's entire population will have completed vaccination by the end of October, these undecided people will have to be convinced to be more positive about vaccination.

[4] The survey provided four answers to choose from: Vaccinated (at least 1st dose), Unvaccinated but wish to be vaccinated, Unvaccinated and still thinking about whether to get vaccinated, and Unvaccinated and do not wish to be vaccinated.
[5] According to a questionnaire with 600 respondents conducted by Architect Co., Ltd. in four prefectures on July 22-24, 8% will not get vaccinated and 12% said that they can't decide whether to get vaccinated. According to a questionnaire conducted by Niigata City on July 9-16 (7,268 respondents), 8% answered that they did not want to get vaccinated, while 3% answered that they have not decided yet.

Main scenario sees normalization of economic activity progressing while gradually holding down spread of COVID-19

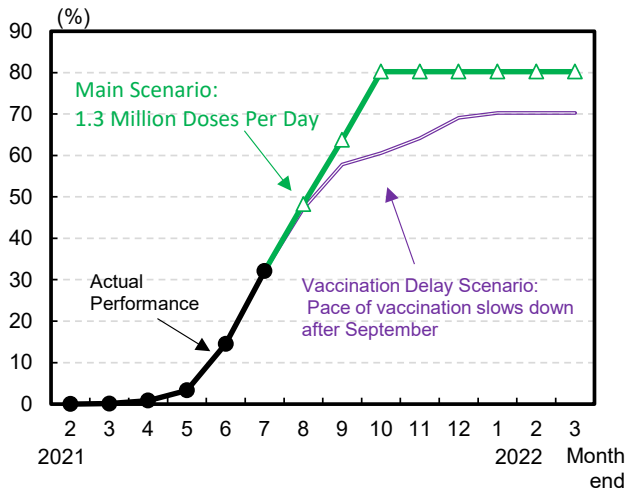
Our main scenario assumes that the current state of emergency and special stricter measures set to last until September 12 will be extended until the end of September. After the state of emergency is lifted it is possible that special stricter measures will remain in place for some time depending on the situation. During this time, the main scenario assumes that turn-out at retail outlets and entertainment facilities in the Tokyo metropolitan area is expected to remain flat in comparison to recent levels, growing in stages during October and beyond until reaching pre-pandemic levels by the end of the year (Chart 10, Right).

The left side of Chart 11 presents the results of our simulation of the number of new infections in Tokyo. Here we referred to research results published by the Public Health England, in which is assumed that the vaccine's infection prevention effect on the Delta strain is 90%, while its ability to prevent serious cases of the disease is 95%. However, in Israel it has been reported that the effectiveness is much lower than this, and that the effectiveness decreases after a certain period of time. Therefore, it is necessary to take the results of this simulation with a certain grain of salt.

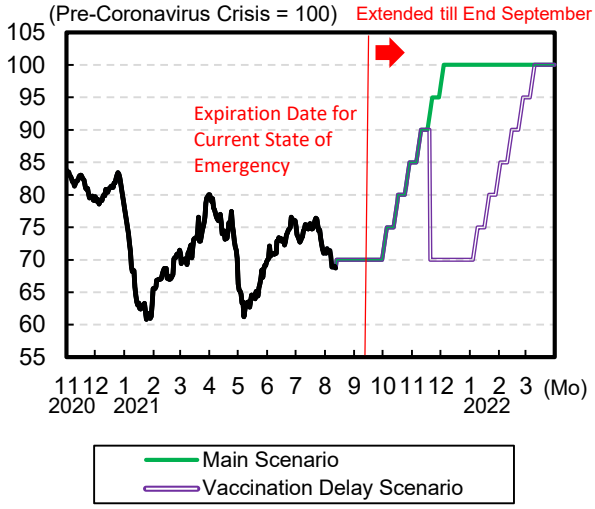
The number of new infections per day in Tokyo is expected to peak by the end of August, and then gradually decline. By the end of September, it is expected to be at 2,000 per day. Hence, in light of levels seen when past states of emergency were lifted, it is likely that additional measures will be required, such as "Special Stricter Measures." With progress in vaccination, the declining trend in the number of new infections is expected to continue through October, when it is assumed that consumer turn-out will increase, and beyond. At the beginning of November, the number of infections per day is expected to fall below 300. At that point it will become easier to uphold economic activity and measures to prevent the spread of COVID-19 at the same time, and the trend toward economic recovery is expected to strengthen. On the other hand, the number of severe cases of the disease[6], which were at 210 per day (on a 7-day moving average, as of August 20th) just recently are expected to lag somewhat behind, with the number of new infections per day and peak around the middle of September. Looking at the numbers by age group we see that the percentage of persons under the age of 60, in which vaccination is not progressing, account for over 90% of new infections. The cumulative number of new infections during the second half of FY2021 is expected to reach around 120,000 (the first half was at 1.7 million). Meanwhile, the number of deaths during the same period is expected to reach 85 (12,000 during the first half) based on the current case fatality rate.

