

Japan's sovereign rating in the post-pandemic era

This paper provides an outlook of Japan's credit rating using market and fundamental data-driven models.



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Abstract

We assess Japan's sovereign credit rating dynamics and its long-term outlook using market-implied and fundamental rating models. Japan's recent market-implied ratings, which are based on government bond prices and Credit Default Swap (CDS) spreads, have outperformed actual ratings and this could continue over the next few years, supported by prolonged Bank of Japan (BOJ) monetary easing – underpinned by the Qualitative and Quantitative Easing (QQE), the Negative Interest Rate Policy (NIRP), and the Yield Curve Control (YCC). In contrast, our fundamental model foresees up to three rating downgrades in the next decade, driven mainly by a further deterioration in fiscal conditions and a sub-par economic growth outlook relative to peers with similar credit ratings. The pandemic has drastically impacted Japan's fiscal metrics, but rating agencies might still apply a 'discretionary bonus' to sovereign ratings for Japan and other countries for some time, reflecting the symmetric nature of the COVID-19 shock. These discretionary bonuses are expected to fade gradually, but for Japan rating agencies may decide to retain the bonus because of Japan's exceptionally strong external financial position; the yen's international reserve currency role; the capacity to refinance its own debt; and Japan's strong governance profile, all factors that would offset any downward pressures on the credit rating. In our adverse scenario, rating downgrades could trigger higher currency funding costs, lower credit ratings for the private sector, and increase international investment outflows. To avoid this adverse scenario, policymakers need to strengthen fiscal sustainability and accelerate structural reforms to boost the long-term post-pandemic growth potential.

Keywords: structural credit ratings; market-implied credit ratings; sovereign risk; macro-economic and fiscal fundamentals; Japanese economy.

JEL codes: E02, E62, E66, G10, H68

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By Jinho Choi, Alexander den Ruijter, Kimi Xu Jiang, and Edmund Moshammer^{1 2}

April 2022

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Contents

I. Introduction.....	2
II. The Historical Dynamics of Japan’s Sovereign Rating	4
III. Assessing Historical Dynamics of Japan’s Sovereign Ratings	6
A. Market-Implied Ratings.....	6
B. Fundamental Model-Implied Ratings	9
IV. COVID-19 Pandemic and Japan’s Sovereign Rating Outlook	14
A. Impact of the COVID-19 Pandemic.....	14
B. Long-term Outlook for Japan’s Sovereign Rating	16
V. Conclusions	25
References	27
Appendix. Fundamental Rating Model Robustness Tests	30

I. Introduction

1. **Japan's sovereign credit rating has travelled along a downward trend over the last three decades, mainly due to the country's economic growth slowdown and deteriorating fiscal health.** High government debt led to credit rating agency downgrades that sparked concern about its creditworthiness. Academics (Hoshi and Ito, 2012 and 2014) and market commentators (Financial Times, 2015 and Forbes, 2017) have expressed concern that the elevated government debt could eventually lead to a sovereign debt crisis in Japan, which might spill over to affect other economies, given Japan's systemic importance within the world economy. Nevertheless, historically the country's sovereign rating has enjoyed support from strong home demand for Japanese government debt; the yen's international reserve currency status; sizable net external assets; and strong institutions.

2. **A rapid fiscal burden accumulation during the COVID-19 pandemic would warrant a review of Japan's sovereign credit risk.** During the COVID-19 pandemic crisis, Standard & Poor's (S&P) revised down its sovereign rating outlook for Japan in June 2020, followed by Fitch in July 2020, mainly because of a highly expansionary fiscal stimulus adopted in response to the pandemic. They also warned about potential further ratings actions, given an expected legacy high debt stock and projected increases in fiscal outlays.

3. **Studies show sovereign rating downgrades could lead to tighter funding conditions for both sovereigns and domestic private firms.** An Afonso et al. (2012) event study identified significant responses in EU government bond yield spreads to changes in rating notations and outlooks, particularly to negative announcements. Gande and Parsley (2005) confirm the existence of spillover effects across sovereign ratings for a set of 34 developed and developing economies. Sovereign debt downgrades can lead to economic and financial consequences given spillovers from sovereign to corporate credit risk. BIS (2011) shows that the rise in sovereign risk after the global financial crisis (GFC) increased costs and adversely affected the composition of bank funding, although the impact was less pronounced for Japan. And Holton et al. (2014) used survey data on access to finance by euro area small and medium-sized enterprises (SMEs) from 2009 to 2011 to show that SMEs experienced increased loan rejections and interest rates during both the GFC and the later debt crisis in some euro area countries.

4. **The transmission of sovereign risk to corporates can also occur through a 'sovereign ceiling channel'.** Corporate issuers rated at, or slightly above, the rating on the sovereign debt are more likely to be downgraded alongside any sovereign debt downgrade. Tsuji (2005) finds that a corporate credit rating, along with market illiquidity and investor preference, is a driver of corporate credit spreads in Japan, and corporates are more likely to reduce investment and debt issuance when faced with higher borrowing costs (Almeida et al., 2016). Similarly, Borensztein et al. (2013) use rating data for advanced and emerging economies between 1995 and 2009 to document the way sovereign ratings significantly affect corporate ratings, especially in countries where capital restrictions and high political risk exist. Bedendo and Cola (2015) show that in the euro area, an increase in sovereign credit spreads is associated with a statistically and economically significant increase in non-financial corporate spreads. A rise in sovereign credit spreads can raise firms' borrowing costs, particularly for those companies benefitting from government aid, those whose sales concentrate on the domestic market, or those that rely more heavily on bank financing.

5. **Credit rating agencies have struggled to strike a balance between reacting to volatile market signals and maintaining a medium-term view on macroeconomic fundamentals.** Accurate timely assessments of the creditworthiness of sovereigns is important for investors, sovereign issuers and financial regulators. This was the main reason credit rating agencies were heavily criticized for being non-responsive or slow to downgrade sovereign ratings when credit quality deteriorated during the GFC (Financial Crisis Inquiry Commission, 2011) and in the years before the European debt crisis. In response, rating agencies claimed that, given the substantial economic consequences of a downgrade, it was appropriate to provide some stability by taking a medium-term view and ‘rate through the cycle’.

6. **Set against this background, this paper aims to address two relevant issues: could Japan’s sovereign rating be further downgraded after the pandemic? If so, how would this affect the Japanese economy?** In particular, we analyze Japan’s historical rating dynamics based on Moody’s market-implied ratings and fundamental model-implied ratings to gain insights into Japan’s sovereign rating outlook. Market-implied ratings are based on either country-specific government bond yields or credit default swap (CDS) spreads and are used as a complementary tool to incorporate the implied market perspective of an issuer’s creditworthiness, based on market prices. Market-implied ratings arise daily and therefore offer a clear advantage, especially when a market is volatile and rating agency decisions only emerge with a time lag. Also, market-implied ratings often anticipate future movements of credit agency ratings, so could help track sovereign’s risk in a more timely manner [Moody’s (2016), Poon et al. (2016), Flannery et al. (2010) and Creal et al. (2014)]. In contrast, fundamental model-implied ratings mainly attribute changes in a country’s sovereign ratings to relevant macroeconomic and institutional factors over the long term. To derive a fundamental model-implied rating, we estimate a Tobit regression for a sample of 41 EU and OECD countries using annual data to explain the simple average rating of Moody’s, S&P, and Fitch. Based on the model’s estimates, we extend our analysis to establish long-term projections for Japan’s sovereign ratings over the next decade – offering three scenarios with different economic growth assumptions.

7. **Our estimates show two drivers of sovereign rating adjustments dominate - a country’s economic performances relative to peers and the size of its government debt.** Under a *Reform* scenario Japan’s sovereign rating is expected to stay around the existing position, but a *Baseline* scenario could anticipate a downgrade to A- and in an *Adverse* scenario Japan’s sovereign rating could weaken three notches to BBB+.

8. **Credit rating agency models allow room for judgement when credit ratings are established. When comparing Japan’s current fundamental rating with its actual ratings (Figure 7 below), we observe that since 2019 the fundamental rating lies below Japan’s average actual rating.** So the rating agencies may continue to apply a discretionary bonus to the sovereign ratings of Japan and other countries for some time, reflecting the COVID-19 crisis because the common pandemic shock hit all the countries. As an example, Fitch’s rating committee has adjusted its quantitative model-based rating for Japan from A- to A since August 2021, arguing that a deterioration in the model’s input factors is temporary. Rating agencies typically wait before taking rating action across countries during crises, a finding described in more detail in Section III. As a crisis fades and its effects become less even, rating agencies could revise their assessment and reduce this type of discretionary bonus for

countries, including Japan. Such a downgrade of Japan's sovereign rating could lead to higher foreign currency funding costs, lower credit ratings in the private sector, and international investment outflows from Japanese government bonds. Such potential developments highlight the importance of shifting Japan's fiscal consolidation back towards targets in the post-pandemic era, posing policy challenges that would arise when trying to promote potential growth through structural reform.

9. **The rest of the paper is structured as follows.** Section II depicts the historical evolution of Japan's sovereign credit rating over the past three decades. Section III assesses Japan's sovereign ratings based on market-implied ratings and fundamental model-implied ratings. Section IV discusses recent rating dynamics during the COVID-19 pandemic crisis and Japan's sovereign rating outlook. Section V concludes and discusses policy implications.

II. The Historical Dynamics of Japan's Sovereign Rating

10. **Japan's sovereign credit ratings have been on a downward trend since the 1990s, challenged by weakening macroeconomic performance and expanding debt burdens (Figure 1).** Until 1997, Japan received AAA long-term foreign and local currency ratings from Fitch, Moody's, and S&P. This changed in 1998 when Fitch and Moody's downgraded the country's foreign currency and (in the case of Moody's) local currency ratings by one notch. Moody's identified a heightened long-term risk because economic and policy weaknesses had precipitated a far worse fiscal position for the country and a much weaker financial system compared to other advanced economies (Moody's, 1998). During the Asian financial crisis, Japan recorded a historically high fiscal deficit of over 10 percent of GDP in 1998 and Moody's noted this rise in government debt reflected both structural and cyclical factors, warning that it expected the government debt to keep rising to levels incompatible with an AAA rating. However, rating agencies noted that any downgrade would still leave Japan ranked among an elite group of highly rated countries (Moody's, 1998).

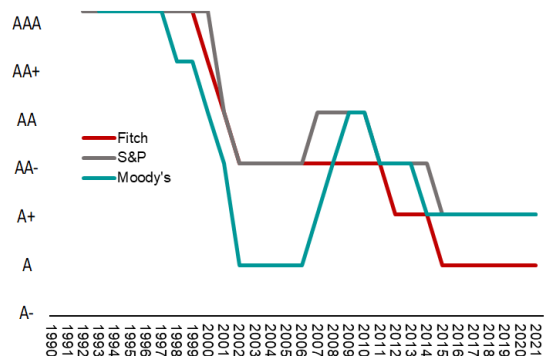
11. **Further downgrades took place in the first years of the 2000s (Figure 2).** Rating agencies continued to voice concerns about the health of Japan's public finances. Japan's fiscal deficit continued high, reaching close to eight percent of GDP in 2002, albeit improved from 1998, while its debt-to-GDP ratio increased to 157 percent in 2002 from 116 percent in 1998, the highest level within the OECD countries at that time. By 2002, Japan's average foreign and local currency ratings were approximately at AA-, which was three notches below the position Japan enjoyed in the mid-1990s. Notably, Moody's had downgraded Japan's local currency rating sharply by four notches since the start of 2000, to A2/A by end of 2002. When Moody's decided to downgrade the local currency rating by two notches in May 2002 the Japanese government objected strongly, arguing that the rating agency lacked 'objective criteria' (Sinclair, 2003). And in September 2002 Japan failed to fully sell a 10-year government bond of 1.8 trillion yen, a sign that market confidence in Japan had been eroded.

12. **Although rating agencies differentiated Japan's foreign currency rating from its local currency rating during the 2000s, the gap disappeared after 2012.**³ Rating agencies boosted Japan's foreign currency credit rating compared to the local currency between 2000

³ No Japanese government bonds (henceforth JGB) had been issued in foreign currency at the time of writing. In contrast, Japanese government agencies and corporates did have foreign currency-denominated debts. Nevertheless, major credit rating agencies still regularly published long-term foreign currency issuer ratings for Japan, which could be regarded as the rating JGBs would receive and could be used as a benchmark for other foreign currency-denominated bonds issued by other domestic entities.

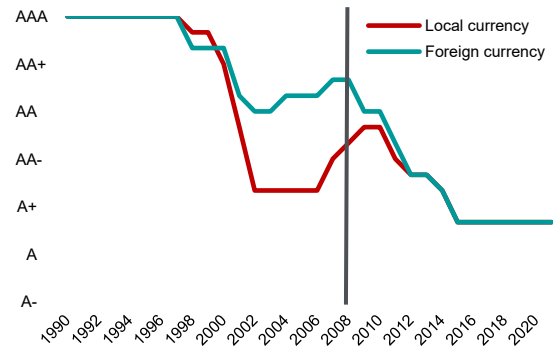
and 2012, recognizing Japan's low foreign currency debt and high foreign exchange reserves. The ratings gap between Moody's local currency and foreign currency ratings peaked at five notches in 2004-2006, when the agency recognized Japan's exceptionally strong foreign creditor position. But the difference between the foreign currency rating and local currency rating disappeared after 2012 when the rating agencies changed methodologies (Moody's, 2010; 2013) and consequently their assessment of the risk of Japan defaulting on foreign currency or local currency obligations.

