Mizuho Economic Outlook & Analysis

December 29, 2020

Sustainability of the US dollar weakness against the Japanese yen

Future yen strengthening pressures are limited based upon current fundamentals

< Summary >

◆ After the serious disruption caused by the Covid-19 shock began to ease in April, the US Dollar (USD) weakened to a greater extent than the Japanese Yen (JPY) amid the risk-on market sentiment under a low interest rate/high stock price environment driven by an unprecedentedly loose monetary policy. As a result, the JPY gradually appreciated in the USD/JPY foreign exchange market. With a view to verifying the risk of further JPY appreciation, we estimated the equilibrium exchange rate of the JPY versus the USD as of September 2020 based on the fundamentals by referring to an earlier study. The outcome was about 103 yen, diverging slightly into overvaluation compared to the market rate in September.

◆ Nonetheless, given the accelerating USD depreciation trend under the risk-on environment after November, the divergence seems to have been eliminated. Furthermore, given changes in the fundamentals, the future USD/JPY equilibrium rate is expected to move toward a gradual USD strengthening/JPY weakening trend, suggesting there is little possibility of

further JPY appreciation pressure. While we cannot dismiss the Japanese yen strengthening to under 100 yen affected by short-term factors such as market sentiment, this scenario is thought to be temporary as the market rate is expected to return to the equilibrium rate over time.

◆ The USD/JPY equilibrium rate will fluctuate along with changes in the fundamentals and the situation of the coronavirus pandemic. It is essential that we regularly monitor the fundamentals to keep track these changes.

Mizuho Research Institute Ltd.
Rino Onodera, Economist
Research Department - Financial Market
Mizuho Research Institute Ltd.
rino.onodera@mizuho-ri.co.jp
Kentaro Arita, Senior Economist
Research Department - Financial Market
Mizuho Research Institute Ltd.
kentaro.arita@mizuho-ri.co.jp

Introduction – the Japanese yen gradually strengthened in 2020

The US Dollar (USD) to Japanese Yen (JPY) exchange rate fluctuated widely at the beginning of 2020 with the outbreak of the coronavirus pandemic. As the spread of infections in the United States and Europe heightened the risk aversion appetite, the JPY to the USD strengthened to 101.19 yen (3/9) for the first time in three years and three months. However, as companies rushed to secure as much funds-on-hand as possible, driven by the spreading coronavirus, the USD soared, and the JPY to the USD plunged to 111.71 yen (3/24), marking a depreciation of about 10 yen. The disruption caused by the pandemic invited panic in the USD/JPY exchange market for the first time in many years, as the market had been stable with little volatility in recent years.[1]

Additional interest rate cuts by the FRB (the Federal Reserve Board) and the conclusion of dollar swap arrangements with the central banks of emerging countries, among other measures, caused the USD/JPY exchange market to gradually regain its calm. As the central banks of various countries suggested that the historically low interest rate environment be maintained, money flowed into risk assets such as stocks and emerging currencies, and the financial markets were dominated by a risk-on sentiment. Under these circumstances, the USD and JPY, a currency pair generally viewed as relatively safe, were sold. But as the FRB continued to loosen its monetary policy even further after the Covid-19 shock by strengthening its forward guidance and emphasizing the possibility of additional monetary easing, USD selling accelerated to a greater extent than JPY selling, leading to the slow appreciation of the JPY relative to the USD.

The JPY appreciation trend still continued at the end of 2020 (as of the writing of this report on December 28). Although the outcome of the US presidential election, which had long been a focus of attention, ended with Joe Biden's election, the US Congress was equally divided between Republicans and Democrats, and the expectation of the "triple-blue scenario" where the Democrats win the White House, the Senate, and the House faded away. As a result, the US long-term interest rates that had continued to rise on the expectation of a large-scale fiscal stimulus package started to fall. Also, as concerns over the tightening of regulations on high-tech firms receded, stock prices began to soar instead of falling with the loss of fiscal stimulus expectations, and this gave rise to a risk-on sentiment in the market. Rising expectations for the practical application of a coronavirus vaccine after November also contributed to the risk-on trend. Although the risk-on sentiment usually invites JPY selling, the aforementioned factors accelerated USD selling to a level that surpassed JPY selling, and as a result, the JPY strengthened to the 103-yen

[1] If we calculate the change in exchange rate using the lowest and highest rates of each year, the outcome is 9.99 yen for 2018 and 7.94 yen for 2019, implying that the change in exchange rate was less than 10 yen for the two recent years.

level toward the end of the year for the first time since the Covid-19 shock.

On the other hand, according to the Bank of Japan's Short-term Economic Survey of Principal Enterprises in Japan (Tankan) (December survey), the predicted USD/JPY exchange rate by manufacturing companies (export companies) for FY2020 was 106.75 yen for large manufacturers, which was relatively undervalued compared to the market rate in December, suggesting that firms were expecting the exchange rate to remain relatively weak. The "Annual Survey of Corporate Behavior" compiled by the Cabinet Office in FY2019 revealed that the break-even yen-dollar rate of export companies (average of all industries) was 100.2 yen for listed firms. The yen continuing to appreciate above the break-even yen-dollar rate level, contrary to the expectation of exporting companies, runs the risk of further eroding the profitability of Japanese exporters already hurt by the pandemic.

The next question is whether the yen will continue appreciating in the USD/JPY exchange market. To answer to this question, it is important to capture the equilibrium exchange rate based on the real economy (fundamentals). Daily exchange rates fluctuate affected by various factors including political events, key persons' remarks, and subsequent market speculation. But the volatility of exchange rates fueled by such rapidly changing factors is generally offset over the long course of trading, and exchange rates will eventually converge at a level based on each country's fundamentals.

There are various ways to compute the equilibrium exchange rate. The most standard method is purchasing power parity, a rate of currency conversion that equalizes the price level of two different countries. Purchasing power parity between the US and Japan indicates the two following points. The first implication is that market rates basically fluctuate within a certain range, with the upper limit being the consumer price-based rate and the lower limit being the export price-based rate. The second is that the equilibrium rate derived by purchasing power parity is considered to be moving toward yen appreciation for both rates calculated using the two price indicators.