[6] The definition of a severe case is based on standards set by the Tokyo Metropolitan government.

Vaccination Rate (Left), and Turn-Out at Retail Stores and Entertainment Facilities (Tokyo Metropolitan Area, Right) Chart 10

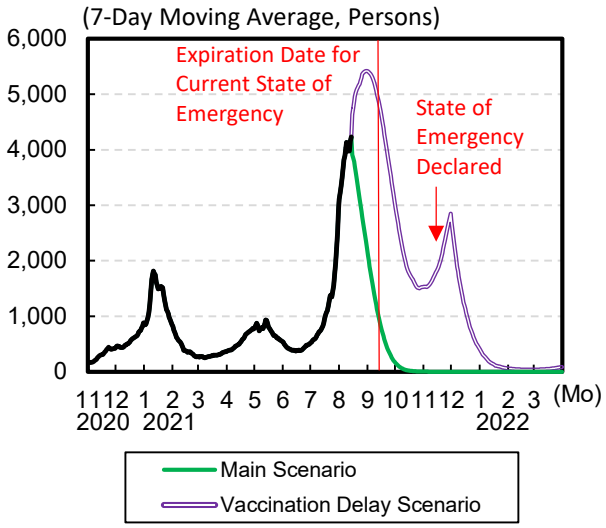


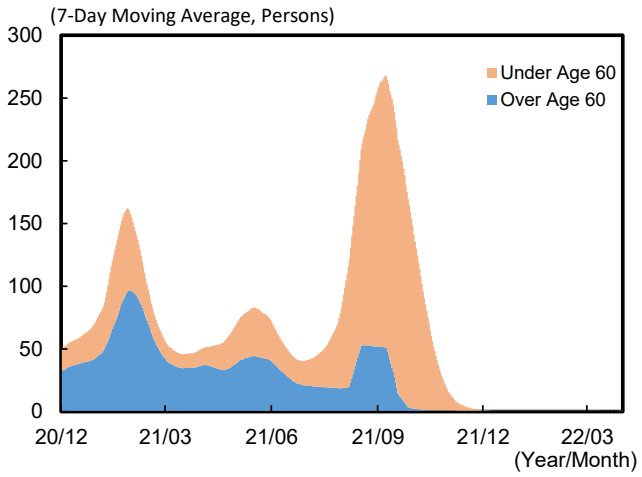
Source: Ministry of Health, Labour and Welfare, Prime Minister's Office; compiled by DIR.
Note: The vaccination delay scenario assumes that the pace of vaccination will gradually slow down in September and beyond, reaching 20,000 doses per day in October and beyond.



Source: Google; compiled by DIR.
Note: The benchmark for turn-out at retail stores and entertainment facilities is the median value per day of the week between January 3 and February 6, 2020. Data from holidays occurring on weekdays and year-end/Japanese New Year (December 28, 2020 to January 4, 2021) are not included.