Figure 1. Japan's Long-Term Local Currency Issuer Ratings



Source: Authors' calculations.

Figure 2. Japan's Long-Term Foreign and Local Currency Issuer Ratings



Source: Authors' calculations.

Note: Computed as a simple average of Fitch, Moody's, and S&P.

13. **Both local and foreign currency ratings improved between 2006 and 2009, when Japan stabilized its macroeconomy and reduced fiscal deficits.** The debt-to-GDP ratio stabilized at about 175 percent of GDP in 2007. Then rating agencies acknowledged that fact, with Japan's lowest local and foreign currency rating from the three main agencies improving to AA- by 2008, but the 2008-2009 GFC arrested this positive trend and when the fiscal balances deteriorated sharply the agencies began to downgrade Japan.

14. **In the early 2010s credit rating agencies adopted a negative stance towards Japan's sovereign ratings.** S&P cut Japan's long-term credit rating by one notch to AA- in January 2011, while Moody's and Fitch reaffirmed their existing sovereign credit ratings⁴, but then Moody's followed S&P to cut Japan's sovereign rating in August 2011. The market had largely expected both moves because they had already factored in an adverse impact from the March 2011 Great East Japan Earthquake and other elements, notably elevated debts, an aging population and prolonged deflation. In May 2012 Fitch lowered Japan's local-currency rating by one level and its foreign currency rating by two levels, leading to a strong market reaction because most analysts had been focused on worries about the European debt crisis, and at that time tended to regard Japanese government bonds as an area of safe haven (Qian et al., 2017). In 2014 and 2015, the three main credit rating agencies further downgraded Japan's sovereign credit rating by another notch, mainly on rising concern about Japan's fiscal position. Moody's downgraded its rating in December 2014, highlighting escalating uncertainty about Japan's ability to cut its fiscal deficit after the government decided to delay a planned consumption tax increase. Then in 2015 Fitch downgraded Japan's credit rating by one notch

⁴ The rating was affirmed at Aa2 in February 2011, but the outlook was also changed to negative at the time.

to A and S&P to A+, citing two main factors – the government’s failure to adopt measures to offset a delay in a sales tax increase in that fiscal year’s budget, and weak growth prospects.

15. **Japan’s credit ratings have remained unchanged from September 2015 till March 2022 at a level of A by Fitch and A1/A+ by Moody’s and S&P, but rating outlooks were lowered during the COVID-19 pandemic.** Rating agencies recognize Japan’s outstanding institutional strength, its high economic development and per-capita income, the country’s exceptionally strong external financial position, and favorable market access. All these factors to some extent mitigate against Japan’s weaknesses – considered to be the high debt-to-GDP, sustained fiscal deficits, and weak growth prospects. When the pandemic crisis erupted in 2020, S&P and Fitch reacted by promptly changing their credit rating outlooks for Japan, with S&P moving to stable from positive and Fitch to negative from stable; Fitch attributed its shift to negative to Japan’s already-high debt burden and its relatively weak fiscal track. In March 2022, Fitch decided to revise the outlook back to stable, as the agency gained confidence about the stabilization of Japan’s government debt ratio over the medium term. The impact of the pandemic on Japan’s ratings is discussed in Section IV.

III. Assessing Historical Dynamics of Japan’s Sovereign Ratings

A. Market-Implied Ratings

16. **In this section, Japan’s actual sovereign ratings are assessed compared to market-implied ratings.** Market-implied ratings are quantitatively derived, based on a comparison of financial asset prices of an issuer with its peer groups. In our study, we refer to a 2002 methodology launched by Moody’s and used by analysts to assess the implied market perception of an issuer’s creditworthiness.⁵ These market-implied ratings are calculated by comparing an entity’s or security’s trading price of bonds or CDS to the trading prices of all other entities or securities in the same Moody’s rating category (Moody’s, 2016). A positive (negative) difference in the so-called ‘market-implied ratings gap’ means that what the market-implied ratings imply is higher (lower) than the actual rating of the entity. Moody’s generally considers gaps of up to +/- 2 notches between a market-implied and an actual rating as insignificant.

17. **Market-implied ratings do not necessarily synchronize with an actual rating and typically are more volatile over time.** These discrepancies are usually viewed as representing differences of opinion between Moody’s and the market about an issuer’s creditworthiness and the employment of different time horizons, but they might also reflect factors such as liquidity or investor preference (Moody’s, 2016). These market-implied ratings also often anticipate potential agency rating changes, so could help track perceived sovereign risk in advance [Moody’s (2007), Poon et al. (2016), Flannery et al. (2010) and Creal et al. (2014)]. This is a key advantage, especially in times of stress when the market needs to price risk accurately.

18. **Several studies have examined the lead-lag relationship between market-implied ratings and actual agency ratings.** Some evidence exists to suggest market prices can anticipate changes in credit ratings and agency rating migration does not always produce the

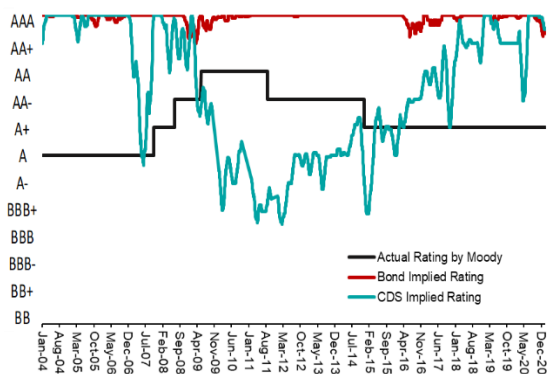
⁵ The series of market prices start from January 2004. An entity’s inclusion is determined essentially by a requirement to have a Moody’s rating and the existence of a publicly traded market for its bonds and CDS.

expected price movement of the affected sovereigns. Market-implied ratings tend to have predictive power over the actual downgrades/upgrades, particularly when large gaps separate actual agency ratings and market-implied ones [Poon et al. (2016), Kou and Varotto (2005)] However, the analytical lead-lag relationship test of Kou and Varotto (2005) cannot be replicated for Japan because only a small sample of rating events exists, although a holistic examination of the implied-rating series still offers some insights.

19. **In this context, Japan's market-implied ratings are traced back to 2004 and compared to actual ratings from key rating agencies.** Market-implied ratings are sourced solely from Moody's⁶, while the actual ratings are obtained as an average of Fitch, Moody's, and S&P ratings on Japan after transforming them to a numeric scale from 1 to 21, where 21 refers to AAA and 1 refers to a default (see Table A.1 in the Appendix for further details on the transformation).⁷ In this study, for sovereign ratings we generally refer to long-term foreign currency ratings from the three agencies for our sample economies. The only exception is Moody's rating on Japan, for which we employ the long-term local currency rating.⁸

20. **Both bond- and CDS-implied ratings suggested Japan's sovereign ratings should have been higher most of the time before the GFC, but lower during the GFC.** A relatively stable macroeconomic environment and an improved fiscal stance led to buoyant market valuations for bonds and CDS in tandem with those for AAA-rated economies. Such positive market sentiment eventually preceded the actual rating upgrades three times between Q3 2007 and Q2 2009. During the GFC, bond prices were hit but rating gaps did not signal any downgrading pressure, yet CDS prices exhibited some stress, suggesting a rating downgrade was warranted (Figure 3).

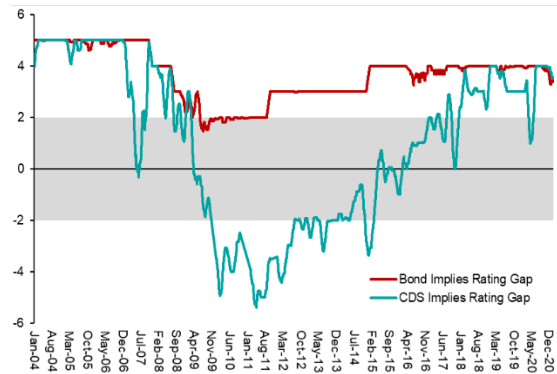
Figure 3. Market-Implied Ratings



Source: Moody's, authors' calculations.

Note: Market-implied ratings are calculated by comparing an entity's or security's trading price of bonds or CDS to the trading prices of all other entities or securities in the same Moody's rating category.

Figure 4. Market-Implied Rating Gaps



Source: Moody's, authors' calculations.

Note: Market-implied rating gaps are calculated by subtracting the actual rating of an entity from the market-based implied rating. The grey area indicates the gaps of ± 2 notches between their market-implied rating and the actual rating which Moody's considers as insignificant.

21. **During the post-GFC period including the time of the European debt crisis, Japan's CDS spreads took a hit, signaling that rating agencies should have**

⁶ As Japan has no outstanding foreign currency bonds, market-implied ratings have to rely on the country's senior unsecured bonds denominated in the local currency.

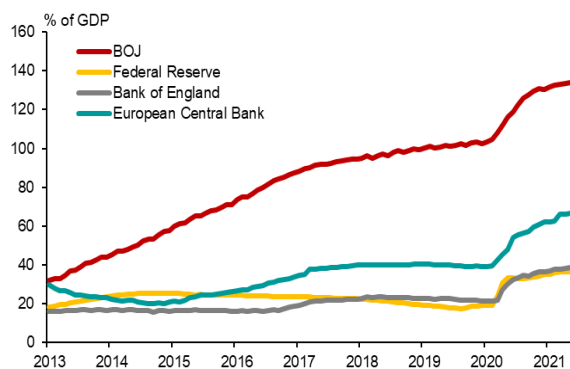
⁷ For Fitch, ratings are transformed on a scale from 0 to 21, because Fitch distinguishes between C and RD/D at the bottom of the scale. C indicates an issuer in default or near default whereby a default-like process has begun, whereas RD/D indicates an issuer is in restricted default.

⁸ We use Moody's local currency rating to better compare the rating with Japan's bond implied rating computed by Moody's, which is based on local currency bonds.

downgraded Japan's sovereign rating to BBB+, while bond prices remained in line with AAA-rated countries. An accumulation of debts after the 2009 global recession and more intense markets scrutiny of advanced economies following the outbreak of the European debt crisis adversely weighed on the CDS spreads, as did the political malaise that hampered effective economic and fiscal strategy decision-making. However, large domestic bond holding commitments continued to limit the impact of foreign investor sentiment on bond prices.

22. Since 2013, bond and CDS prices could have been elevated, mainly supported by aggressive monetary easing. In this period, the Bank of Japan (BOJ) strengthened its unconventional monetary policy framework to combat the deflationary pressure and revive the economy. First, it introduced the Qualitative and Quantitative Easing (QQE) policy in April 2013, then adopted a Negative Interest Rate Policy (NIRP) in January 2016, and subsequently introduced the QQE with Yield Curve Control (YCC) policy in September 2016. Consequently, the BOJ substantially expanded its balance sheet (Figure 5) and rapidly increased its holdings of Japanese Government Bonds (JGBs), largely at the expense of domestic financial depository institutions (Figure 6).⁹ Against this background, bond prices remained elevated thanks to the stable BOJ demand and a low interest rate environment for refinancing the debts. Meanwhile, CDS spreads have been trading with positive biases compared to peers since 2016, despite the increasing public debt. Both bond- and CDS-implied measures suggested Japan's sovereign rating should be standing at AA+ or above for most of the time after 2016 (Figure 4).

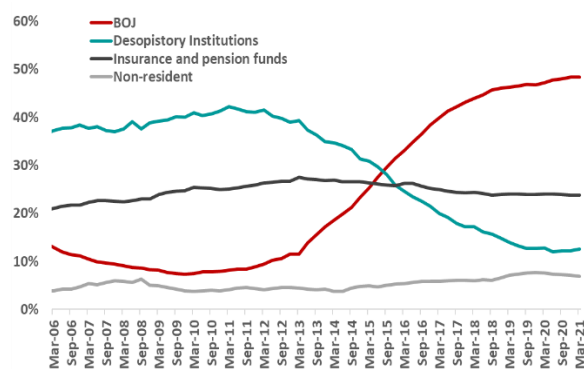
Figure 5. Total Asset Size of Balance Sheets by Major Central Bank



Source: Central banks' websites, authors' calculation.

Note: Based on four-quarters moving average of nominal GDP.

Figure 6. Sectoral Holdings of JGBs



Source: Bank of Japan, Haver Analytics, AMRO calculation.