Yet the idea of purchasing power parity has certain limits. Strictly speaking, "the law of one price," an underlying assumption of purchasing power parity, is not feasible in the real world. To begin with, all goods and services that constitute prices are never of the same quality in two different countries, and the presence of trade barriers such as custom tariffs makes it impossible to converge prices completely through arbitrage transactions. Furthermore, some services including medical services are not easily exposed to international competition, and as their prices are mostly determined domestically, it is difficult to imagine the prices of two different countries converging at the same level. Also, foreign exchange rates are determined not only by prices but also by such factors as economic relations between the two nations, foreign transactions, different monetary

policies, and the status of currency transactions with a third country. The impact of such factors cannot be understood by exchange rates calculated based on purchasing power parity.

Accordingly, we decided to employ another method to calculate the equilibrium exchange rate using fundamental indicators such as interest rates, current balance, and government debt, in addition to the price factor, which is called BEER (Behavioral Equilibrium Exchange Rate).[2] In this report, we will try to estimate the USD/JPY equilibrium exchange rate using the concept of BEER by referring to an earlier study by Watabe, Onodera and Tahara (2019).[3] In addition to the estimated equilibrium exchange rate, we will also assess the risk of further yen appreciation based on MHRI's fundamentals forecast. Our forecasting period is two years ahead from the present (2022). Also, the forecast of the fundamentals employed in our study is taken from MHRI'S "Economic Outlook."

I. USD/JPY equilibrium exchange rate based on the fundamentals

1. Summary of estimate methods

Chart 1 shows a summarized calculation method. We first estimate the equilibrium rate of the real effective exchange rate based on explanatory variables that consist of various fundamental indicators. The equilibrium rate is positioned as, in the case of the Japanese Yen, an appropriate value of the JPY, taking into consideration Japan's fundamentals. Furthermore, we also estimate the equilibrium rates for other major currencies (EUR and CNY) that reflect their respective fundamentals, because we believe the movement of such currencies has an indirect impact on the US Dollar and Japanese Yen.

By calculating the equilibrium rate for each currency and solving simultaneous equations that employ a formula that includes the divergence of the equilibrium rate from the market rate, we can determine the USD/JPY equilibrium exchange rate. Through this process we can derive the USD/JPY equilibrium exchange rate that reflects various fundamentals other than price factors as well as the movement of third countries' currencies that may affect the US Dollar and Japanese Yen, which cannot be understood by purchasing power parity only.

The USD/JPY equilibrium exchange rate fluctuates sharply in response to changes in each country's fundamentals. Further out, we can break down the fundamentals by

---

[2] Clark and MacDonald (1999).

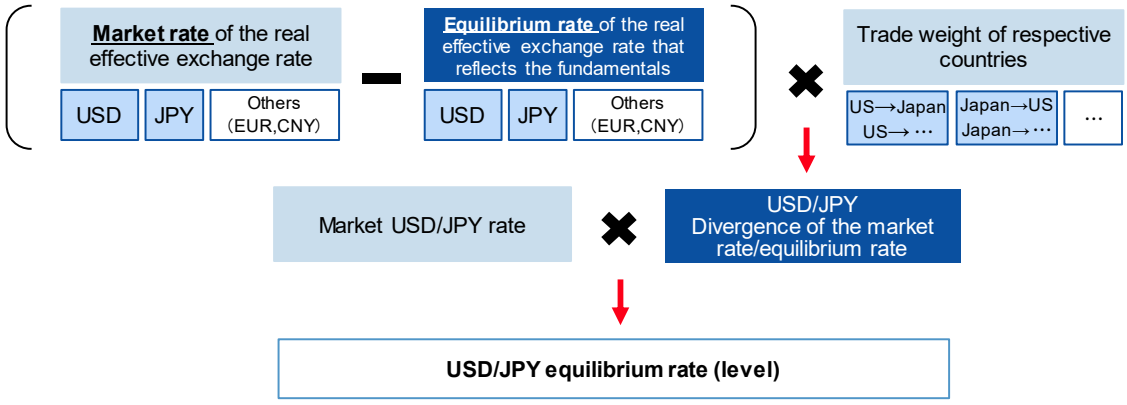
[3] Refer to the Japanese version, みずほリポート（2020）「ドル安円高の持続性」 (December 29), for details of the calculation method and outcome. https://www.mizuho-ri.co.jp/publication/research/pdf/report/report20-1229.pdf

explanatory variables to analyze which factors drive the changes. This makes it possible to forecast the future equilibrium rate by considering the future fundamentals of each country.

In this report, we calculated the equilibrium exchange rate on a monthly basis for the purpose of prompt reporting and enhancing the frequency of fixed-point observation. As described earlier, the equilibrium exchange rate moves with changes in the fundamentals. Therefore, by observing the changes in the fundamentals more frequently, we believe we can grasp any change in the direction of the future exchange rate more quickly. Also, to ensure prompt reporting we selected EUR and CNY as the third countries' currencies to be incorporated in the calculation of the USD/JPY exchange rate. According to BIS, the four USD, JPY, EUR and CNY currencies account for about 70% of the total currency transactions, which represents adequate coverage.

In the next section, we first calculate the equilibrium rates of the USD and JPY that reflect their respective fundamentals. And by examining the future outlook of these fundamentals, we analyze how these equilibrium exchange rates will evolve in the future. Lastly, we will estimate the USD/JPY equilibrium exchange rate and assess the possibility of further yen appreciation in the future.

Chart 1: Estimation process of the USD/JPY equilibrium exchange rate (outline)



Source: Made by MHRI based upon Watabe, Onodera and Tahara (2019).

2. Estimation and assessment of the real effective equilibrium rate of USD and JPY

(1) Fundamental indicators factored in the calculation and their impact on the equilibrium rate

In this report, we estimated the real effective equilibrium rate of each country, selecting the following five fundamental indicators (**Chart 2**) by referring to Watabe, Onodera and Tahara (2019). Of these, the combination that has the largest coefficient of determination and has a sign consistent with the possible impact of each indicator on the real effective

exchange rate was adopted.

Chart 2: Candidates of explanatory variables and symbol conditions

Indicators	Calculation method	Impact on equilibrium rate
Prices (1): Terms of trade	Export price index / Import price index	+/−
Prices (2): Relative prices of services versus goods	Consumer Price Index (CPI) / Producer Price Index (PPI)	+
Nominal interest rate	10-year government bond yield	+
Current account balane	Current account balance / Nominal GDP (%)	+
Government debt	Government debt / Nominal GDP (%)	−

Source: Made by MHRI based upon Watabe, Onodera and Tahara (2019) and others.