Number of New Infections in Tokyo by Scenario (Left), and Outlook for Severe Cases (Main Scenario, Right) **Chart 11**





Source: Ministry of Health, Labour and Welfare, Google, CEIC, Japan Meteorological Agency, Cabinet Office; compiled by DIR.
Notes: 1) The number of new infections was calculated after estimating effective reproduction number. We use a simple equation introduced by Toyo Keizai Inc. for effective reproduction number (Supervised by Professor Hiroshi Nishiura, Kyoto University Graduate School of Medicine):
Effective reproduction number = (number of new positives during last 7-days/number of new positives during the previous 7-days) ^ (mean generation time 5-days/ report interval 7-days).
The equation for estimating the effective reproduction number is as follows. We used daily temperature from the previous year for the temperature data portion of the estimate:
log (effective reproduction number/(1 – vaccination completion rate (-7) * 0.9)) = 1.70 x log (turn-out at retail stores and entertainment facilities (-14)) – 0.05 x log (average temperature (-14)) + 0.002 x (fixed dummy variable) – 7.21 The estimation period was between September 1, 2020 and August 6, 2021. Variable and constant terms all had significance of 1%. The coefficient of determination was 0.79.
2) Our estimate assumes vaccination occurs twice, and that 90% of twice vaccinated people, will show no possibility of infection within seven-days after completing vaccination. The mutant variant dummy takes into consideration the infectious capacity of the alpha variant and the delta variant. Replacement by the delta variant is assumed to have progressed through mid-August.
3) The number of severe cases is estimated by considering the vaccination rate to the cumulative number of newly infected persons over 60 years old and under 60 years old, which is the average length of hospital stay for each severely ill person for 20 days. The estimation formula is as follows. Number of severely ill persons = 0.016 × Cumulative number of newly infected persons over the age of 60 in the past 20 days × (1-Vaccination rate) × 0.95 + 0.003 × Cumulative number of newly infected persons under the age of 60 in the past 20 days × (1-Vaccination rate) x 0.95 + 13.7.
The period covered by this estimate is September 1, 2020 to August 6, 2021. Variable and constant terms all had significance of 1%, and the coefficient of determination was 0.93. The definition of a severe case is based on standards set by the Tokyo Metropolitan government.

A fifth state of emergency could be declared if vaccination lags behind main scenario's estimates

What will happen with the infection situation if vaccination efforts fail to progress according to the main scenario's assumptions? Here, it is assumed that the vaccination pace gradually slows down from September, and the vaccination completion rate reaches a plateau at 70% in January 2022 ("Vaccination Delay Scenario" on the left of Chart 10).

Based on these assumptions, the change in the number of new infections per day from the present to the end of September is almost the same as the main scenario. However, it starts to rise in comparison to the main scenario in mid-October, and then increases in early November (Chart 11, left). In mid-November, the declaration of a fifth state of emergency will become unavoidable, and in order to curb the spread of infection, consumer turn-out will have to be kept under control for about two months as it was at the time of the fourth declaration.

Economic losses according to this scenario are relatively small at around 0.2 tril yen, but the recovery period for service consumption will be delayed. In addition, the number of new infections in the second half of 2021 is expected to reach about 600,000 (about +480,000 compared to the main scenario), and the number of deaths is expected to reach 416 (+331). In order to avoid such a situation, the government should prepare measures to maintain the vaccination pace while referring to foreign precedents.