23. Overall, CDS-implied ratings tended to demonstrate a stronger signaling power for rating downgrades. In the run-up to the two sovereign rating downgrades after 2010, CDS-implied rating gaps had become negative, four notches lower than the actual rating before the 2011 downgrade and three notches lower before the 2015 downgrade. After then, CDS spreads signaled some stress in the sovereign's creditworthiness when the COVID-19 crisis hit in the first quarter of 2020, but did not suggest any further rating movement. The widening in the spreads then quickly reversed and has maintained a significant and positive bias ever since. However, despite these persistent and significant rating gaps, rating agencies have taken no action since mid-2014.

⁹ As a reference, at the end of Q4 2020, approximately 48 percent of outstanding JGBs were held by the BOJ, compared to only about 14 percent at the end of Q4 2012.

24. **Looking forward, extraordinary easy monetary policies are expected to persist and so support the market-implied ratings, despite increasingly challenging fiscal conditions.** Market economists believe that the BOJ's March 2021 policy assessment paves the way for a longer period of loose monetary policy, with the implied money market instruments policy rate likely to stand unchanged during the next three years. This suggests BOJ's monetary easing would still strongly support bond market sentiment and sovereign credit valuation.

B. Fundamental Model-Implied Ratings

25. **Fundamental model-implied ratings focus mainly on explaining sovereign ratings through macroeconomic and institutional variables, so removing the discretionary judgement of agencies' credit ratings.**¹⁰ These variables include per capita income, GDP growth, inflation, real exchange rate changes, external debt, external reserves, economic development, default history, government effectiveness indicators, and corruption [Cantor and Packer (1996), Afonso (2003), Mellios and Paget (2006), Afonso et al. (2007), Afonso et al. (2010)].

26. **Rating agencies tend to follow these fundamentals but their models also allow room for judgement when setting credit ratings, which will likely continue to play a future role.** As an example, at Moody's a rating committee reviews the output of a quantitative scorecard model and can argue for deviations.¹¹ Also, some scorecard sub-sections allow for subjectivity and qualitative adjustments by the credit analysts. Moody's adjusts the qualitative position for Japan's fiscal strength assessment downwards by one notch, to incorporate the agency's perception about challenges stemming from Japan's high government debt stock. Fitch makes two qualitative adjustments to its model-predicted rating: a one notch positive adjustment for Japan's favorable external finances assessment, but then a one notch negative adjustment to reflect Japan's public finances – and naturally these two adjustments cancel out one another. Furthermore, in August 2021, Fitch's rating committee adjusted its model-based rating for Japan from A- to A, arguing that a deterioration in the model's input factors are temporary. These Fitch's and Moody's examples demonstrate how rating agencies can qualitatively adjust the credit ratings predicted by their models.

27. **Literature on how judgment drives sovereign ratings has mostly focused on two crises: the Asian Financial Crisis (AFC) in the late 1990s and the Euro Area Debt Crisis in the 2010s.** In response to the AFC, Ferri, Liu and Stiglitz (1999) conclude that the actual ratings assigned to the four high-growth dynamic Asian economies beforehand were consistently higher than economic fundamentals would warrant. Then, after the crisis, actual ratings dropped more sharply than model-predicted ratings, implying that rating downgrades were larger than the economic fundamentals would suggest. Investigating these views, Mora (2006) confirms that predicted ratings were indeed lower than assigned ratings before the crisis, but not higher during the crisis. Examining the euro area crisis, Gärtner et al. (2011) find that Portugal, Ireland, Greece and Spain were rated worse during the crisis compared to all the other countries in their sample, and that the rating markdown due to the unexplained

¹⁰ As a reference, Moody's (2016) states that 'rating analyses incorporate forward-looking expectations', which are inherently subjective, and that 'the four rating factors in the scorecard may not in all cases constitute an exhaustive treatment of the considerations that are important for a particular sovereign rating, and the rating may differ from the one implied by the scorecard range.

¹¹ According to Moody's, the subjective adjustment of the qualitative notching can exceed one notch.

remainder led to higher interest rates on government bonds, thereby aggravating the European debt crisis. Similarly, Vernazza and Nielsen (2015) demonstrate that the euro area periphery was downgraded far too heavily during the 2009–2011 sovereign debt crisis when the rating committees repeatedly overruled signals flowing from fundamentals. Similarly, Lennkh and Moshammer (2018) show that for their sample of 74 countries between 2003 and 2016, judgement was applied inconsistently, both across countries and over time; in particular, the ratings of ‘Crisis Countries’ experienced more severe deviations than suggested by their respective fundamentals, before, during, and after the crisis. For countries in the Asia Pacific region, judgement was generally balanced, but with high dispersion across countries.

28. In this section, we first estimate a structural rating model using panel data and then analyze potential scenarios for rating actions on Japan after the COVID-19 pandemic. Using annual data from 1990 to 2020 for the 41 EU27 and OECD countries, we explain the average sovereign rating of S&P, Moody’s and Fitch through the logarithm of GDP-per-capita in purchasing power parity (PPP) terms, general government debt as a percentage of GDP, government effectiveness¹², the interaction between government debt and governance effectiveness, the spread of 10-year government bonds relative to U.S. Treasury bonds, and the unemployment rate. Ratings are sourced from rating agencies, bond yields from the OECD, the IMF and Haver Analytics, Government effectiveness refers to the World Bank Worldwide Governance Indicators, and all other data is sourced from the IMF’s World Economic Outlook (WEO) database. Ratings refer to long-term foreign currency ratings, converted into a 1-to-21 numerical scale, whereby 21 refers to AAA and 1 refers to a default (although for Moody’s rating for Japan we consider the long-term local currency rating.)¹³

Our main model specification is a pooled Tobit regression that allows for a censored upper bound. Because the rating scale is bounded, without properly accounting for censoring, coefficients may be biased. Therefore, in writing out the Tobit likelihood function, we first define an indicator function I :

$$I(y) = \begin{cases} 1 & \text{if } y < y_H \\ 0 & \text{if } y \geq y_H \end{cases}$$

where y is the average rating and y_H refers to AAA.

Next, let φ be the standard normal probability density function, Φ be the standard normal cumulative distribution function, β the vector of estimated coefficients, σ the estimated standard deviation and i stands for the year. Then the likelihood function is:

¹² Government effectiveness is proxied by the World Bank’s Government Effectiveness Indicator. It is scaled to zero mean and unit standard deviation.

¹³ When comparing long-term foreign currency and local currency ratings, we note that in our sample of OECD and EU countries, since 1990 the difference between foreign currency and local currency ratings has clearly diminished among all three credit rating agencies. The difference has nearly disappeared for Moody’s since 2002 and for Fitch since 2016. The evolution of the rating agencies’ views about sovereign foreign currency and local currency obligations has changed over time; in a 2020 publication, Fitch noted, “the LC and FC credit profiles for any given sovereign are typically indistinguishable at investment-grade level, i.e. ‘BBB-’ and above. [...] For non-investment-grade sovereigns, the potential for divergent credit profiles is greater, particularly for sovereigns that are in or approaching distress, i.e. at the ‘CCC’ level and below.” When a difference between the foreign currency and local currency long-term ratings emerged for most countries in our sample, the local currency rating was higher than the foreign currency rating. Moody’s credit rating for Japan is an exception; the country’s foreign currency rating was higher than its local currency long-term rating for nine years in our sample (in some years substantially higher). This reflected the country’s low foreign currency obligations and high foreign exchange reserves. Fitch’s foreign currency rating for Japan was higher than the agency’s local currency rating for Japan for 10 years in our sample (one notch difference).

$$\mathcal{L}(\beta, \sigma) = \prod_{i=1}^N \left(\frac{1}{\sigma} \varphi \left(\frac{y_i - X_i \beta}{\sigma} \right) \right)^{I(y_i)} \left(1 - \Phi \left(\frac{X_i \beta - y_H}{\sigma} \right) \right)^{1-I(y_i)}$$

The list of indicators X is the natural logarithm of GDP-per-capita, government debt, governance effectiveness, the interaction between government debt and governance effectiveness, the 10-year bond yield spread between JGB and U.S. Treasury, and the unemployment rate. We then allow for a linear time trend and control for the crisis years, adding a single dummy that is 1 in any of the years 2008-2010 and 2020.¹⁴

29. **Overall, the estimated parameters are intuitive and we find a highly significant correlation to suggest ratings are driven by GDP-per-capita, while for government debt high bond yield spreads relative to the U.S. and unemployment are a rating negative (Table 1).** The governance and interaction coefficient for debt and governance are positive and significant, while debt has a negative coefficient. This implies that high debt has a stronger negative rating impact for sovereigns with weak governance. The time trend has a negative coefficient, indicating that over time, rating agencies increased scrutiny. This could either be a response to criticism about lax ratings before the 2008-2009 financial crisis, or due to their regularly updating of rating models to match peer group developments. The positive rating bonus for the crisis dummy supports the argument that rating agencies postponed rating downgrades when countries were hit by symmetric shocks.

30. **Our quantitative rating model for Japan displays already-deteriorating economic fundamentals in the early 90s (Figure 7).** Official ratings were more optimistic until 2002, but then adjusted abruptly to below A+, aligned with our estimated rating. Also from 2010 to 2014, rating agencies downgraded more gradually than our estimated rating would have suggested. Otherwise, our model closely tracked the official ratings.

Table 1. Pooled Tobit Panel Regression Estimation Results

Dependent variable: Average sovereign rating by S&P, Moody's and Fitch

Explanatory variable	Coefficient estimate (β)	Robust t-stat
GDP-per-capita (log)	5.129***	10.73
Government debt	-0.035***	-8.40
Governance	1.569***	5.25
Government debt*Governance	0.012***	4.02
Bond yield spread	-0.343***	-13.02
Unemployment rate	-0.081***	-3.84
Year	-0.151***	-12.99
Crisis (2008-10, 2020)	1.142***	5.62
Constant	303.7***	13.26
Sigma	4.097***	12.11
N	1005	
R^2 (pseudo)	0.294	

Source: Rating agencies, OECD, IMF, Haver Analytics, Authors' estimation.

Note: *** $p < 0.001$

¹⁴ In a robustness test we considered individual dummies for every year and found these dummies followed a close-to-linear trend, except for the crisis years 2008-2010 and in 2020. In each of the crisis years the rating bias was about equal in size. We note that this might have been observed by chance, and potentially this crisis bias might be different for other crises. For our scenario analysis, we consider a gradual fading of the crisis dummy. Please refer to the Appendix for further robustness tests that apply alternative regression models and comments on indicator selection.

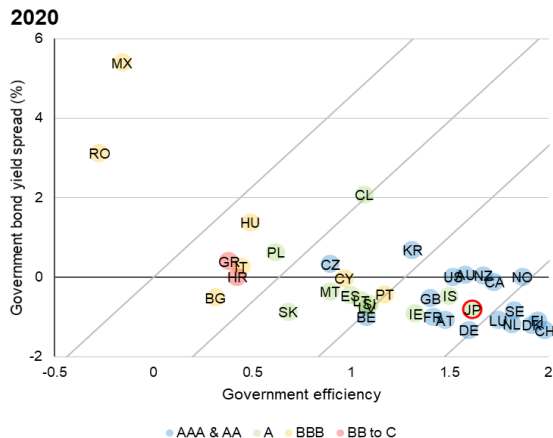
31. **The fundamental rating model considers a time trend and we estimated that compared to 1990, all else being equal, countries in our sample would have been downgraded four notches over the last three decades.** This is because agencies rate sovereigns relative to their peer group, and place a large weight on variables such as economic output that, on average globally, chart a steady increase. This mainly reflects the fact that rating agencies periodically revise their thresholds for quantitative variables, such as GDP-per-capita, for different rating levels. They set these thresholds to specific percentiles of the distribution of countries at a specific point in time. As a result, if the reference panel economies improve their GDP-per-capita on average, then each individual country in our sample needs to outperform the panel to improve its rating in that category. Given this background, the negative estimate shows growth in our sample economies was relatively slower over the past three decades, but this trend was interrupted during the crisis years 2008-2010, and again most recently in 2020 when rating agencies applied softer criteria.

32. **For Japan, we also observe that improvements in economic variables such as GDP-per-capita, governance, and unemployment added positive rating signals (Figure 7), but not sufficient to compensate for the negative trend.** This suggests that the peer group outperformed Japan and partly explains Japan's downgrades over the years. In Japan's favor are its robust labor market – with unemployment rates at around three percent – and strong institutional governance, but its GDP-per-capita today lies at similar levels to countries such as Italy, which is rated in the BBB category (Figure 8).

33. **Next to the economy-relative-to-peers measure, public debt is another major ratings driver.** Japan is the most indebted country in the world, with its debt-to-GDP ratio above 250 percent. In 1990, its debt-to-GDP ratio was at 64 percent, after when it rose steadily until 2014, to plateau at around 235 percent. However, spending related to COVID-19 has added to the burden. On a positive note, our model takes into account different debt-carrying capacities across countries. And we find significant evidence that rating agencies tend to punish countries with weaker institutions – as measured by the World Bank government efficiency indicator – more than those with large debt stocks. For example, Spain with a debt-to-GDP ratio half that of Japan is also single A-rated, because Spain is lower-rated in government efficiency (Figure 9).

