

Global Aging 2023: The Clock Ticks

January 18, 2023

Key Takeaways

- The pace of structural reform implementation has slowed as governments have focused on competing priorities in recent years. Yet, without continued or new policy measures, the worsening demographic outlook has increased the risk that rising age-related expenditure could become unsustainable for some sovereigns.
- While in absolute terms, old-age dependency ratio and age-related expenditure are notably lower today in emerging versus advanced economies, their increase is far steeper on average than that of advanced economies, implying that the scale of the policy adjustment required to offset rising aging pressures is for now greater in emerging market sovereigns.
- In the absence of policy action to cut age-related spending, the median net general government debt will rise to 102% of GDP in advanced economies and 155% of GDP in emerging economies by 2060.
- In such a no-policy-change scenario, just over half of the 81 sovereigns we have analyzed would have credit metrics that we associate with speculative-grade sovereign credit ratings ('BB+' or below) by 2060, according to our simulation of hypothetical long-term sovereign ratings and credit metrics.

PRIMARY CREDIT ANALYSTS

Samuel Tilleray

London
+ 442071768255
samuel.tilleray
@spglobal.com

Marko Mrsnik

Madrid
+34-91-389-6953
marko.mrsnik
@spglobal.com

SECONDARY CONTACT

Marius Schulte

Frankfurt
+49 6933999240
marius.schulte
@spglobal.com

RESEARCH CONTRIBUTORS

Purnima Nair

CRISIL Global Analytical Center, an
S&P affiliate, Mumbai

Prapti Mohanty

CRISIL Global Analytical Center, an
S&P affiliate, Mumbai

Governments worldwide face a ticking clock as the global population grows increasingly older. Rising age-related expenditure could become unsustainable for several sovereigns amid declining fertility rates, rising interest levels, and steep government debt. In the seven years since S&P Global Ratings published "Global Aging 2016: 58 Shades of Gray," an assessment of the potential credit implications of aging for sovereign states, governments have borrowed extensively to soften the fallout on households and companies from a series of shocks, including the COVID-19 pandemic and the war in Ukraine. Meanwhile, following the trend of developed sovereigns, fertility rates have continued to decline worldwide, which has worsened most sovereigns' demographic profiles--perhaps most acutely those of middle-income emerging sovereigns.

Frequent electoral cycles and a plethora of global economic emergencies have diminished most governments' capacity to focus on the long term, even as central banks' ability and willingness to use their own balance sheets to soften shocks is elapsing. The resulting pressures on public finances--from high government debt and rising interest rates--are leading many governments to focus on the near term, and to delay contentious pension reforms until the distant future. Unfortunately, this does not diminish the problem of rising age-related spending. Indeed, the

scale of the ongoing demographic transition and its likely manifold effects on societies risks becoming unmanageable if left ignored.

One of S&P Global Ratings' core assumptions is that governments will prioritize servicing bonded debt over other fiscal promises, including pension liabilities. In developed economies, this assumption has rarely been tested, particularly not at average debt-to-GDP ratios as elevated as they are now. Broadly speaking, governments have three pathways in the face of rising demographic pressures, each involving their own set of political and economic costs:

- Making pension or other age-related reforms that arrest either the rise in age-related expenditure or the worsening in age-dependency ratios;
- Taking other offsetting fiscal measures, such as raising taxes, reducing spending on non-age-related items, except interest payments; or
- Running consistently higher deficits and effectively kicking the can down the road.

A combination of all three is possible, but procrastinating governments will be drawn to the third option, risking the peril of markets still reeling from quantitative tightening.