Vigilance must be maintained regarding the appearance of new variant strains

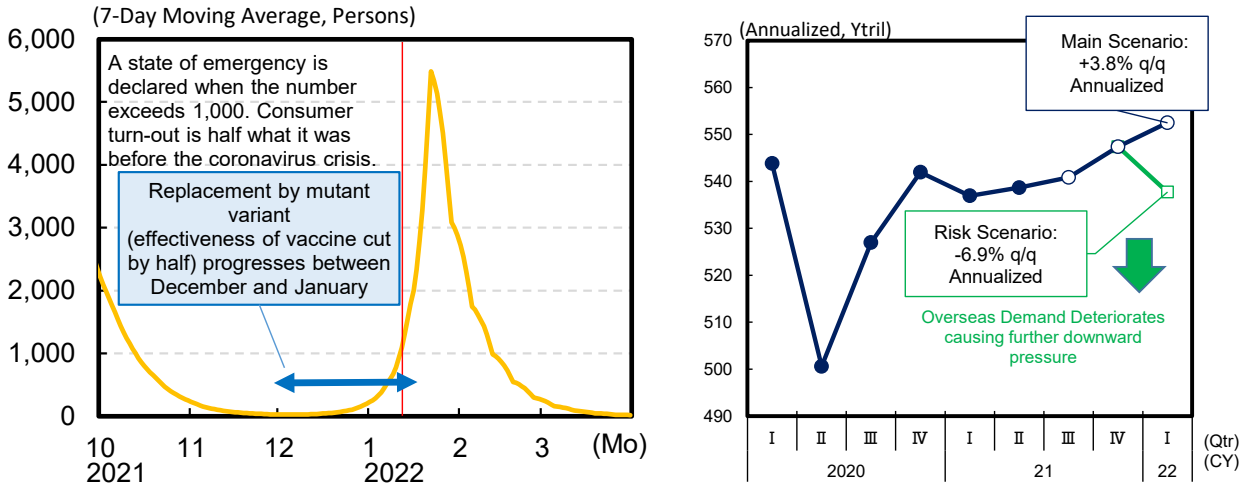
Vaccination is progressing in the advanced nations, which are now moving toward full-scale resumption of economic activities, but vaccination rates in the emerging nations are still low. According to the University of Oxford database, only 1.3% of people in low-income countries had received at least one dose of the vaccination as of August 18 (32% worldwide). In addition to the Delta variant, the Lambda variant is currently rampant in South America. It is quite possible that another new mutant strain will emerge before the vaccine becomes widespread in the emerging nations, and that it will spread to advanced nations such as Japan as well.

Therefore, we have provided a risk scenario in which a mutant strain appears, against which the effectiveness of the vaccine is halved (Chart 12, the vaccination pace is the same as in the main scenario). Lambda strains, which have also been detected in Japan, may be candidates for this scenario. As replacement with new mutant strains progresses from December 2021 to mid-January 2022, the level of infectiousness in the city will increase, and the number of new infections per day will increase sharply from early January. The government will then be forced to issue a fifth state of emergency in mid-January. In addition, the number of new infections will explode, so if the number of consumer turn-out does not decrease by half during the state of emergency as compared to before the coronavirus crisis, it will have to be extended beyond April.

As a result, FY2021 real GDP would be expected to decline to +2.8% y/y, while the monetary value to losses would rise to around -3.7 tril yen. This is a scale which exceeds that of the first state of emergency when losses were -3.4 tril yen (see Chart 5). If infections spread overseas as well, the deterioration of overseas demand could cause a further decline in Japan's growth rate. The normalization of economic activities which have progressed up to this point centering on the advanced nations would unavoidably fall behind. Economic activity would then be in danger of stagnating until new vaccines effective against variant strains of COVID-19 could be developed and disseminated. According to the risk scenario, the number of new infections would reach around 500,000 during the second half of FY2021 (around +380,000 in comparison to the main scenario), with the number of deaths at 348 (+263).

When the Alpha and Delta variants began to spread overseas, the virus flowed into the country and the infection spread in local communities despite the strengthening of border measures in Japan. When a new mutant strain appears overseas in the future, it will first be necessary to take thorough border measures such as prolonging the isolation period at the time of entry in order to prevent the variant from being brought into Japan. In addition, a review of the system to enhance the effectiveness of measures to prevent the spread of infection should also be considered, including legislation to strengthen individual behavior restrictions so that if a new mutant strain begins to spread in the city, consumer turn-out can be brought under control at an early stage.