34. **In the fundamental model-implied rating, bond yield spreads also become significant.** Japan enjoyed very low yields, below U.S. levels throughout the sample period. Such low yields are common today, given the large central bank bond-buying programs across countries (Figure 10), but a decade ago Japan's sizable negative yield spread to its U.S. counterpart was a distinguishing feature and a justification for its relatively strong rating when considering its large public debt burden (Figure 7).

Figure 10. Bond Spreads and Government Efficiency



Source: Authors' calculation.

Note: Average ratings, government bond yield spread in percent and government efficiency following the World Bank's scale across EU+OECD countries in 2020. Grey lines refer to iso-quantiles of predicted ratings in steps of single notches.

IV. COVID-19 Pandemic and Japan's Sovereign Rating Outlook

A. Impact of the COVID-19 Pandemic

35. **The COVID-19 pandemic has inflicted tremendous impacts on the global economy and Japan.** In 2020, Japan's real GDP contracted sharply by 4.5 percent, reflecting the severe impact of the COVID-19 pandemic. The Japanese government adopted unprecedented large economic stimulus packages amounting to about 52 percent of GDP, including three supplementary budgets in fiscal year (FY) 2020.¹⁵ Japan's economic relief measures mainly focused on providing financial support to affected firms, including SMEs, subsidies for employment retention program, and ways to extend direct cash handouts to all households. Not surprisingly, Japan's fiscal deficit widened sharply from 3.1 percent of GDP in FY2019 to 11.0 percent in FY2020 (Figure 11). For FY2021, the government announced its largest initial budget of JPY106.6 trillion, including JPY5 trillion for a COVID-19 contingency fund. In November 2021, the government announced another sizable economic stimulus package amounting to JPY78.9 trillion, of which government spending would contribute JPY49.7 trillion.

36. **Rating agencies responded to the possible ramifications of the COVID-19 pandemic for Japan in 2020.**

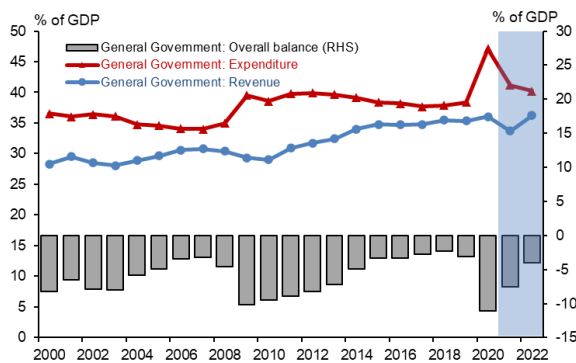
- In July 2020, Fitch changed the outlook on Japan's long-term foreign currency and local currency A ratings from 'stable' to 'negative'. The outlook was revised back to 'stable' in March 2022.
- In June 2020, S&P revised the outlook on its A+ foreign currency and local currency ratings for Japan from 'positive' to 'stable'.

¹⁵ Japan's fiscal year runs from April 1 to March 31, starting one quarter later than the calendar year.

- In contrast, Moody's did not officially take a rating action over this period, and in their refreshed credit opinions maintained its 'stable' outlook for Japan's A1/A+ credit ratings in 2020 and in 2021.

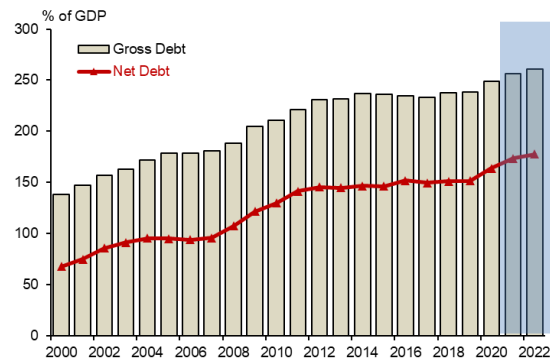
The outlook revisions since 2020 raise questions about the path of Japan's credit ratings after the pandemic, in particular because Japanese government debt is expected to top 260 percent of GDP in coming years, after plateauing over the past decade (Figure 12).

Figure 11. Fiscal Balance



Source: Cabinet Office, AMRO staff projections.
Note: Based on general government debt.

Figure 12. Government Debt



Source: Cabinet Office, AMRO staff projections.
Note: Based on general government debt.

37. **Lasting scars from the prolonged health and economic crisis on Japan's economy may increase the downside risks in medium- to long-term macroeconomic outlooks.** This may further complicate the country's strong commitment to shifting the debt ratio along a downward path over the medium term. Rating agencies also note that Japan has a mixed record with debt consolidation, including over the decade from 2010 to 2020. The gross and net government debt ratio did not decline materially in the post-GFC years (Figure 12) despite favorable conditions such as low interest rates that helped reduce the interest burden on government debt, positive real and nominal GDP growth, and smaller government deficits. The lasting scars from the COVID-19 pandemic across the economy will amplify the negatively impacts on potential medium-term growth expected from an aging of Japan's population and the consequent declining workforce.

38. **That said, Japan's strong external position within the general global fiscal deterioration may provide buffers against downgrades.** Despite Japan's high government debt, its sovereign ratings have benefited from the country's substantial foreign exchange reserves, strong external positions, robust private savings, and very high domestic ownership of government bonds. The prospect for Japan's sovereign rating outlook will depend on whether these country-specific positive factors suffice to fully, or partially, offset downward pressures on its credit ratings. Another balancing factor will be how strictly credit rating agencies maintain their assessment standards after the pandemic, because Japan will not be the only country whose fiscal position is severely affected by the COVID-19 crisis.

39. **Existing unusually easy monetary policies will likely still support market-implied ratings for the next few years, as discussed in Section III.** In March 2021 the BOJ announced the results of its policy review after the Monetary Policy Meeting, undertaking policy framework fine-tuning to sustain the effectiveness of its monetary strategy and

operations. Most market economists interpreted this to mean it was paving the way for a longer period of loose monetary policy, with the policy rate implied from money market instruments expected to remain unchanged over the next three years. The market consensus does not expect to see an end to the BOJ's QQE any time soon, suggesting prolonged strong support for bond market sentiment and sovereign credit valuations.

B. Long-term Outlook for Japan's Sovereign Rating

40. **To establish long-term projections for Japan's sovereign ratings, we use our fundamental model estimation results, taking two steps.** In the first stage, we draw on key assumptions about Japan's macroeconomic and financial circumstances during the post-pandemic periods which would, in turn, affect the government debt's trajectory. We also incorporate structural and demographic factors, including rising social security spending and government efficiency. Based on the scenarios, we obtain long-term projections for Japan's government debt-to-GDP ratio. In the second step, we build long-term projections for Japan's sovereign ratings by applying the model estimates to our forecasts on Japan's GDP-per-capita, unemployment rate, government debt, bond yield spreads, and governance efficiency.

Macroeconomic Scenarios

41. **As a first step, we formulate a set of three scenarios — *Reform*, *Baseline*, and *Adverse* — on key macroeconomic and financial variables through to FY2030.** Japan's potential growth had declined from four percent in the early 1990s to near zero during 2010-2011, according to BOJ data (Figure 13). The potential growth rate recovered to around one percent during 2013-2015, supported by Abenomics economic stimulus and structural reform policies, before declining gradually during 2016-2019. One pivotal consideration in our scenarios is the economic fallout from the COVID-19 pandemic, which might lead to a temporary, or permanent, reduction in Japan's long-term growth potential depending on the duration of the crisis. For modeling a crisis dummy, we assume the COVID-19 pandemic leaves lasting scars on the global economy, and that credit rating agencies will maintain their COVID-19 bonus in full throughout 2021, before fading it out linearly up until 2024. In all three scenarios we assume a gradual normalization of U.S. monetary policy, such that the future path of the 10-year U.S. Treasury bond yield fall would align with financial market expectations.¹⁶

42. **The *Reform* scenario assumes Japan's economy can gain growth momentum post-pandemic by successfully transforming into a digitalized economy using fully integrated information and communication technology.** Accordingly, potential growth rates increase, mainly driven by higher total factor productivity and capital stock accumulation. Under the *Reform* scenario, real GDP growth reaches 1.6 percent by FY2030, with CPI inflation at two percent. The 10-year JGB yields are assumed to gradually rise to 1.5 percent by FY2030, widening the spread over the U.S. Treasury from the 2020 level, albeit at a slower pace than in the *Baseline* scenario. Government efficiency is assumed to improve gradually alongside enhanced private sector productivity.

¹⁶ Long-term projections of 10-year government bond yields are constructed from the Bloomberg's forward curve matrix, reflecting prevailing market expectations on April 23, 2021.

43. The **Baseline scenario** assumes the economic impact of the COVID-19 pandemic is short-lived and Japan's potential growth reverts to a pre-crisis downward trend as the working-age population shrinks. Under this scenario, real GDP growth is expected to gradually slow to 0.8 percent by FY2030 (Figure 14), while unemployment rates slowly increase to 2.7 percent (Figure 15). CPI inflation will remain 0.7 percent, far below the BOJ's inflation target (Figure 16). On the long-term interest rates, alternative paths are considered for 10-year JGB yields – one constructed from market expectations (Baseline 1, Figure 17) and the other assuming no change in the BOJ's YCC policy (Baseline 2, Figure 17). In both cases, the long-term bond yield spreads are forecast to widen from 2020 levels, which affects Japan's sovereign rating outlook positively. Throughout, government efficiency is assumed to remain unchanged, proxied by the World Bank's Government Effectiveness Indicator (Figure 18).

44. The **Adverse scenario** assumes that the scars of the COVID-19 pandemic last a long time, which implies negative supply shocks and permanent damage to Japan's growth potential. Under this scenario, real GDP growth will converge to zero, and CPI inflation drops to 0.1 percent by FY2030. The 10-year JGB yields are assumed to remain at around zero, widening the spread over the U.S. Treasury significantly from the 2020 level – and government efficiency is assumed to gradually decline.

Figure 13. Potential GDP Growth

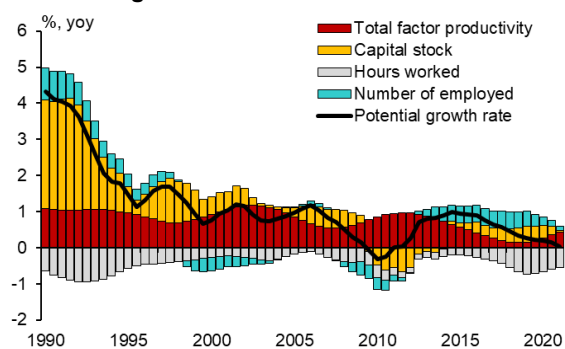


Figure 14. Real GDP Scenario

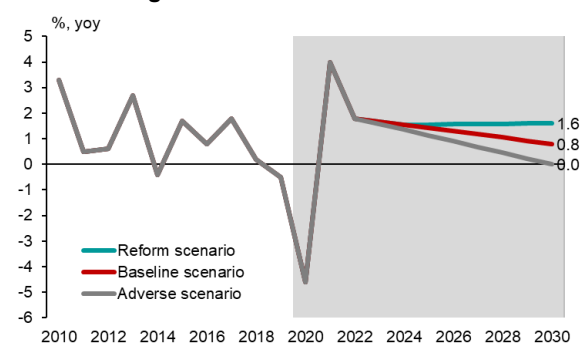


Figure 15. Unemployment Rate Scenario

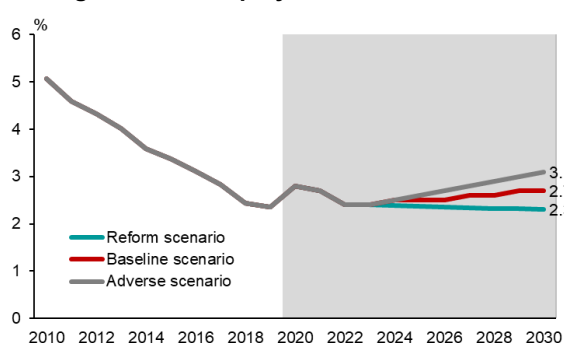


Figure 16. CPI Inflation Scenario

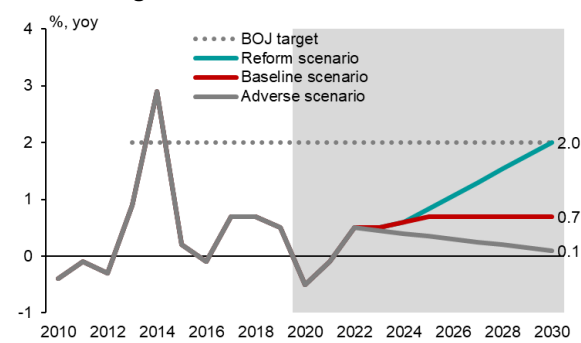
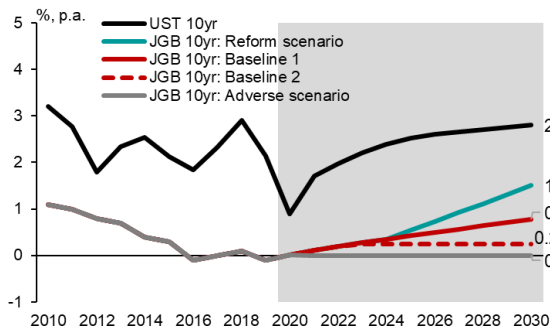
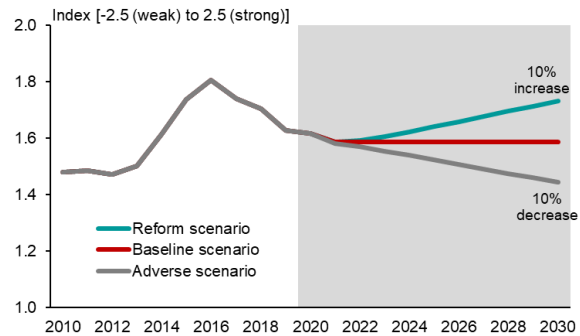


Figure 17. Long-term Interest Rate Scenario



Source: Ministry of Finance Japan, Haver Analytics, U.S. Congressional Budget Office, authors' estimation.