For advanced economy sovereigns, there is some good news: namely, that at the beginning of our simulation period (2025 for this report) we expect improved budget balances relative to our 2016 assessment. In a minority of cases, this reflects targeted actions aimed at containing age-related spending, including through raising retirement ages, adjusting calculation or indexation formulas, and increasing contribution rates, although we note that the pace of these structural reforms appears slower than in our last report. Compared with our 2016 results, this implies that for a subset of mostly developed sovereigns with better assumed medium-term fiscal balances due to age or other fiscal reforms, the downward trajectory on sovereign ratings between 2025 and 2060 because of age-related pressures is less steep than in the past. Therefore, a larger number of advanced sovereigns should be able to retain their investment-grade status. By contrast, our simulation (which assumes public finances will be in "autopilot mode", as described below) suggests that the median emerging market sovereign would be less likely to retain investment-grade ratings, despite relatively higher long-term economic growth prospects and lower starting points in most emerging market economies with respect to age-dependency ratios and age-related expenditure. Indeed, higher projected increases in age-related spending over the long-term horizon significantly affect emerging market sovereigns' long-term creditworthiness prospects. For emerging market governments--as in advanced economies--decisive action in stabilizing escalating age-related expenditure would pay a steady dividend over many years to come, in the form of healthier public finances and lower associated amounts spent on debt financing. Alternatively, delaying difficult reforms could push public debt to unsustainable levels in a number of rated sovereigns, or force governments to abruptly cut real spending outlays for households.

While S&P Global Ratings does not expect such a widespread, calamitous outcome, there is a conceivable scenario whereby the costs of this transition, both fiscal and political, increase because they are left unaddressed. Governments may find themselves forced to make large, unpopular spending cuts in age-related expenditure items. And high inflation and rising interest rates are not helping; during 2023, backward indexation of pension expenditure will add to fiscal pressures after a year of multi-decade-high inflation levels across much of the developed and emerging world.

On average, and mostly because of the stronger medium-term fiscal deficits that S&P Global Ratings analysts now expect for advanced economies, our long-term debt simulations for sovereigns are lower than they were in 2016. Despite this, we believe that nearly all countries will

face a steep, demographically driven deterioration in public finances in the absence of adjustments in social safety net costs combined with policies that boost growth. Our updated study shows that despite the substantial progress made to date, the projected magnitude of the future fiscal burden will require additional measures.

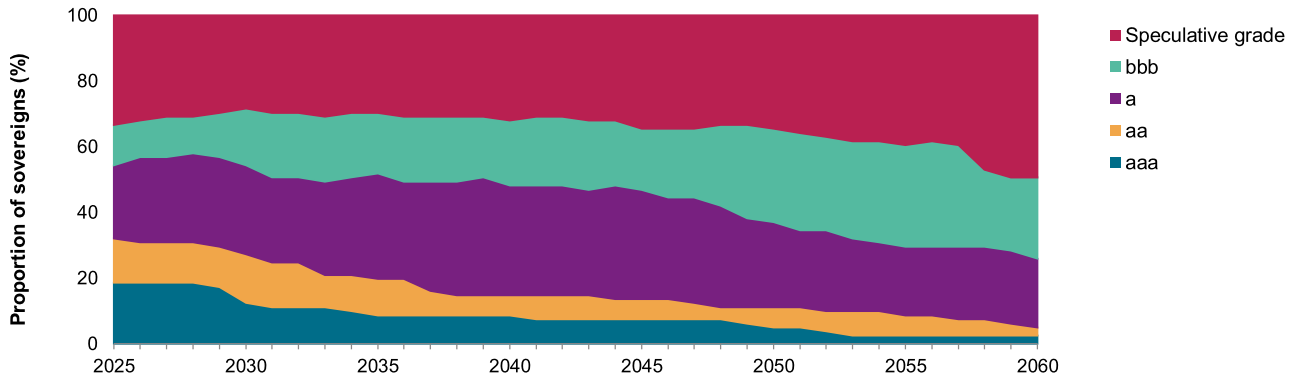
According to our simulated hypothetical scenario in which nations take no further measures to plan for aging populations, and incorporating the dynamics of aging-dependent public expenditure programs and interest payments, the financial burden on most sovereigns will gradually increase, leading to deteriorating fiscal indicators from about the mid-2020s and an accelerating worsening, particularly from the mid-2030s, with significant differences among sovereigns. These estimates include the following expectations:

- Most governments will be on a path of fiscal consolidation until at least 2025, although in several countries progress will stall, particularly in 2023. Beyond 2025, the impacts of an aging population on government fiscal expenditure will begin to worsen fiscal balances, at first gradually, but then accelerating and becoming more noticeable certainly by the mid-2030s.
- The median government will have consolidated its fiscal balance to 2.4% of GDP by 2025 (advanced sovereigns to 1.3% of GDP; emerging market sovereigns to 2.6% of GDP). This will then worsen to 3.4% of GDP in 2035 (2.7% for advanced sovereigns; 4.3% for emerging markets). Left unchecked, these fiscal imbalances will worsen rapidly, owing to the effects of cumulative interest burdens and further aging pressures. Indeed, by 2060 our simulation suggests that, in the absence of reforms to aging-related fiscal policies, the typical government will be running a deficit of 9.1% of GDP (5.6% in advanced sovereigns; 15.9% in emerging markets).
- This would lead to the median general government net debt burden as a percentage of GDP increasing to 49% for all sovereigns by the mid-2030s--and then likely accelerating to about 142% (102% in advanced sovereigns; 155% in emerging markets) of GDP by 2060.

Taking into account these expected future budgetary imbalances and projected economic growth dynamics, we calculate that about half of the 81 sovereigns we have analyzed would have credit metrics that we currently associate with speculative-grade sovereign ratings, compared with about one-third of this sample in 2025 (see chart 1).

Chart 1

Almost half of sovereigns could be marked speculative-grade by 2060
 Hypothetical long-term sovereign rating distribution under "no policy change" scenario



Source: S&P Global Ratings.
 Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

To arrive at this calculation, we introduced a simplified analytical model to simulate the impact on sovereign credit metrics (as explained in detail in the appendix). The model is based on a very limited number of variables compared with those in our sovereign rating criteria (see "Sovereign Rating Methodology," published Dec. 18, 2017), and as such is not as comprehensive as the methodology underlying our sovereign ratings. The hypothetical ratings that this simplified model generates should not be construed as S&P Global Ratings' view of the likely future ratings trajectory; rather, they illustrate the intensity and profile over time of the challenge demographic change poses for sovereign solvency, assuming no mitigating policy action was undertaken. Since the results of this simulation are not sovereign ratings derived by applying our current criteria, we present them in lower case ('aaa', 'aa', etc.).

We anticipate that our hypothetical future credit ratings for our entire sovereign universe would generally be below their present levels. Under the no-policy-change scenario, which assumes no further policy actions to counter demographic fiscal pressures, we see firstly a drop in the number of sovereigns rated in our highest rating categories 'aaa' and 'aa', with an accompanying increase in those appearing in the 'a' category. Eventually, our simulation predicts that the worsening in overall creditworthiness will see a rise in speculative-grade ratings, with the proportion accelerating particularly from the 2050s.

Our projections show that overall, the median advanced sovereign would hypothetically retain investment-grade ratings throughout the period, due to improved budget balances at the beginning of the simulation period, as well as other changes in model assumptions (including our changed interest rate assumption). In total and on average, these effects have been stronger than offsetting impacts from worsened demographic projections. By contrast, we think the median emerging market sovereign would be less likely to retain investment-grade ratings, despite relatively higher long-term economic growth prospects and a healthier starting position in terms of age-dependency ratios and age-related expenditure. Indeed, higher projected increases in age-related spending over the long term significantly affect their future creditworthiness prospects.

We emphasize that these scenarios do not represent an S&P Global Ratings prediction that the

sovereign ratings of many governments will inevitably fall because of demographically related fiscal pressures. In our view, it is unlikely that governments will allow debt and deficit burdens to spiral out of control in the manner outlined above--even if creditors would be willing to underwrite such huge debts. Nevertheless, the scenarios do indicate the scale of the task that governments face in pruning benefits granted by unfunded, state-run social security systems and achieving further budgetary consolidation as well as growth-enhancing policies.

Our Global Aging Study Now Covers 81 Rated Sovereigns

S&P Global Ratings began analyzing the implications of shifting demographics for sovereign ratings in 2002, starting with advanced sovereigns. In May 2006, we published simulations that projected an almost universal deterioration of sovereign creditworthiness in a sample of 32 such sovereigns (see "Global Graying: Aging Societies And Sovereign Ratings," published June 27, 2006). We updated this study in 2007 (see "What A Change A Year Makes: Standard & Poor's 2007 Global Graying Progress Report," published Sept. 19, 2007).