Now, we want to look at how these indicators can affect the real effective exchange rate. In the estimate of this report, we incorporated two price factors, namely, terms of trade and relative prices of services versus goods. Terms of trade is defined as the ratio of export price against import price, in other words, an exchange ratio in trade transactions. Improvement in the terms of trade, either through a rise in export price or a decline in import price, leads to higher prices in the domestic market thanks to the push-up effect of real income, and this increases the equilibrium rate (income effect). At the same time, however, if improvement in the terms of trade lowers the prices of import items and strengthens the shift in demand from domestic products to import items (substitution effect), improvement in the terms of trade may decrease the equilibrium rate. Therefore, we can say that the impact of the terms of trade can be positive or negative depending on the subject country.

Relative prices of services versus goods are an indicator that adds the impact of both "goods" prices where the purchasing power parity mechanism applies easily, and "services" prices where the mechanism does not work. For prices of goods, the law of one price is said to apply relatively easily through trade transactions, and an increase in goods prices may weaken the currency value in arbitrage through trade transactions (purchasing power parity). On the other hand, for service prices protected by high trade barriers, such as medical prices, the law of one price and the mechanism of purchasing power parity do not apply. As a result, an increase in domestic prices led by rising service prices may strengthen the currency value. Hence, we can say that when the relative prices of services go up (or down) versus goods, either through the mechanism where goods prices fall (or rise) or service prices rise (or fall), the equilibrium rate increases (or decreases).[4] In sum, we decided to select the relative prices of services versus goods because this is a good

[4] Balassa-Samuelson effect.

indicator to grasp the impact of domestic price changes more extensively than purchasing power parity.[5]

Similarly to the price factor, we also need to consider the impact of interest rates as another factor that may affect the foreign exchange rate. Since the currencies of relatively high interest rate countries are favored as investment and fund management targets, interest rate rises generally serve as a factor in currency appreciation. Likewise, we considered that the same relationship applies to the equilibrium rate where the equilibrium rate goes up when interest rates rise. It should be noted that as the preceding indicator reflects the impact of prices separately, we employed the nominal interest rate that does not consider price changes as an interest rate indicator.

In addition to prices and interest rates, the supply and demand of currency also constitutes an important factor affecting the exchange rate. As an explanatory variable to reflect the supply and demand of currency, we selected the current account balance as the most representative indicator. A rise in the current account surplus means an increase in export proceeds and dividends received from overseas. As remunerations denominated in foreign currency have to be converted into domestic currency, foreign currency selling and domestic currency buying transactions are generated in the foreign exchange market. Therefore, a rising current balance surplus is considered to be a positive factor for the equilibrium rate.

We also factored in the credit risk of each country by incorporating the outstanding government debt as an explanatory variable. Since an increase in government debt indicates a rise in the country's credit risk, it becomes a domestic currency selling factor and exerts negative pressure on the equilibrium rate.

In the following section, we estimate the equilibrium rates of the USD and JPY using the above indicators and assess its divergence from the market rate. We then provide an outlook of the fundamentals and examine how the USD and JPY equilibrium rates may change in the future. The estimated values are computed based on the fundamentals of each month, and the latest outcome represents the value as of September when most of the indicators have been released.

(2) Estimation and assessment of the USD equilibrium rate

The USD equilibrium rate reflecting the US fundamentals is depicted in **Chart 3**. The USD surged from March to April 2020 in terms of both market rate and equilibrium rate. Despite a series of emergent interest rate cuts, the market rate skyrocketed fueled by cash-

[5] In this report, we followed Watabe, Onodera and Tahara (2019) and simply calculated the relative prices of services versus goods based on the Consumer Price Index (CPI) characterized by the higher weight of services as service prices and the Producer Price Index (PPI) of final goods as goods prices.

on-hand demand of the USD on the back of disruptions caused by the coronavirus pandemic. On the other hand, declining goods prices due to the pandemic (to be described in a later section) caused an upsurge in the equilibrium rate. As the market started to regain its calm after the initial Covid-19 shock, both the market rate and the equilibrium rate moved toward USD depreciation. The US dollar depreciation after the initial Covid-19 shock is also backed by the fundamentals.

However, the market rate remained relatively overvalued compared to the equilibrium rate as of September. The reasons for the overvaluation seemed to be the resurgence of coronavirus infections and heightened uncertainty over the global economic environment related to the US presidential election. Compared to the March to April period when the pandemic was deepening in the United States and Europe with major cities under lockdown, it seems that the sense of uncertainty was alleviated by the resumption of economic activities and the stabilization of financial markets. Even so, such factors as the resurging pandemic, unpredictability over vaccine distribution, and uncertainty over the US presidential election caused the USD to be overvalued relative to the economic fundamentals in September.

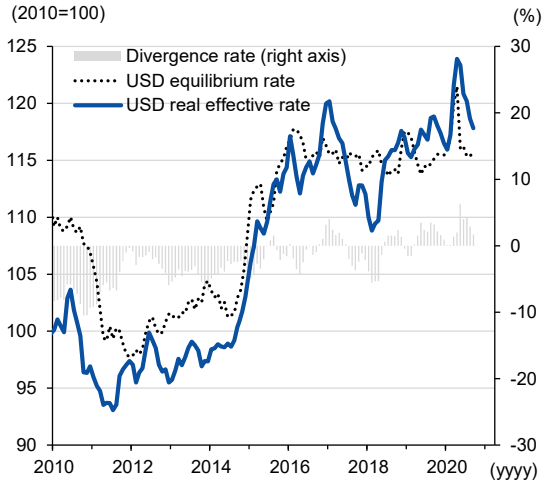
However, as of the writing of this report, these uncertainties seem to be waning with, as mentioned in the previous section, rising expectations for the practical application of vaccines among major pharmaceutical companies, and the risk of confusion over the outcome of the US presidential election and potential drastic policy changes by the new government receding since November. Under these circumstances, since USD selling accelerated following the improvement in risk sentiment, the USD diverging into the overvalued range relative to the equilibrium rate diminished sharply in November through December.

On the other hand, how will the equilibrium rate of the USD based on the fundamentals evolve in the future? To answer to this question, we now want to review the development of the USD equilibrium rate up until now and break down the underlying fundamental factors of its movement (**Chart 4**). As depicted in **Chart 4**, the major factor behind the fluctuation of the USD equilibrium rate since the beginning of 2020 is relative prices of services versus goods. As discussed earlier, when the relative prices of services heighten as a result of either goods prices going down or service prices going up, prices can exert upward pressure on the equilibrium rate.