Figure 18. Government Efficiency Scenario



Source: World Bank, authors' estimation.
Note: Based on 3-year moving averages.

Fiscal Outlook

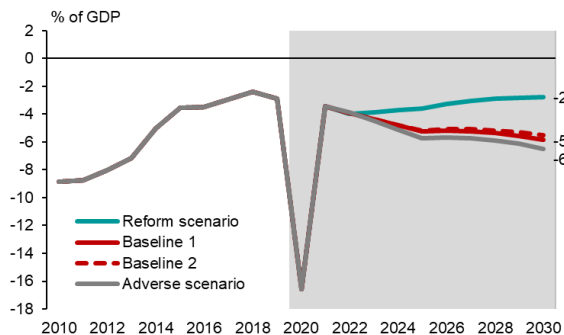
45. **Japan's fiscal balance is projected to keep running post-pandemic deficits under all scenarios, driven mainly by ballooning social security spending.** To establish general government long-term revenue projections, we assumed tax-to-GDP ratios broadly in line with Cabinet Office long-term forecasts, while interpolating social contributions from the government's latest projections released in 2018. For expenditure, we forecast social security benefits using government projections, assuming that government expenditures other than social security spending will keep increasing at the growth rate of nominal GDP-per-worker, following the related literature (e.g., Doi, Hoshi and Okimoto, 2011). However, structural mismatches between social security benefits and contributions will weigh on the government's fiscal burden, regardless of the scenario considered (see Box A on "Cost of Aging Population in Japan").

- **Under the *Reform* scenario, by FY2030 government revenue is expected to increase to 36.4 percent of GDP, while expenditure is likely to moderate to about 39.1 percent of GDP.** A successful digital transformation, leading to technological progress in the healthcare sector, could reduce per-capita healthcare spending, compared to the level assumed in the *Baseline* scenario. Even though these healthcare sector reforms would not be sufficient to reduce expenditure as a percentage of GDP by FY2030, the reforms would contribute to a gradual improvement in fiscal deficits to 2.8 percent of GDP by FY2030.
- **Under the *Baseline* scenario, the fiscal deficit is projected to widen gradually to 5.9 percent of GDP by FY2030, after recovering from 16 percent of GDP in FY2020 to 3.4 percent of GDP in FY2021 (Figure 19).** Government revenue is forecast to remain flat during the forecasting horizon, at about 35 percent of GDP, with the contributions from tax revenues at about 18 percent of GDP and social security contributions at about 14 percent. In contrast, government expenditure is projected to gradually increase to 42 percent of GDP in FY2030 from 38 percent of GDP in FY2019. As a key driver, social benefits-related expenditures will increase to 25 percent of GDP in FY2030 from 21 percent of GDP in FY2019. The debt servicing burden will likely continue to shrink because interest payments are expected to drop to 0.9 percent in FY2030 from 1.6 percent of GDP in FY2019 due to the lagging effects of a prolonged ultra-easy monetary policy.

- Under the *Adverse* scenario, the fiscal deficit is projected to deteriorate to -6.5 percent of GDP.

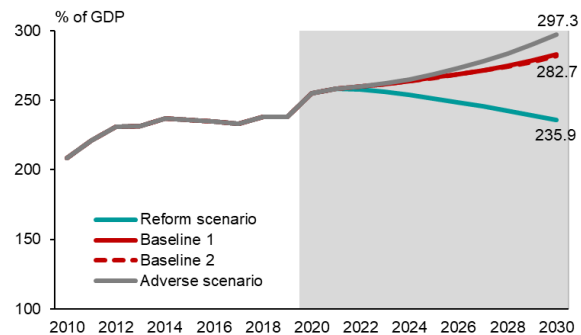
46. **Government debt is expected to increase to over 280 percent of GDP by FY2030 under the *Baseline* scenario.** In contrast, under our *Reform* scenario, the debt will contract to 236 percent of GDP by FY2030, after peaking at 258 percent of GDP in FY2021 (Figure 20). Comparing the projected debt dynamics for the various scenarios, indicates that the only way to reverse the trend increase in debt/GDP ratio from persistent primary balance deficits is through stronger economic growth and higher inflation (Figure 21 and 22).

Figure 19. Fiscal Balance Projection



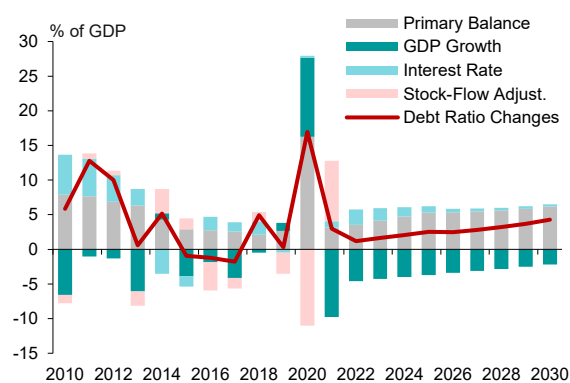
Source: Cabinet Office, authors' estimation.

Figure 20. Government Debt Projection



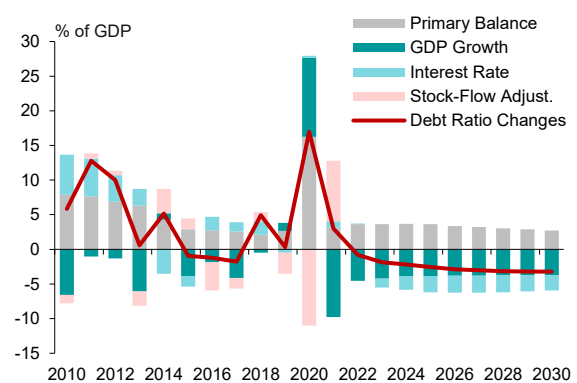
Source: Cabinet Office, authors' estimation.

Figure 21. Debt Dynamics: *Baseline* Case



Source: Cabinet Office, authors' estimation.

Figure 22. Debt Dynamics: *Reform* Case

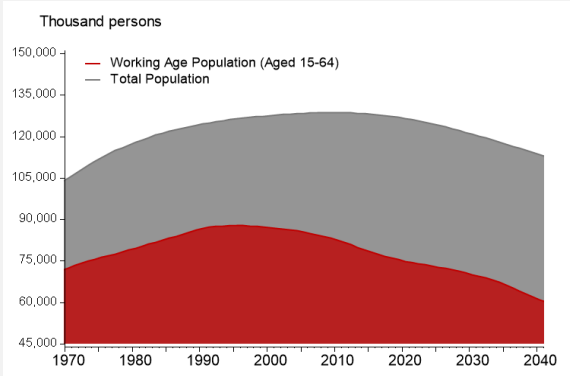


Source: Cabinet Office, authors' estimation.

Box A. Cost of Aging Population in Japan

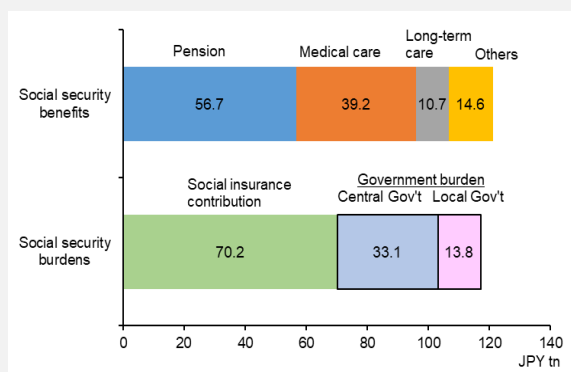
Structural mismatches in social security benefits and contributions will continue to weigh on the government's fiscal burden. Japan's population peaked in 2008 at 128 million and has been declining ever since (Figure A1). This aging demographic structure has increased the government's fiscal burden as it addressed gaps between social security benefits and contributions (Figure A2). Projections show the share of the old-aged (65 or above) will account for more than one-third of the total population by 2040 (Figure A3). The increase in social security spending will accelerate, given the expected higher medical and long-term care expenditure per capita for the elderly, especially those aged 75 years and over (Figure A4). By interpolating the government's long-term projections of social security balances, we expect that the gap between social security benefits and social insurance contribution will continue to widen, leading to a higher fiscal burden (Figure A5 and A6).

Figure A1. Long-term Projection for Japan's Population



Source: United Nations, Haver Analytics.

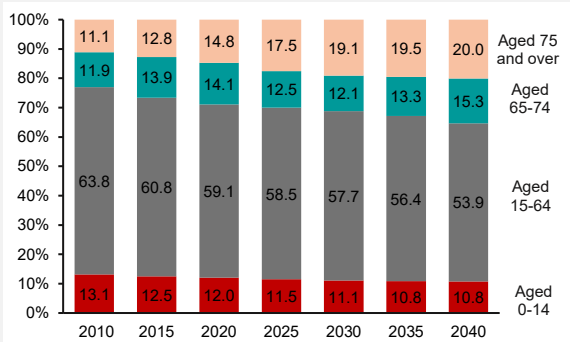
Figure A2. Social Security Benefits and Burdens, FY2020



Source: Ministry of Health, Labour and Welfare Japan.

Note: Based on the initial budget.

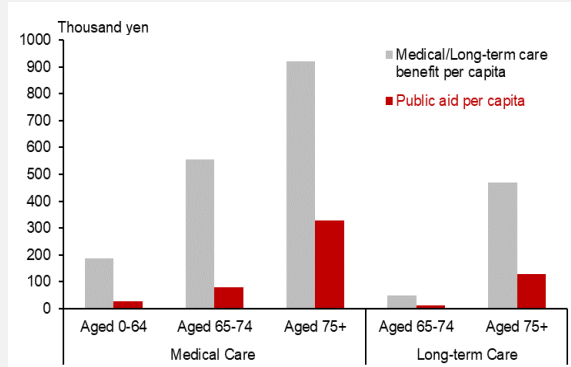
Figure A3. Long-Term Projection for Japan's Demographic Structure



Source: National Institute of Population and Social Security Research (IPSS), United Nations, authors' calculations.

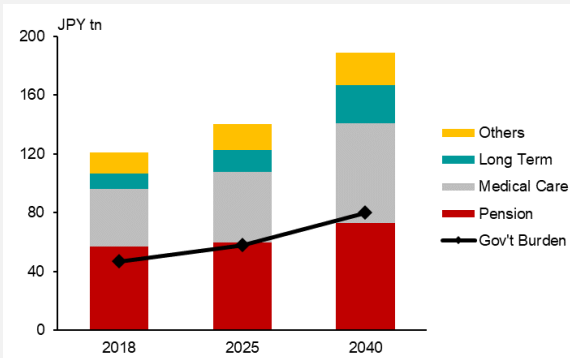
Note: Based on medium-fertility and medium mortality assumptions. The percentage compositions of the aged 75 and over and those aged 65-74 are estimated by using the shares from the UN Population Projection.

Figure A4. Per-capita Social Security Benefits by Age, 2018



Source: Ministry of Finance Japan.

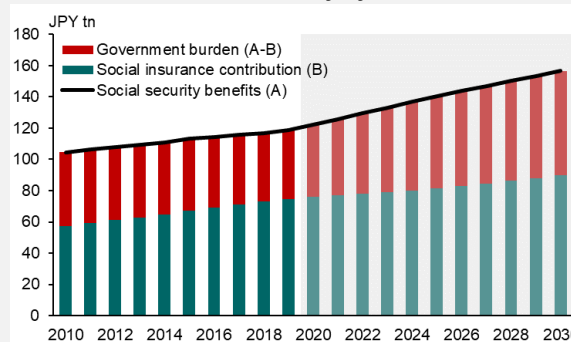
Figure A5. Long-term Projection for Social Security Burden



Source: Cabinet Secretariat, Cabinet Office, Ministry of Finance, Ministry of Health, Labour and Welfare Japan.

Note: Based on the government's projections under baseline scenario (May 2018).

Figure A6. Long-Term Projection for Budget Support to Social Security System



Source: Cabinet Secretariat, Cabinet Office, Ministry of Finance, Ministry of Health, Labour and Welfare, authors' estimation.

Note: Interpolations were made on the government's long-term projections for social security benefits and contributions in FY2025 and FY2040 under the baseline scenario (May 2018).