In our 2010 report ("Global Aging 2010: An Irreversible Truth," published Oct. 7, 2010), we widened the geographic coverage of the analysis by adding information on long-term trends in age-related spending in 17 other sovereigns, mainly in emerging markets. Our 2013 report ("Global Aging 2013: Rising To The Challenge," published March 20, 2013) expanded the geographic coverage to 50 sovereigns. Our most recent 2016 report ("Global Aging 2016: 58 Shades Of Gray," published April 28, 2016) increased the coverage to 58 countries.

This report has the broadest reach yet, with 81 sovereigns now covered, capturing nearly four-fifths of the world's population. In addition, we have extended our simulation horizon from 2050 to 2060. However, we no longer track and project unemployment benefits as a component of age-related expenditure, because the link between such spending and age-related pressures appears weaker than it once was, and relates more to cyclical spending. This is in line with the change in methodology of one of our key sources, the European Commission's "2021 Ageing Report".

The old-age dependency ratio will worsen in all countries

We expect that the old-age dependency ratio (the number of elderly population relative to the working age population) will worsen in every country covered, with no exceptions. For most sovereigns, demographers expect the old-age dependency ratio will go further and double by 2060. In Eastern Asia and most of Europe, demographic dynamics appear to be particularly affected by what has been a steadily rising old-age dependency ratio. For sovereigns in large parts of Latin America and Western Asia (in particular the Gulf), the projected demographic shifts look to be significant. Countries in these two regions are also at a relatively nascent stage in their demographic transition, suggesting that (at least for certain sovereigns) current systems to support the elderly may not be appropriately calibrated and will require potentially politically unpopular adjustments. At the other end of the spectrum, demographic projections suggest that sub-Saharan Africa is young and expected to remain young well into our projection horizon up to 2060, with a plausibly manageable demographic shift over this period.

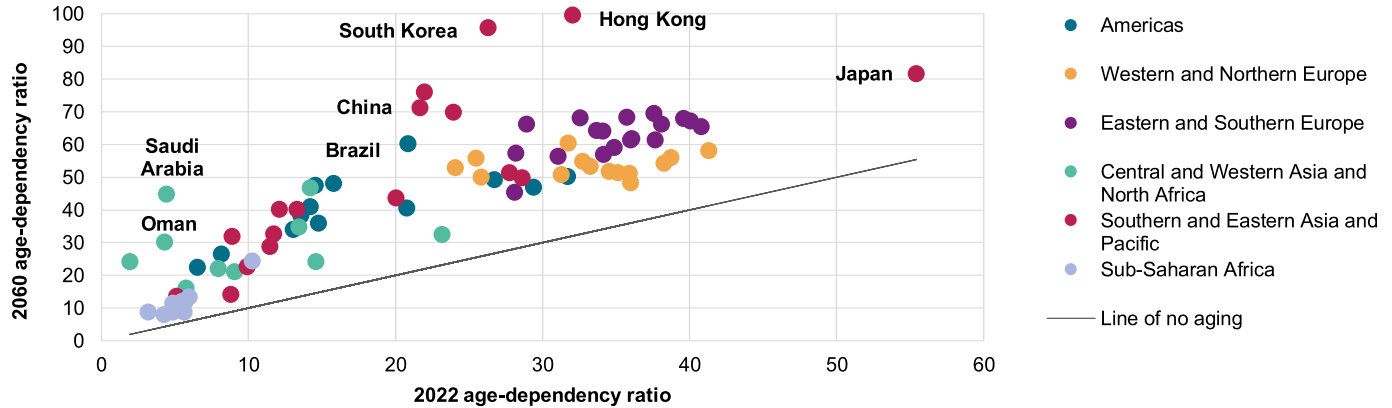
As chart 2 shows, the oldest countries in the world in 2060, as measured by the age-dependency ratio, will predominantly be countries in East Asia. Japan, which currently stands as a clear outlier in the world, will be overtaken by South Korea and Hong Kong, both of which face large shifts in their population profiles. Indeed, when comparing the scale of Japan's demographic shift until 2060 (measured by the vertical distance from the "line of no aging"), Japan no longer looks to be

an outlier. Arguably, at such an advanced stage of its transition, Japan is in a more favorable position than peers, given that its society is already making the necessary adjustments. For example, Japan now has by far the highest employment rate in its elderly population. It is for this reason that Gulf countries such as Saudi Arabia, Oman, and Qatar bear close watching, since their significant demographic shifts come from a starting point of limited elderly populations.