The relative prices of services versus goods in the United States has been on a rising trend in recent years (**Chart 5**) with service prices continuing to rise steadily while goods prices stagnate (**Chart 6**). Due to the spread of the coronavirus, when a series of lockdown was imposed globally in early 2020, growth momentum of the relative prices of services versus goods surged and pushed up the USD equilibrium rate. This was because the Covid-

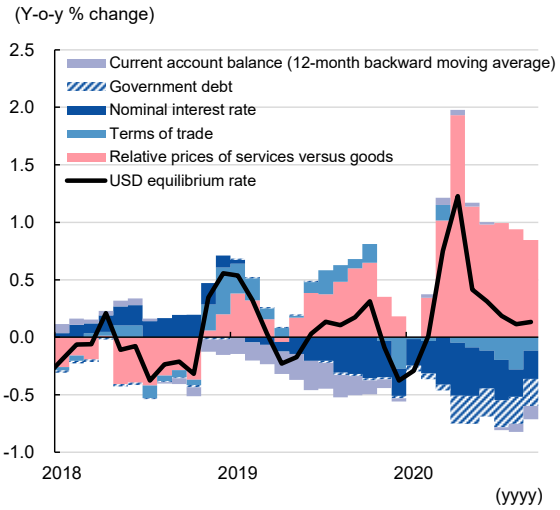
19 shock pushed down goods prices more sharply than the fall in service prices. Although both prices for goods and services fell driven by steep cuts in demand during the pandemic, the downside impact of energy prices due to slumping transportation demand weighed more heavily on goods prices, while the prices of rents and medical services that comprise a major portion of services stayed firm with less impact on service prices.

Chart 3: Equilibrium rate and market rate of the USD



Note: The equilibrium rate is estimated by MHRI. The market rate is shown up until November.
Source: Made by MHRI based upon Bloomberg and others.

Chart 4: Equilibrium rate of the USD and a breakdown of the underlying factors



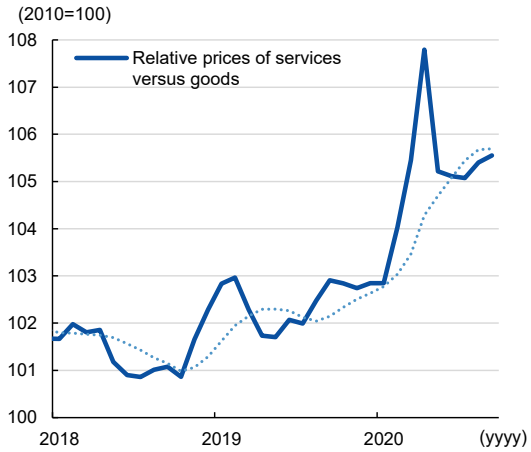
Note: The equilibrium rate is estimated by MHRI.
Source: Made by MHRI based upon Bloomberg and others.

Nonetheless, amid the gradual resumption of economic activities, the impact of the Covid-19 shock receded and the steady increase in the relative prices of services versus goods came to a halt. As production and export activities moved toward normalization and energy prices were back on a recovery track, the price of goods started rising again and pushed down the relative prices of services. Meanwhile, service consumption growth became sluggish due to the imposition of restrictions on business hours and outside activities, reducing the push-up effect of service prices on the relative prices of services versus goods. As a consequence, the increase in the relative prices of services versus goods slowed and gradually eroded the push-up effect of the USD equilibrium rate.

Going forward, we expect the relative prices of services versus goods to return to a gradual growth track and contribute to a smooth increase in the USD equilibrium rate. As economic activities normalize along with the distribution of coronavirus vaccines, personal consumption related to travel and eating out, which have plummeted due to the pandemic, is expected to revive and gradually buoy service prices once again. Also, goods prices are expected to stagnate again as in the pre-pandemic period with the recovery of energy prices

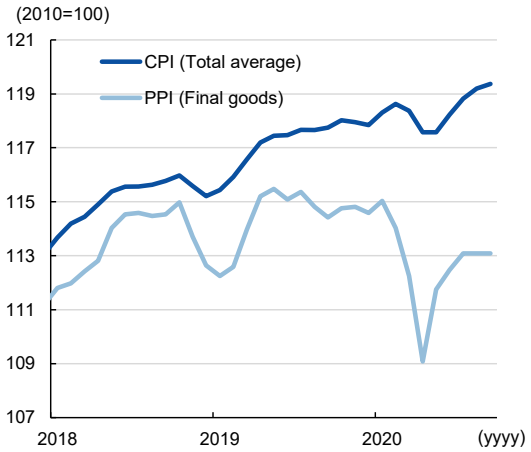
coming to an end. MHRI anticipates that the US economy will return to the pre-pandemic level in the latter half of 2021. We project that the relative prices of services versus goods will also return to the pre-pandemic level and be on a rising track in the latter half of 2021, after remaining stagnant during the first half of 2021, and they are expected to exert upward pressure on the USD equilibrium rate.

Chart 5: US: Relative prices of services versus goods



Note: The dotted line shows the six-month backward moving average. Service prices = consumer price (total average), goods prices = producer prices (final goods).
Source: Made by MHRI based upon Bloomberg.

Chart 6: US: Consumer Price Index (CPI) and Producer Price Index (PPI)



Source: Made by MHRI based upon Bloomberg.

It should be noted that the fall of the USD equilibrium rate was also due to other factors, such as a deterioration in the terms of trade, decline of nominal interest rates, and increase in government debt, albeit their degree of contribution was limited compared to the relative price factor. We also want to study the current status and outlook of these factors.

The terms of trade slightly worsened as the impact of falling oil prices driven by the Covid-19 shock affected export prices more seriously than import prices (**Chart 9**). However, since the export and import structures are similar in the United States, export and import prices in the US are closely linked, and this lowers the volatility of the terms of trade. In fact, the terms of trade, after the impact of the Covid-19 shock started to diminish, have remained flat thanks to the recovery of both export and import prices, following a rebound in oil prices. Going forward, as oil prices are projected to pick up at an extremely slow pace, fluctuations in the terms of trade are expected to remain minimal and have only a limited impact on the USD equilibrium rate.