Sovereign Rating Outlook

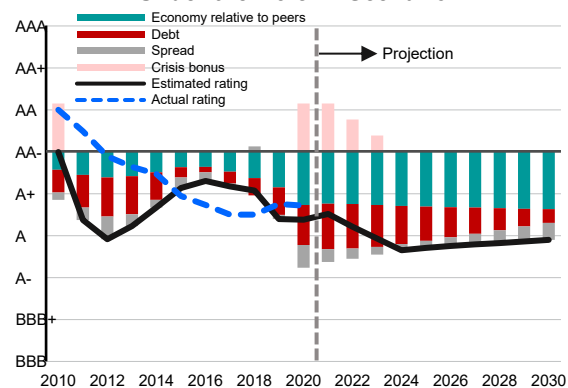
47. Our fundamental rating model forecasts one- to three-notch sovereign rating downgrades for Japan in the coming decade, depending on the scenarios considered.

Our fundamental rating model suggests that the two main drivers of sovereign rating adjustments are a country's economic performances relative to peers, and its government debt position. Under the *Reform* scenario, we expect Japan's sovereign rating to be downgraded to A by one notch (Figure 23), and under the *Baseline* scenario by two-notches to A- (Figure 24 and 25). However, our *Adverse* scenario would lead to a three-notch sovereign rating downgrade to BBB+ (Figure 26). Our long-term projections for fundamental model-implied ratings point to the downside risk that Japan's sovereign ratings could fall into a range of BBB. This exercise highlights the importance of establishing Japan's fiscal consolidation back on track post-pandemic, and poses policy challenges to boosting potential growth by structural reforms.

- **Our *Reform* scenario would point to a downgrade by one notch by FY2024, mainly because of the lagging impact of debt accumulation during the pandemic.** After that downgrade, no further rating adjustment is anticipated because the positive debt-reduction impact will likely be offset by shrinking spreads between Japanese bond yields over U.S. Treasury bonds (Figure 23). The growth momentum turns more positive under this scenario, so economic competitiveness relative to the peers would become less ratings-negative and stabilize somewhat. High economic growth also helps reduce Japan's government debt-to-GDP ratio, which in turn alleviates the debt stock's large adverse impact on the rating. However, the nominal interest rate on 10-year JGBs can be expected to rise to 1.5 percent by the end of FY2030 alongside the higher growth, which could then increase effective interest payments over time and offset some of the gains from higher economic growth.
- **The *Baseline* scenarios suggest a downgrade of Japan's average A+ rating by two notches to A- during the next decade, driven by a slowing growth momentum and expanding government debt.** Under the *Baseline* scenario, Japan's government debt will increase another 30 percentage points in the next 10 years, while economic growth will continue to decelerate. Our fundamental rating model suggests this move would justify a one-notch rating downgrade when the crisis bonus phases out towards FY2024, followed by pressure for another ratings downgrade by FY2030 (Figure 24 and 25). The downward trend in growth within this scenario would render Japan's economy less competitive than the peers with which Japan currently shares similar sovereign ratings. Increased debts would also continue to adversely weigh on the rating after the initial drag during the pandemic crisis. The 10-year JGB interest rates are expected to gradually inch higher, to reach either 0.25 percent, assuming no changes in the BOJ's YCC policy (Figure 25, *Baseline* 2), or 0.8 percent, reflecting market expectations (Figure 24, *Baseline* 1) by the end of FY2030. Both cases will lead to a widening of the bond yield spreads between the U.S. and Japan, which would positively affect Japan's sovereign ratings.
- **Under the *Adverse* scenario, Japan's sovereign rating is projected to deteriorate by three notches to BBB+, with much slower growth and faster debt accumulation.** This three-notch downgrade to an unprecedented BBB level is mainly

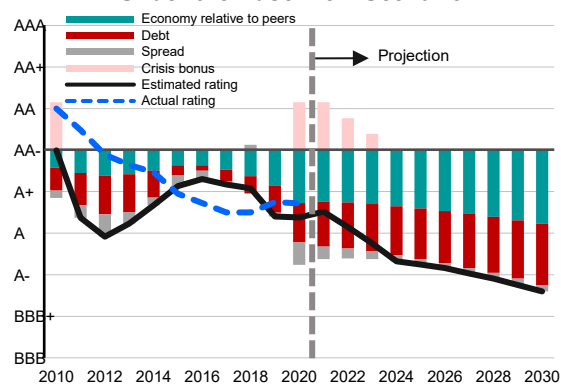
attributable to a persistent loss in any growth momentum hit hard by the COVID-19 pandemic, along with an even faster accumulation of government debts (Figure 26), which in this scenario will likely approach 300 percent of GDP by FY2030.

Figure 23. Fundamental Model-Implied Rating Under the Reform Scenario



Source: Authors' estimation.

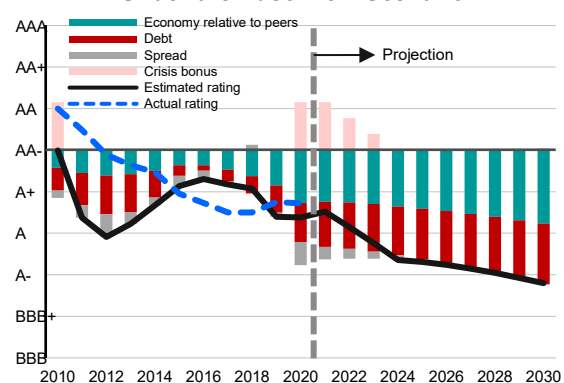
Figure 24. Fundamental Model-Implied Rating Under the Baseline 1 Scenario



Source: Authors' estimation.

Note: Baseline 1 assumes long-term projection of 10-year JGB yields in line with market expectations.

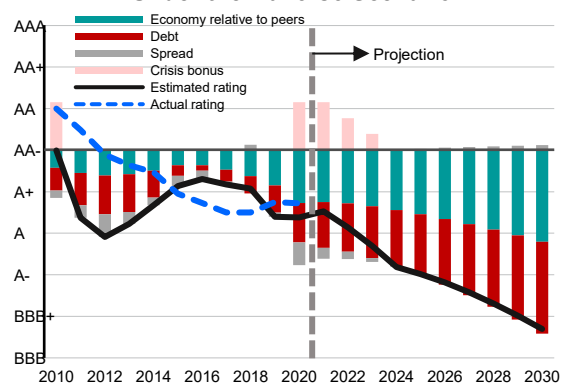
Figure 25. Fundamental Model-Implied Rating Under the Baseline 2 Scenario



Source: Authors' estimation.

Note: Baseline 2 assumes the long-term projection of 10-year JGB yields with the BOJ's YCC policy unchanged.

Figure 26. Fundamental Model-Implied Rating Under the Adverse Scenario



Source: Authors' estimation.

48. **Nevertheless, credit rating agencies may still recognize Japan's unique characteristics when assessing its sovereign credit rating. This will depend on Japan being able to maintain the strengths as circumstances change. Japan's key strengths are discussed as follows:**

- A strong capacity to finance government debt: Japan has demonstrated a strong capacity to fund its high debt, mainly because of a very high share of domestic investors in its sovereign bonds at over 95 percent, so the default risk is consequently much lower. JGB issuances benefit from Japan's historically high private savings, which are, to some extent, a mirror image of government borrowings. In contrast, many other economies – including some highly indebted southern European countries. – owe most of their sovereign debts to foreign creditors

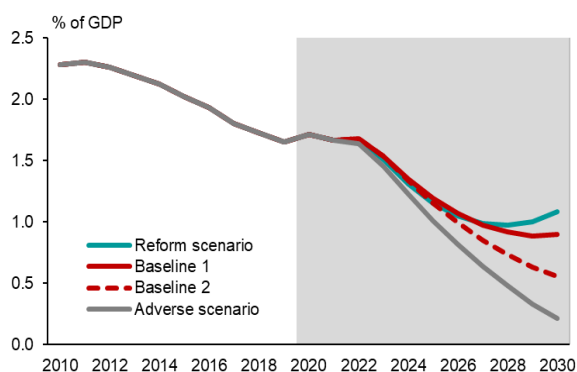
- The position of the Japanese yen as an international reserve currency: Japan benefits from the foreign currency reserve status of the Japanese yen,¹⁷ which contributes to Japan's status as an international safe haven. The three main credit rating agencies assign an uplift for Japan in their credit assessment because the yen is a reserve currency. Their rationale is that a country with a reserve currency benefits from stable international demand for its currency, so liabilities and assets denominated in that currency benefit from such demand. This reduces the risk that the country might lose funding for its liabilities (i.e. government debt). In Moody's sovereign rating model, all else being equal, Japan's reserve currency benefit provides a final credit rating uplift of approximately one notch.¹⁸
- Japan's exceptionally strong external position: Japan's external finances are very strong, supported by sizable current account surplus. It held a net external creditor position of over 50 percent of GDP in 2020 (IMF, 2021), a much higher standing than that of the typical level of A or AA countries. Japan is the world's largest net external creditor country and at over 66 percent of GDP (or USD 3,441 billion) in 2020, its net international investment position is the highest in the world in nominal value (IMF, 2021).
- Robust institutions and overall governance: Standards of governance and the quality of public institutions are very strong. Japan obtains an average World Bank Governance Indicator score in the 89th percentile of all countries ranked by the World Bank's 2021 edition, establishing Japan's governance strength at a comparable level with many AA and even a few AAA-rated countries.

49. **Even within a drastic rating downgrade scenario, JGB interest rates may not rise significantly if the BOJ continues to employ its ultra-easy monetary policy, as assessments based on the market-implied ratings show.** Even if Japan's sovereign ratings were downgraded to BBB+ under the *Adverse* scenario, domestic investors' strong home-bias and historically low interest rates (Figure 27) would continue to help the government maintain its debt financing capacity with low borrowing costs. However, any continuation of the ultra-easy monetary policy in the *Adverse* scenario would be an ominous sign that the economy might well continue losing growth momentum. The impact on Japan's stock markets of any possible downgrade to BBB+ is difficult to foresee because it has never occurred. The stock markets responded only marginally to past sovereign rating downgrades, except in May 2002 when the rating was revised down two-notches from Aa3 to A2 (Figure 28).

¹⁷ As of Q1 2021, about six percent of official foreign currency reserves were held in the yen (source: IMF Currency Composition of Official Foreign Exchange Reserves database).

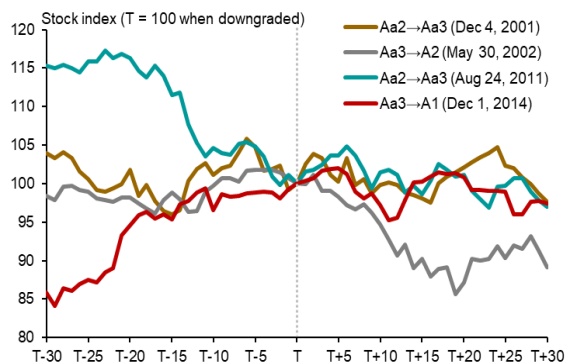
¹⁸ Moody's is most explicit in the way it gives an uplift to countries with a reserve currency. Countries with a reserve currency explicitly receive a different fiscal strength assessment in Moody's methodology. Reserve currency countries' debt burden carries much lower weight (10%) than in the assessment for non-reserve currency countries (50%). Moreover, Moody's assigns a greater weight to the debt burden criterion for reserve currency countries (90%) than for non-reserve currency countries (50%).

Figure 27. Effective Interest Payment Ratio



Source: Cabinet Office, authors' estimation.

Figure 28. Stock Market (Nikkei 225) Responses to Japan's Sovereign Rating Downgrades

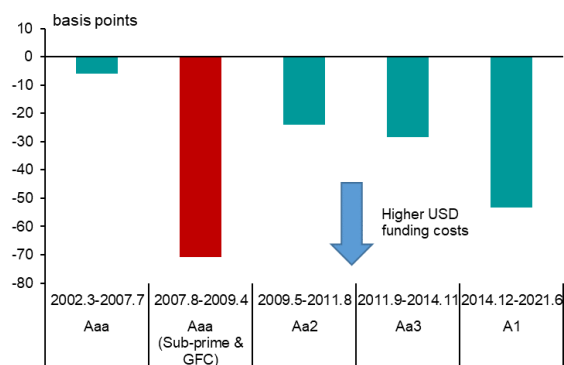


Source: Haver Analytics, authors' calculation.

Note: T indicates the dates when Moody's announced to downgrade Japan's long-term local currency ratings.

50. However, the ramifications of any rating downgrades to Japanese sovereign debt could emerge in higher foreign currency funding costs and lower private sector credit ratings. Sovereign rating downgrades for Japan might eventually bring about a rise in foreign currency funding costs, as occurred in past episodes (Figure 29). Given Japan's continued expansion in overseas investments, a sequence of sovereign rating cuts may exacerbate the financial burden for Japanese firms, and financial institutions such as life insurance companies and regional banks. And any government-debt credit rating downgrades could negatively impact the credit ratings for Japanese firms. This credit rating spillover effect, from sovereign to corporates, tends to be more significant for firms with a pre-downgrade rating equal to or above the sovereign rating, as Almeida et al. (2016) shows empirically (Figure 30).