Risk Scenario: Number of New Infections in Tokyo (Left), and Outlook for Real GDP (Right) Chart 12



Source: Cabinet Office, Ministry of Health, Labour and Welfare, Google, CEIC, Japan Meteorological Agency; compiled by DIR.
Note: Estimates for number of new infections are the same as in Chart 11.

Japan's Economic Outlook No. 210 (August 20, 2021) Chart 13

		2020			2021				2022				2023	FY2020	FY2021	FY2022
		Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar			
Real GDP	Q/q %; annualized	-28.2	22.8	11.9	-3.7	1.3	1.6	4.9	3.8	3.1	3.1	2.7	2.3			
	Y/y	-10.1	-5.6	-1.0	-1.3	7.5	2.6	1.0	2.9	3.4	3.7	3.2	2.8	-4.5	3.4	3.3
Private spending	Q/q %; annualized	-29.2	22.1	9.4	-4.0	3.4	-1.1	6.8	4.4	3.4	2.6	2.4	2.4	-5.9	3.3	3.4
Private housing investment	Q/q %; annualized	2.3	-21.0	0.1	3.8	8.6	0.7	2.2	2.2	2.0	1.8	1.6	1.6	-7.2	1.9	1.9
Capex	Q/q %; annualized	-21.9	-8.0	18.3	-4.9	7.0	5.5	6.6	5.7	4.1	3.8	3.2	2.8	-6.8	4.6	4.5
Government final consumption	Q/q %; annualized	2.7	11.5	7.6	-6.7	2.0	1.2	0.4	-0.4	-0.2	0.5	0.2	0.2	3.3	1.0	0.1
Public investment	Q/q %; annualized	12.3	2.6	4.0	-4.0	-5.7	4.8	3.9	1.1	0.2	0.2	0.2	0.2	4.2	-0.2	1.0
Exports	Q/q %; annualized	-53.8	32.6	55.8	9.8	12.3	4.5	6.3	5.6	5.8	7.3	7.0	4.8	-10.4	14.4	6.1
Imports	Q/q %; annualized	-2.6	-29.0	20.8	16.8	21.9	2.4	5.0	4.4	3.6	3.7	3.1	2.6	-6.8	9.9	3.7
Nominal GDP	Q/q %; annualized	-27.1	23.6	9.7	-4.0	0.2	2.1	5.5	4.1	3.8	3.4	3.1	2.6	-3.9	3.1	3.7
GDP deflator	Y/y	1.4	1.2	0.2	-0.1	-0.7	-0.7	-0.1	0.1	0.5	0.4	0.4	0.4	0.6	-0.4	0.4
Industrial production	Q/q	-16.8	9.0	5.7	2.8	1.2	1.2	4.0	2.7	1.8	1.1	0.8	0.6	-9.5	12.3	7.7
Core CPI	Y/y	-0.1	-0.3	-0.9	-0.5	-0.6	-0.0	0.2	-0.3	0.6	0.6	0.6	0.8	-0.5	-0.2	0.6
Unemployment rate	%	2.7	3.0	3.0	2.8	2.9	2.9	2.8	2.8	2.7	2.6	2.5	2.4	2.9	2.9	2.6
Trade balance (goods, services)	Y tril; annualized	-5.9	4.9	9.7	5.7	3.9	4.8	5.0	5.1	5.6	6.5	7.3	7.8	3.9	4.7	6.8
Current account balance	Y tril; annualized	8.7	16.4	25.6	20.5	20.8	20.8	21.4	21.6	22.2	23.0	24.1	24.7	18.3	21.7	24.0
Major assumptions																
Crude oil price (WTI futures)	$/bbl	28.0	40.9	42.7	58.1	66.2	68.3	65.5	65.5	65.5	65.5	65.5	65.5	42.4	66.4	65.5
Exchange rate	Yen/$	107.6	106.1	104.5	105.9	109.4	109.9	109.8	109.8	109.8	109.8	109.8	109.8	106.0	109.7	109.8

Source: Compiled by DIR.
Note: GDP through Jan-Jun 2021: actual; thereafter: DIR estimates.