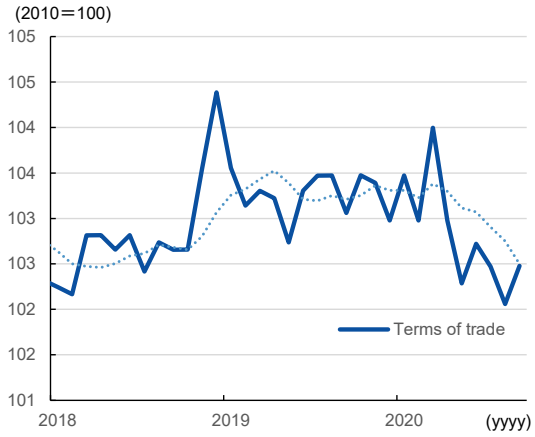
Next, the nominal interest rate (the US 10-year Treasury yield) plummeted to a historical low on the back of unprecedented monetary easing after the Covid-19 shock

(**Chart 8**) and contributed to bringing down the USD equilibrium rate.

In the future, the US 10-year Treasury yield is projected to rise gradually supported by the global economic recovery, but the pace of the rise is likely to be very moderate given that the FRB's aggressive monetary easing is expected to be prolonged. Meanwhile, the FRB has rejected the possibility of slashing interest rates even further, for example, by introducing negative interest rates, and it is difficult to imagine an additional decline of interest rates from the current level. Hence, we do not anticipate downward pressure to emerge on the future USD equilibrium rate due to further interest rate cuts. Rather, we expect the nominal interest rate to pressure the USD equilibrium rate higher through gradual through the gradual rise of interest rates.

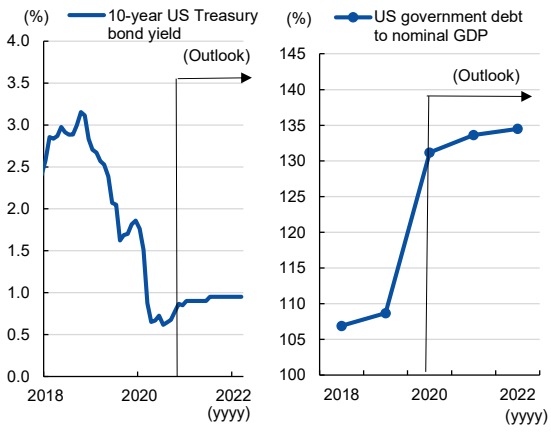
As for the last factor, government debt, the ratio of US government debt to nominal GDP is expected to grow substantially from 108.7% in 2019 to 131.2% in 2020 and to 133.6% in 2021 (**Chart 8**), according to the World Economic Outlook（October,2020）released by the IMF. As the new Biden administration is believed to introduce large-scale fiscal stimulus measures, including investment in environmental and infrastructure projects, the US government will likely issue a massive amount of government bonds to procure the necessary funds, and the government debt may grow even larger than the amount projected by the IMF. Consequently, the government debt factor will continue to serve a negative factor on the USD equilibrium rate in the future.[6]

Chart 7: US: Terms of trade (export price/import price)



Note: The dotted line shows the six-month backward moving average
Source: Made by MHRI based upon Bloomberg.

Chart 8: US: Nominal interest rate and outstanding government debt



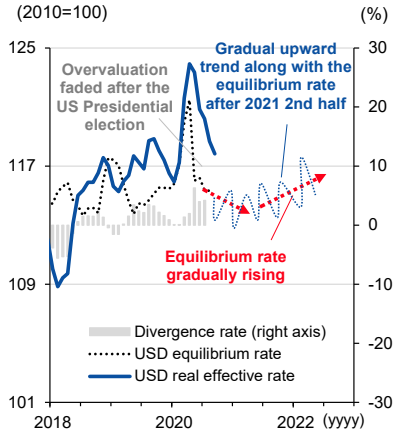
Note: For the forecast of the US 10-year Treasury yield, refer to "FY2020–FY2021 Economic Outlook" (December 10, 2020).
Source: Made by MHRI based upon Bloomberg and IMF.

[6] However, in the estimation of the USD equilibrium rate, government debt is not recognized as a significant factor from a statistical perspective (10% level). We should take this finding into consideration when measuring the impact of the government debt to nominal GDP ratio on the USD equilibrium rate.

We now summarize our discussion thus far (**Chart 9**). While increasing government debt becomes a downside factor for the USD equilibrium rate, the gradual rise of interest rates in the United States following the recovery of the global economy, as well as a moderate increase in "the relative prices of services versus goods" from the latter half of 2021, which is the biggest contributor to the USD equilibrium rate, is expected to push up the USD equilibrium rate. Thus, we forecast the future USD equilibrium rate to be on a progressively rising track.

It should be mentioned that as of September, the actual USD market rate was overvalued relative to the equilibrium rate. As mentioned earlier, however, it is highly likely that the upward divergence had already been eliminated in the November to December period by virtue of the weakening USD after the easing of uncertainty over the Covid-19 pandemic and the US presidential election. For this reason, we hold that the additional pressure of the USD weakening to eliminate this overvalued divergence will be limited in the future.

Chart 9: USD: Relationship between the market rate and the equilibrium rate and their outlook



	Current status (as of Sept.)		Outlook (up to 2021 1H)	Outlook (after 2021 2H)
Equilibrium rate	USD weakening trend	→	USD weakening trend maintained	Toward a gradual USD strengthening trend
Divergence (Market rate - equilibrium rate)	Overvaluation (Market rate >> equilibrium rate)	→	— (Overvaluation eliminated in Nov. to Dec.)	—
Convergence pressure	USD weakening pressure (Elimination of overvaluation)	→	— (Same as above)	—
Market rate	USD weakening trend	→	USD weakening trend along with the equilibrium rate	Toward USD strengthening along with the equilibrium rate

Note: The equilibrium rate is estimated by MHRI. The market rate is plotted up until November. The dotted arrow on the graph shows the anticipated direction in the future and does not represent a specific level.
Source: Made by MHRI based upon Bloomberg and others.

(3) Estimation and assessment of the JPY equilibrium rate

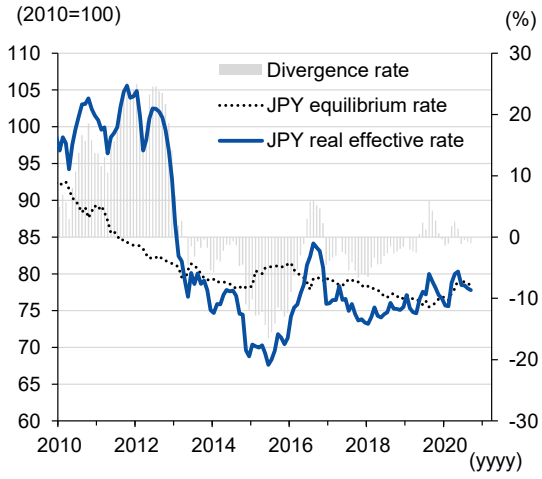
The JPY equilibrium rate reflecting Japan's fundamentals is presented in **Chart 10**. The JPY after 2020 has been traded at prices mostly the same as the equilibrium rate. When the new coronavirus started to spread globally in March and April, the JPY appreciated in both terms of market rate and equilibrium rate. And as the Covid-19 shock somewhat abated, both the JPY market rate and the equilibrium rate were on a weakening trend until

September. Divergence of the JPY market rate from the equilibrium rate has remained minimal, and if we assume that the fundamentals as of September will remain unchanged, pressure of the JPY strengthening or weakening to eliminate this divergence is not expected to emerge.