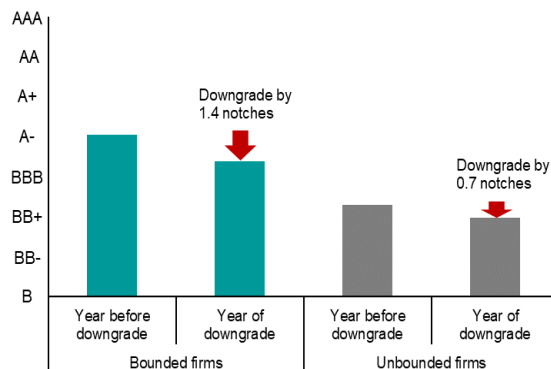
Figure 29. USD/JPY 3-Month Basis Swap Spreads



Source: Bloomberg, authors' calculation.

Note: Based on the period averages of daily USD/JPY OIS basis swap spreads; Each rating indicates Moody's long-term foreign currency ratings on Japan.

Figure 30. Effect of Sovereign Rating Downgrades on Corporate Ratings



Source: Almeida et al. (2016).

Note: Based on the difference-in-differences matching estimation for corporate ratings around a sovereign downgrade with the median of 1-notch). Bounded (unbounded) firms indicate the one whose rating equal to or above (below) the sovereign rating. The sample covers nonfinancial firms from 13 countries, including Japan, from 1990 to 2013.

51. A downgrade to BBB+ in the Adverse scenario is unlikely to have any significant impact on JGB interest rates, taking into account the potential BOJ policy reaction, but it might dampen international investor demand for JGB securities. Many official institutional investors have minimum credit rating requirements for eligible sovereign issuers. The Swedish Riksbank, for example, has a minimum credit rating requirement for issuers

issuing debt securities of A- (Sveriges Riksbank, 2020). In the *Adverse* scenario, investors with credit rating requirements above BBB+ would no longer be able to undertake new investments in JGB securities, and might have to reduce existing JGB holdings. If we conservatively assume half of the official foreign exchange reserves allocated to Japanese yen as of Q1 2021 were invested in JGB securities, and that international investors could, over time, no longer invest this in JGB securities, foreign demand for Japanese sovereign debt would cumulatively decrease by about USD 350 billion (approximately three percent of Japan's 2021 sovereign debt).¹⁹ Moreover, index investors, such as those tracking the popular FTSE World Government Bond Index, would have to reconsider their JGB portfolio if the *Adverse* scenario were to occur, because the inclusion criteria includes a minimum entry with A- by S&P and A3 by Moody's. Also, within the FTSE World Government Bond Index²⁰ the Japanese yen portfolio represented 16.5 percent of total market capitalization in June 2021; with some USD 2.5 trillion tracking this index²¹, any one percent underweight from index investors would lead to an outflow of USD 25 billion.

V. Conclusions

52. Our combined assessment, using market- and fundamental model-implied ratings, provides a more balanced view of Japan's sovereign rating outlook. By their nature, market-implied ratings tend to reflect short-term market dynamics, offering more focus on government's funding costs and sovereign credit risks, proxied by CDS spreads. This leads to more positive implied-ratings than the actual ratings, particularly since 2013. This is in part the result of the BOJ's prolonged easy monetary policy with the NIRP, followed by the QQE with YCC policy. In contrast, fundamental model-implied ratings focus mainly on explaining sovereign ratings using macroeconomic fundamental, financial and institutional variables. Our fundamental rating model has captured the key drivers that determined a deterioration in Japan's sovereign rating over the past three decades, while pointing to potential sovereign rating downgrades by one- to three-notches under the different scenarios. Our analysis suggests that Japan's long-term risk on sovereign rating downgrades could be shouldered by the private sector through higher foreign currency funding costs as well as lower credit ratings.

53. The active role of fiscal policy will continue to be pivotal in the short term to combat any prolonged economic impact from the COVID-19 pandemic. Given the possibility of recurring virus infection waves, fiscal support measures will be needed to protect lives and livelihoods, with well-targeted spending and swift implementation to help the hardest-hit households and industries essential to promote packages efficacy. Having said that, fiscal stimulus packages tend to focus on maintaining existing economic circumstances with direct cash handouts and financing support rather than enhancing the economy's longer-term productivity.

54. The risk of further sovereign downgrades highlights the need for government to recalibrate its fiscal consolidation plan and secure long-term fiscal sustainability once the pandemic subsides. The considerable fiscal stimulus rolled out in FY2020 means the government's target to achieve a primary balance surplus by FY2025 is no longer feasible, so a recalibration is required to avoid a fiscal cliff in coming years. Our scenario analysis suggests

¹⁹ IMF Currency Composition of Official Foreign Exchange Reserves database shows 692.1 billion USD of official foreign exchanges reserves was allocated in yen at the end of Q1 2021.

²⁰ Based on FTSE World Government Bond Index Factsheet published in June, 2021.

²¹ "FTSE Russell confirms Chinese sovereign bonds to join WGBI index", Nikkei Asia, March 30, 2021.

fiscal deficits would remain sizable even under the *Reform* scenario, driven mainly by increased social security spending. Key policy considerations to wrench fiscal consolidation back on track are as follows:

- Fiscal spending should be directed toward supply-side reforms to boost productivity by accelerating digitalization, rather than to provide demand support, with the Japanese government mindful that it is very difficult to shrink fiscal expenditure once it is allocated – as demonstrated after the GFC. In this regard, consideration should be given to establishing an independent fiscal institution, similar to most other advanced economies, notably the U.S. Congressional Budget Office (CBO) and the U.K. Office for Budget Responsibility (OBR). Such an institution would enhance the oversight of budgets and government compliance with medium- to long-term fiscal goals.
- Tax revenues could be raised further, from various sources. One example would be to restructuring the property tax by reducing too-broad preferential treatments. Another would be to change the inheritance tax to trim an existing wide range of exemptions. Raising green/environment taxes, such as carbon tax, could be considered, given the modest level compared to other countries. And further raising consumption tax rates might be an option in the long-term, although this is infeasible immediately because only two years have passed since a 2019 increase.
- Medical and long-term care benefits need to be contained to curb rising social security-related spending. Increasing insurance co-payments for high-income earners would be one right move while physician-induced overtreatments should be monitored closely to control ballooning medical costs.
- To reduce the increasing fiscal burden of public pensions – expected to be depleted by around 2050 – the government needs to intensify efforts to incentivize pensioners to supplement public pensions with private alternatives by providing tax preference or deduction.

55. Structural reforms, including measures toward digitalization, should be further accelerated to boost Japan's long-term growth potential. To cope with chronic labor shortages in a rapidly aging population, Japan should continue to expand the scope to receive foreign workers. Furthermore, the COVID-19 pandemic has revealed weaknesses in the capabilities of the Japanese economy to deal with the crisis. Structural reforms should be accelerated, in particular the realm of digitalization, where Japan lags behind the world; the 2020 World Digital Competitiveness Ranking, compiled by the International Institute for Management Development (IMD), ranks Japan 27th globally and seventh in Asia out of 63 countries. A strong and steadfast government commitment to structural reform would translate this unprecedented COVID-19 pandemic crisis into an opportunity for the aging society to transform itself into a highly digitalized, more vibrant economy with greater growth potential. The promotion of digitalization throughout the economy should be a policy priority, helping to encourage telecommuting, remote medical consultations, and online services activities such as e-shopping, e-learning, and e-banking. Changes to telecommuting working styles would help reduce labor shortages by mobilizing Japan's capable female workforce at home and the government should upgrade the public sector through digital transformation, while preserving its institutional strength compared to its peer rating group.

References

- Afonso, A., 2003. "Understanding the Determinants of Government Debt Ratings: Evidence for the Two Leading Agencies." *Journal of Economics and Finance*, 27(1), pp. 56-74.
- Afonso, A., Gomes. P. and Rother P., 2007. "What Hides Behind Sovereign Debt Ratings." *ECB Working Paper Series* No. 711, January 2007.
- Afonso, A., Gomes. P. and Rother P., 2010. "Short-and Long-Run Determinants of Sovereign Debt Credit Ratings." *International Journal of Finance and Economics*, January 2010.
- Afonso, A., Furceri, D. and Gomes, P., 2012. "Sovereign Credit Ratings and Financial Markets Linkages: Application to European Data." *Journal of International Money and Finance*, 31(3), pp. 606-638.
- Almeida, Heitor, Igor Cunha, Miguel A. Ferreira and Felipe Restrepo, 2016. "The Real Effects of Credit Ratings: The Sovereign Ceiling Channel." *Journal of Finance*, 72(1), pp. 249-290.
- Bank of International Settlements, 2011. "The Impact of Sovereign Credit Risk on Bank Funding Conditions." *CGFS Papers*, No. 43.
- Bedendo, Mascia, and Paolo Colla, 2015. "Sovereign and Corporate Credit Risk: Evidence from the Eurozone." *Journal of Corporate Finance*, 33, pp. 34-52.
- Borensztein, Eduardo, Kevin Cowan, and Patricio Valenzuela, 2013. "Sovereign Ceilings "Lite"? The Impact of Sovereign Ratings on Corporate Ratings." *Journal of Banking & Finance*, 37(11), pp. 4014-4024.
- Cantor R., and Packer F., 1996. "Determinants and Impact of Sovereign Credit Ratings." *Federal Reserve Bank of New York Economic Policy Review*, pp. 37-54.
- Creal, Drew D., Robert B. Gramacy, and Ruey S. Tsay, 2014. "Market-Based Credit Ratings." *Journal of Business & Economic Statistics*, 32(3), pp. 430-444.
- Doi, Takero, Takeo Hoshi and Tatsuyoshi Okimoto, 2011. "Japanese Government Debt and Sustainability of Fiscal Policy." *Journal of the Japanese and International Economies*, 25(4), pp. 414-433.
- Ferri, G., L.-G. Liu and J.E. Stiglitz, 1999. "The Procyclical Role of Rating Agencies: Evidence from the East Asian Crisis." *Economic Notes*, 28(3), pp. 335-355.
- Financial Crisis Inquiry Commission, 2011. *The Financial Crisis Inquiry Report: Final Report of the National Commission on the Causes of the Financial and Economic Crisis in the United States*. New York: Public Affairs.
- Financial Times, 2015. "Is Japan in danger of a fiscal crisis?", February 23, 2015.
- Flannery, Mark J., Joel F. Houston, and Frank Partnoy, 2010. "Credit Default Swap Spreads as Viable Substitutes for Credit Ratings." *University of Pennsylvania Law Review*, 158(7), pp. 2085-2123.
- Forbes, 2017, "When Will Japan's Debt Crisis Implode?", December 11, 2017.

Gande, Amar, and David C. Parsley, 2005, "News Spillovers in the Sovereign Debt Market." *Journal of Financial Economics*, 75(3), pp. 691-734.

Gärtner M., Griesbach B. and Jung F., 2011. "PIGS or Lambs? The European Sovereign Debt Crisis and the Role of Rating Agencies." *International Advances in Economic Research*, 17(3), pp. 288-299.

Holton, Sarah, Martina Lawless and Fergal McCann. 2014, "Firm Credit in the Euro Area: A Tale of Three Crises." *Applied Economics*, 46(2), pp. 190-211.

Hoshi, Takeo and Takatoshi Ito, 2014. "Defying Gravity: Can Japanese Sovereign Debt Continue to Increase Without a Crisis?" *Economic Policy*, 29(77), pp. 5-44.

International Monetary Fund, 2021. *Balance of Payments and International Investment Position Statistics*, updated 28 April 2021.

Kou, Jianming and Simone Varotto, 2005. "Predicting Agency Rating Migrations with Spread Implied Rating." *ISMA Center Working Paper*, University of Reading.

Lennkh, A. and Moshammer E., 2018. "Sovereign Ratings: An Analysis of the Degree, Changes and Source of Moody's Judgement." European Stability Mechanism, *Working Paper Series* Volume 2018, No. 27.

Mellios, Constantin and Eric Paget-Blanc. 2006. "Which Factors Determine Sovereign Credit Ratings?" *European Journal of Finance*, 12(4), pp. 361–377.

Moody's, 1998. "Rating Action: Moody's Changes The Outlook for Japan's Country Ceilings for Foreign Currency and the Domestic Currency Rating of the Government to Negative." April 1998.

Moody's, 1998. "Moody's Lowers the Ratings of the Government of Japan as well as the Foreign Currency Country Ceilings for Japan." November 1998.

Moody's, 2010. "Narrowing the Gap – A Clarification of Moody's Approach to Local versus Foreign Currency Government Bond Ratings." February 2010.

Moody's, 2013. "Sovereign Bond Ratings Methodology." September 2013.

Moody's, 2016. "Moody's Market Implied Ratings: Description, Methodology, and Analytical Applications." July 2016.

Mora, Nada, 2006. "Sovereign Credit Ratings: Guilty beyond Reasonable Doubt?" *Journal of Banking and Finance*, 30(7), pp. 2041-2062.

Poon, Winnie, Iftexhar Hasan, Gaiyan Zhang, Jianfu Shen, 2016. "Are Market Implied Ratings Viable Alternatives to Credit Ratings?" The 23rd Annual Conference of the Multinational Finance Society (MFS), Stockholm, Sweden.

Qian, Zongxin, Wendun Wang and Kan Ji, 2017. "Sovereign Credit Risk, Macroeconomic Dynamics, and Financial Contagion: Evidence from Japan." *Macroeconomic Dynamics*, 21, pp. 2096–2120.

Sinclair, Timothy, J. 2003. "Global Monitor, Bond Rating Agencies." *New Political Economy*, 8(1), pp. 147-161.

Sveriges Riksbank, 2020. "Regulations for the Gold and Foreign Exchange Reserves." October 2020.

Tsuji, Chikashi, 2005. "The Credit-Spread Puzzle." *Journal of International Money and Finance*, 24(7), pp.1073–1089.

Vernazza, D.R. and Nielson E.F., 2015. "The Damaging Bias of Sovereign Ratings." *Economic Notes*, 44(2), pp. 362-408.

Appendix. Fundamental Rating Model Robustness Tests

Our main model specification (1) is a pooled Tobit regression. See Section III for a detailed description and Figure A.1 for a graphical cross-country comparison of actual and predicted ratings.

As a robustness test for whether the linear time trend is appropriate, in the model specification (2) we replace the linear time trend and the crisis dummy with year fixed effects. The results are virtually unchanged, as seen in Table A.2. Model (1) is to be preferred, given its lower complexity.

To assess the impact of censoring in the specification (3) we estimate a simple pooled OLS regression. Coefficients for GDP-per-capita and government debt are very much different from the main model specification, hinting that censoring is indeed relevant and model (1) is capturing this bias.

In models (1)-(3) we do not account for country fixed effects, because the aim is to explain not only changes, but also the actual country rating levels. As a robustness check, in the model (4) we estimate a fixed-effects panel regression. This specification controls for omitted variable bias when this heterogeneity is constant over time. As to be expected, slow-moving indicators GDP-per-capita and governance effectiveness are no longer significant when allowing for clustered standard errors. However, interacting with government debt, governance remains significant. The coefficient for bond yields is slightly lower, otherwise, signs and magnitude of the remaining indicators remain broadly unchanged.

Unlike the static panel model (4), in the dynamic panel data model (5) we consider lagged ratings as a regressor. Including a lagged dependent variable as a regressor violates strict exogeneity, because the lagged dependent variable is likely to be correlated with the errors. We apply the Arellano-Bond estimator to correct for this bias. The coefficients are similar to the fixed effects regression, but governance and its interaction with debt are no longer significant.

To test for structural breaks, in Table A.3. we compare our preferred model (1) using the full sample, with estimates on subsamples (6) limiting to the years 2008 and earlier, and (7) the years 2009 and later. We find that all coefficients maintain their signs and most are also consistent in magnitude. Unemployment rate and governance tend to be more important drivers recently, while GDP-per-capita lost significance.

For our baseline model, we selected nine regressors, which all turned out to have high explanatory power while also offering good data availability across countries and time. To test that selection we estimate a lasso regression, and found that all nine regressors remain valid for a lambda corresponding to the minimum cross-validated mean squared error. We considered further regressors as explanatory variables. The coefficient of GDP growth turns out to be negative, because countries with lower levels of GDP tend to grow faster (catching up), but tend to have lower ratings.

If we consider the interaction between GDP-per-capita level and its GDP growth, variations in growth rates have little rating impact on countries at GDP-per-capita levels of Japan. We considered inflation, inflation squared, and, to correct for outliers, its log-transformations. We

find that high and low inflation is a significant credit negative, but with relatively small coefficients. The high primary balance we found as credit negative. This might be explained by fiscal consolidation to correct for imbalances. The current account balance was not significant, however larger net international investment position is a strong credit-positive. Private sector debt we found a significant credit negative, but with relatively small coefficients.

As a dependent variable for our baseline model, we consider the average rating of S&P, Moody's and Fitch. For all agencies and countries, we consider the long-term foreign currency rating, except for Moody's rating for Japan, where we consider the long-term local currency rating. As a robustness test, we re-estimated the model, applying foreign currency ratings throughout, and the results are broadly unchanged. When applying local currency ratings, the signs of coefficients are unchanged, however, the interaction between government effectiveness and debt is no longer significant. In that specification, government effectiveness, unemployment rate and the time trend have a larger weight. In addition, the pseudo- r^2 of 0.34 is higher than the pseudo- r^2 of the baseline specification at 0.29. Nevertheless, we prefer the baseline model specification where countries in the sample were generally lower-rated, for its conservatism.

Table A.1. Transformation of Long-Term Issuer Credit Ratings to Numerical Values

Numerical value	Fitch	Moody's	S&P
21	AAA	Aaa	AAA
20	AA+	Aa1	AA+
19	AA	Aa2	AA
18	AA-	Aa3	AA-
17	A+	A1	A+
16	A	A2	A
15	A-	A3	A-
14	BBB+	Baa1	BBB+
13	BBB	Baa2	BBB
12	BBB-	Baa3	BBB-
11	BB+	Ba1	BB+
10	BB	Ba2	BB
9	BB-	Ba3	BB-
8	B+	B1	B+
7	B	B2	B
6	B-	B3	B-
5	CCC+	Caa1	CCC+
4	CCC	Caa2	CCC
3	CCC-	Caa3	CCC-
2	CC	Ca	CC
1	C	C	SD/D
0	RD/D	No value	No value

Figure A.1. Actual Rating and Predicted Ratings by Model Specification (1)

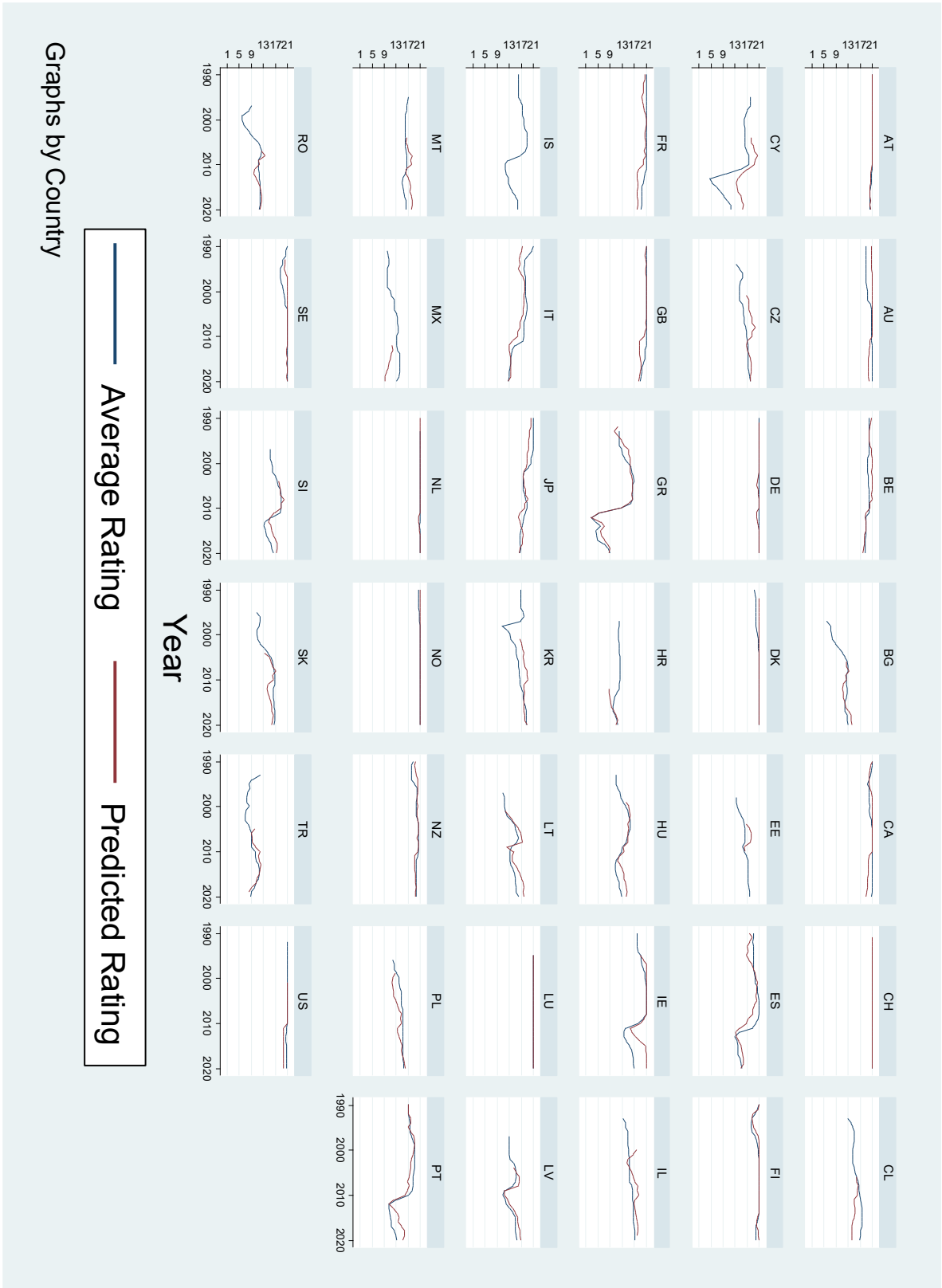


Table A.2. Panel Regression Estimation Result by Model Specification (1)-(5)

Average Rating	(1) Tobit	(2) Tobit Year-FE	(3) Pooled OLS	(4) Country-FE	(5) Arellano- Bond
GDP-per-capita (log)	5.129*** (10.73)	4.990*** (10.40)	2.690*** (9.24)	2.515 (1.52)	-0.152 (-0.22)
Government debt	-0.0345*** (-8.40)	-0.0333*** (-8.27)	-0.0280*** (-6.74)	-0.0686*** (-6.71)	-0.0188** (-2.72)
Governance	1.569*** (5.25)	1.596*** (5.36)	1.733*** (7.63)	0.332 (0.39)	-0.220 (-0.52)
Gov.debt*Governance	0.0118*** (4.02)	0.0107*** (3.76)	0.0138*** (4.56)	0.0231*** (3.69)	0.00482 (1.38)
Bond yield spread	-0.343*** (-13.02)	-0.392*** (-12.66)	-0.327*** (-12.94)	-0.195*** (-3.85)	-0.217*** (-8.21)
Unemployment rate	-0.0811*** (-3.84)	-0.0825*** (-3.89)	-0.0851*** (-4.54)	-0.131** (-2.73)	-0.0429* (-2.11)
Year	-0.151*** (-12.99)		-0.116*** (-12.34)	-0.0613* (-2.23)	-0.0207 (-1.22)
Crisis (2008-10, 2020)	1.142*** (5.62)		0.923*** (5.75)	0.798*** (5.01)	0.284** (3.27)
Average Rating (lag)					0.680*** (14.32)
Constant	303.7*** (13.26)	3.765** (2.61)	240.0*** (12.92)	134.7* (2.67)	49.37 (1.52)
Sigma	4.097*** (12.11)	3.969*** (11.80)			
<i>N</i>	1005	1005	1005	1005	946
<i>R</i> ² (pseudo)	0.294	0.299	0.764	0.669	

Source: Authors' estimation.

Note: Robust *t* statistics in parentheses, Country-FE and Arellano-Bond estimator standard errors are clustered by country.* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.3. Panel Regression Estimation Result by Model Specification (1), (6)-(7)

Average Rating	(1) Tobit Full Sample	(6) Tobit Before 2008	(7) Tobit After 2008
GDP-per- capita (log)	5.129*** (10.73)	6.935*** (13.98)	3.193*** (5.43)
Government debt	-0.0345*** (-8.40)	-0.0213*** (-3.88)	-0.0255*** (-4.85)
Governance	1.569*** (5.25)	0.812* (2.23)	3.329*** (9.42)
Gov.debt*Governance	0.0118*** (4.02)	0.00470 (1.26)	0.00235 (0.61)
Bond yield spread	-0.343*** (-13.02)	-0.319*** (-9.90)	-0.314*** (-7.22)
Unemployment rate	-0.0811*** (-3.84)	0.0563** (2.64)	-0.191*** (-5.60)
Year	-0.151*** (-12.99)	-0.166*** (-8.28)	-0.185*** (-4.83)
Crisis (2008-10, 2020)	1.142*** (5.62)	0.826** (2.63)	1.098*** (4.27)
Constant	303.7*** (13.26)	325.5*** (8.13)	377.6*** (4.91)
Sigma	4.097*** (12.11)	2.075*** (11.22)	5.059*** (8.63)
<i>N</i>	1005	528	477
<i>R</i> ² (pseudo)	0.294	0.355	0.279

Source: Authors' estimation.

Note: Robust *t* statistics in parentheses.* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

European Stability Mechanism



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