Then, if there are changes in the fundamentals, how will the JPY equilibrium rate be affected going forward? Should the JPY equilibrium rate start to appreciate, the market rate will become undervalued relative to the equilibrium rate, and this may give rise to yen appreciation pressure to eliminate the divergence. How great then is the yen appreciation risk?

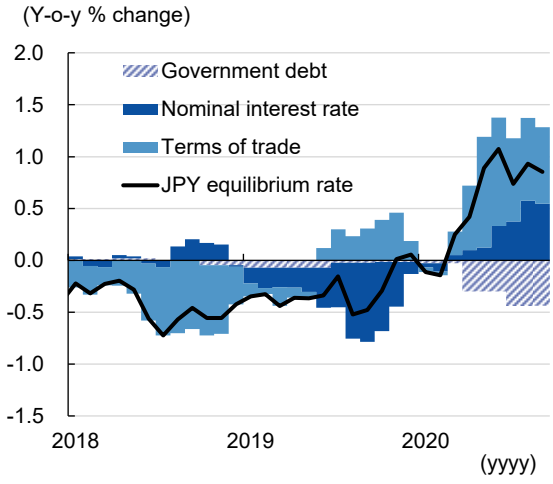
We try to understand the degree of yen appreciation risk by assessing the current status and outlook of the fundamentals that underpins the movement of the JPY. **Chart 11** depicts a breakdown of the fundamental factors to explain the fluctuation of the JPY equilibrium rate. The chart reveals that fluctuations of the JPY after 2020 were driven mainly by an improvement in the terms of trade. The increase in the JPY equilibrium rate at the beginning of 2020 was clearly due to improved terms of trade. As a result of the estimation, the improvement in terms of trade is a factor pushing up the equilibrium rate of the JPY.

Chart 10: JPY equilibrium rate and market rate



Note: The equilibrium rate is estimated by MHRI. The market rate is shown up until November.
Source: Made by MHRI based upon Bloomberg and others.

Chart 11: JPY equilibrium rate and a breakdown of the underlying factors



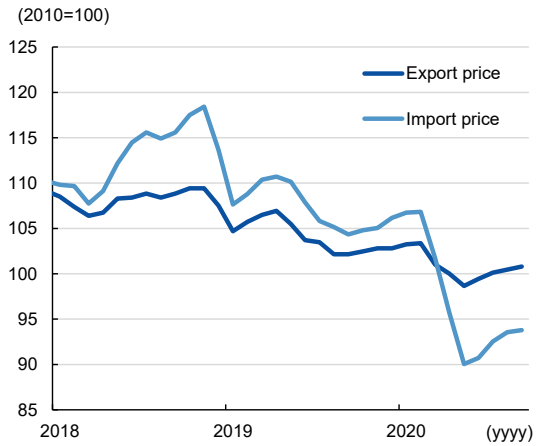
Source: Made by MHRI based upon Bloomberg.

As the Covid-19 shock caused oil prices to fall dramatically, import prices dropped more significantly than the decline of export prices (**Chart 12**), this led to a substantial

improvement in Japan's terms of trade (**Chart 13**) [7].The decline of crude oil prices affects import prices to a greater extent than export prices because Japan is a net importer of crude oil, which holds a significant share in total imports.

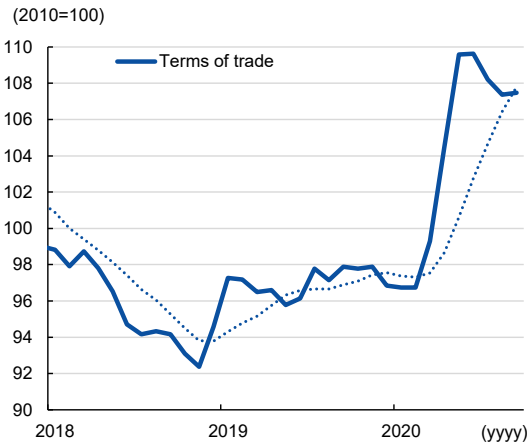
The terms of trade in the coming years are expected to deteriorate modestly. Although the global economy, including Japan, is projected to head toward recovery after 2021, its pace is expected to be extremely slow. We expect it will take some time until herd immunity is acquired through the widespread use of vaccines, and while situation unfolds, households and companies in many nations such as Japan are anticipated to act cautiously. We therefore believe the supply and demand balance will remain loose in terms of external and domestic demands, weighing down the rise of both export and import prices. But with the global economy heading for recovery, crude oil prices are expected to rise, albeit at a slow pace and make the recovery of import prices more dominant. Therefore, we forecast that the terms of trade will change for the worse and return to the pre-pandemic level gradually. Accordingly, pressure on JPY appreciation driven by improvement in the terms of trade will likely fade, and the JPY will probably come under depreciation pressure step by step.

Chart 12: Japan: Export price index and import price index



Source: Made by MHRI based upon Bloomberg.

Chart 13: Japan: Terms of trade



Note: The dotted line shows the six-month backward moving average.
Source: Made by MHRI based upon Bloomberg.

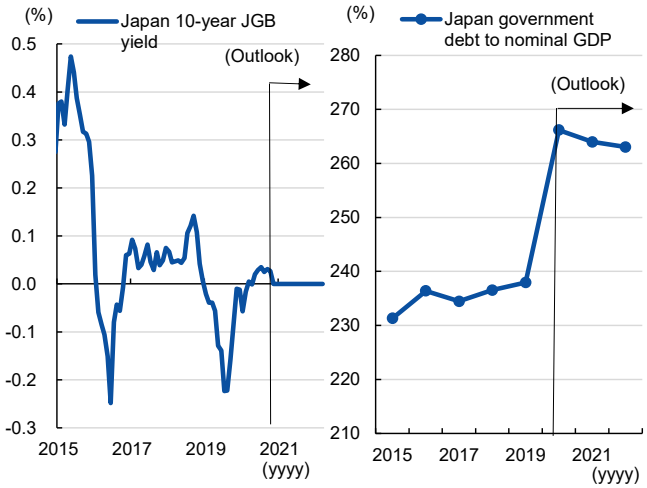
Similarly to the terms of trade, the nominal interest rate has also made a positive contribution to strengthening the JPY slightly since the beginning of 2020. As the Japanese government launched an emergency economic stimulus package to tackle the Covid-19

[7] According to the Ministry of Finance "Trade Statistics," mineral fuels accounted for about 21.6% of the total import value in 2019 (export of mineral fuels: about 1.8%).

shock and drastically increased the issuance of government bonds, speculation rose that interest rates might surge due to the deteriorating supply and demand balance of JGBs, pushing up the 10-year JGB yield steadily from the preceding year.

However, the increase in JGB purchases by the Bank of Japan supported the supply and demand of JGBs and the rise of the 10-year JGB yield was limited. The Bank of Japan's Yield Curve Control (YCC), which manipulates long- and short-term interest rates by buying the necessary amount of JGBs without setting a ceiling to keep the yield on 10-year bonds near zero percent, has been effective.

Chart 14: Japan: Nominal interest rate and outstanding government debt



Note: For the 10-year JGB yield forecast, refer to "FY2020–FY2021 Economic Outlook" (December 10, 2020).
Source: Made by MHRI based upon Bloomberg and the IMF.

Given the difficulty of predicting when the Covid-19 crisis will come to an end, the central banks of many countries, including the United States, are expected to maintain a loose monetary policy over the long term. In the press conference after the Monetary Policy Meeting in June, Bank of Japan governor Kuroda stated that it would be difficult for the Bank of Japan to hike interest rates ahead of the FRB,[8] and it seems that the Bank of Japan has no choice but to stick to its loose monetary policy for the time being. Since YCC mentioned earlier is also foreseen to be maintained, we hold that the 10-year JGB yield will continue to hover at around 0% in the immediate future. Hence the nominal interest rate will not likely impose upward pressure on the JPY equilibrium rate in the future.

Meanwhile, increasing government debt has pressured the JPY[9] to depreciate. According to the IMF's "World Economic Outlook (October,2020)," Japan's government debt to nominal GDP ratio is forecast to rise significantly from 238.0% in 2019 to 266.2% in 2020 (**Chart 14**). The IMF's estimate also states that Japan's government debt to nominal GDP ratio will slightly lower (2021: 264.0%) after 2021. But

[8] The Nikkei online edition, "'An interest rate hike is unlikely even in FY2022,' stated Bank of Japan governor Kuroda. Japan's economy continues to be challenging," (Accessed: October 1, 2020). https://www.nikkei.com/article/DGXMZO60395290W0A610C2000000/

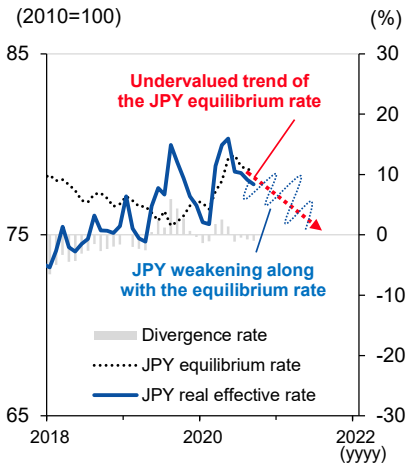
[9] However, in the estimation of the JPY equilibrium rate, government debt is not recognized as a significant factor from a statistical perspective (10% level). We should take this finding into consideration when measuring the impact of the government debt to nominal GDP ratio on the JPY equilibrium rate.

given that the highly uncertain situation will prevail for some time to come, the Japanese government may be compelled to implement another large-scale economic stimulus package and increase its outstanding debt even further, just like in the United States. Accordingly, we believe the government debt will continue to exert downward pressure on the JPY in the future.

If we summarize our discussion thus far, the future JPY equilibrium rate is projected to be on a deprecation trend on the back of worsening terms of trade and expanding government debt. Furthermore, as of September, divergence of the JPY market rate from the equilibrium rate has remained small, and this implies a limited possibility of the JPY coming under appreciation or depreciation pressure to eliminate the divergence. In the light of this observation, we forecast that the future JPY market rate will depreciate along with a weakening of the JPY equilibrium rate (**Chart 15**).

In the next section, we will estimate the USD/JPY equilibrium exchange rate using the USD and JPY equilibrium rates calculated in the previous section and examine the risk of Japanese yen appreciation in the future.

Chart 15: JPY: Relationship between the market rate and the equilibrium rate and their outlook



	Current status (as of Sept.)		Outlook (-2022)
Equilibrium rate	JPY slightly weakening	→	JPY weakening trend
Divergence (Market rate - equilibrium rate)	Almost no divergence (market rate = equilibrium rate)	→	—
Convergence pressure	—	→	—
Market rate	JPY slightly weakening	→	JPY weakening to be maintained along with the equilibrium rate

Note: The equilibrium rate is estimated by MHRI. The market rate is plotted up until November. The dotted arrow on the graph shows the anticipated direction in the future and does not represent a specific level.
Source: Made by MHRI based upon Bloomberg and others.

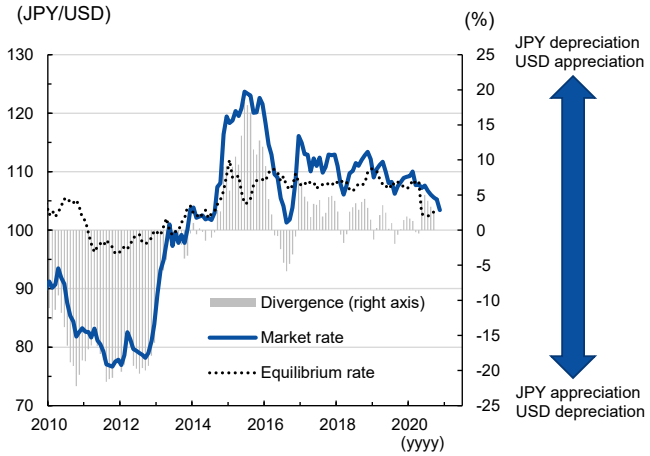
3. Calculation and assessment of the USD/JPY equilibrium rate

The outcome of our USD/JPY equilibrium rate calculation is shown in **Chart 16**. The estimated rate as of September was 103 yen, when the yen was more expensive compared to the September market rate (monthly average rate: 105.6 yen). Accordingly, if we assume that the fundamentals will remain unchanged from September, the USD/JPY rate will be exposed to USD depreciation (JPY appreciation) pressure to eliminate the USD/JPY

undervaluation (JPY depreciation).

If we consider the potential changes in the fundamentals that underpin the USD and JPY, the USD/JPY equilibrium rate is expected to turn to a gradual USD appreciation/JPY depreciation trend in the latter half of 2021 (**Chart 17**). The potential appreciation of the USD equilibrium rate is projected to be subdued while the risk of the resurging pandemic remains with us for a certain period, and the USD is expected to continue depreciating. Meanwhile, the JPY equilibrium rate is also expected to weaken, and this suggests that the USD/JPY equilibrium rate will most likely remain flat as a result of both USD and JPY depreciation. In the latter half of 2021 when the US economy is expected to recover to the pre-pandemic period thanks to the widespread use of vaccines, the USD equilibrium rate is projected to appreciate due to a rise in the relative prices of services versus goods. With the JPY continuing to depreciate, the USD/JPY equilibrium rate is projected to trend upward.

Chart 16: USD/JPY equilibrium rate and market rate



Note: The equilibrium rate is estimated by MHRI. The market rate is plotted up until November.
Source: Made by MHRI based upon Bloomberg and others.

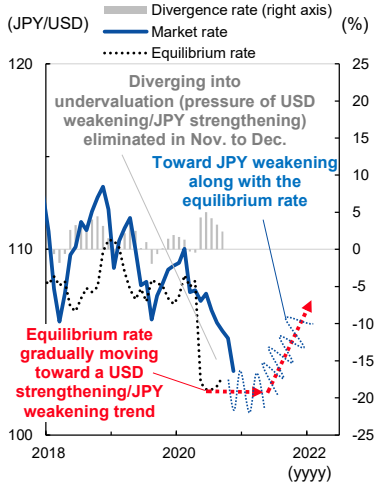
As the USD was relatively overvalued (USD appreciation) compared to the equilibrium rate, as of September there was roughly a 3% divergence (JPY depreciation) in the USD/JPY market rate from the equilibrium rate. But as the USD weakened on the back of the risk-on sentiment in the November to December period, the divergence of undervaluation was most probably eliminated quickly. In fact, the current USD/JPY market rate in December (average closing rate in New York up until December 24) was 103.85 yen, coming very close to 103 yen, which was the equilibrium rate in September. Furthermore, we believe it is less likely that the future USD/JPY equilibrium rate will head toward a further USD weakening/JPY strengthening trend. Therefore, we hold that the additional pressure of JPY appreciation will be limited on the USD/JPY market rate observed based on the fundamentals.

However, there is also a good chance that the market rate will diverge from the equilibrium rate, depending on the political situation and geopolitical risks in each country and subsequent changes in the market sentiment. We cannot deny the possibility of a temporary USD depreciation fueled by a heightening of the risk-on sentiment in the global

market, as well as sharp JPY appreciation stemming from the geopolitical risk factor, may trigger a move in the USD/JPY rate closer to 100 yen or even lower.

If this factor is simply temporary and does not have a substantial impact that completely changes the trend of the fundamentals, the divergence from the equilibrium rate will likely diminish with the passage of time, and the market rate can be expected to eventually return to an equilibrium rate that reflects the fundamentals. We therefore believe the USD/JPY will not remain under 100 yen forever.

Chart 17: Relationship between the USD/JPY market rate and the equilibrium rate and their outlook



	Current status (as of Sept.)		Outlook (up to 2021 1H)	Outlook (after 2021 2H)
Equilibrium rate	USD weakening/JPY strengthening trend	→	Remain flat with both USD and JPY weakening	Toward a gradual USD strengthening/JPY weakening trend
Divergence (Market rate - equilibrium rate)	Diverge into undervaluation (JPY weakening) (market rate << equilibrium rate)	→	— (Undervaluation [JPY weakening] eliminated in Nov. to Dec.)	—
Convergence pressure	USD weakening/JPY strengthening pressure (Elimination of undervaluation)	→	— (Same as above)	—
Market rate	USD weakening/JPY strengthening trend	→	**Mostly remain flat**	**Toward gradual USD strengthening/JPY weakening along with the equilibrium rate**

Note: The equilibrium rate is estimated by MHRI. The market rate is plotted up until November. The dotted arrow on the graph shows the anticipated direction in the future and does not represent a specific level.
Source: Made by MHRI based upon Bloomberg and others.

II. Conclusion – Room for JPY appreciation is limited

In this report, we estimated the equilibrium rates of the USD and JPY reflecting various fundamental indicators including prices and assessed the degree of divergence from the market rates. Moreover, we provided a forecast of fundamentals and discussed how the equilibrium rates of the USD and JPY may evolve in the future. The USD/JPY equilibrium rate that considers these factors was 103 yen as of September. Although the market rate in September was relatively undervalued (JPY depreciation) compared to the equilibrium rate, mounting expectations for the practical application of vaccines to overcome the coronavirus and less uncertainty over the US presidential election seem to have corrected the overvaluation of the USD and eliminated the undervaluation divergence of the USD/JPY market rate. In addition, considering potential changes in the fundamentals in the future, the equilibrium USD/JPY rate is projected to turn to a USD appreciation/JPY depreciation trend from the latter half of 2021 with the revival of the US economy. Hence our conclusion is that pressure on further JPY appreciation will be limited from a

fundamentals' perspective.

Needless to say, we should also be alert to possible changes in the direction of the fundamentals, which will affect our estimation and forecast, depending on the development of the Covid-19 pandemic and the economic policy of each country. With a view to understanding these changes, it is essential to observe the equilibrium USD/JPY rate on a regular basis, ideally on a monthly basis.

Under the current economic environment impacted by incredibly high uncertainty, it is extremely difficult to forecast the outlook of the foreign exchange market. The workings of JPY appreciation, however, is an important issue for export companies in Japan as it has a great impact on their earnings. We hope our analysis will be of some help for those trying to forecast the future trend of the USD/JPY exchange rate that fluctuates dynamically affected by market speculation.

Reference

Refer to the original Japanese report by clicking the URL below for the reference material.

https://www.mizuho-ri.co.jp/publication/research/pdf/report/report20-1229.pdf