Chart 2

Not all regions will age equally

Shift in age-dependency ratio between 2022 and 2060, by region



Source: S&P Global Ratings.
 Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

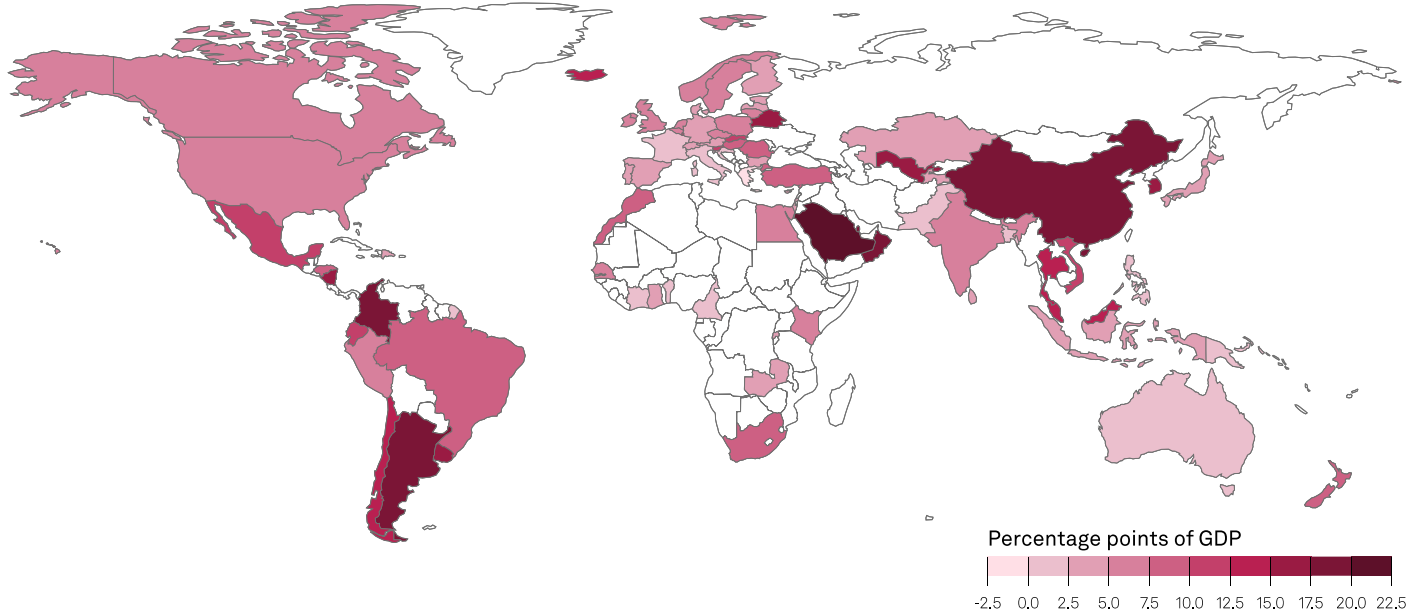
Future Trends In Age-Related Public Spending

In the absence of further policy measures (or unprecedented positive labor productivity shocks), we generally expect that population aging will lead to increases in overall expenditure that are sensitive to demographic change. Our estimates nevertheless suggest that the impact will differ significantly among the countries in our sample, as well as among the individual age-related factors we considered in this study: old-age pensions, health care, and, where data is available, long-term care for the frail. Unlike some other demographic studies, we didn't include education as an age-related spending category. Although the number of pupils and students will likely decline in most countries, it is also likely that spending per student will rise to help ensure satisfactory productivity growth by investing in human capital. We believe this is the case for emerging market sovereigns, as they develop their education systems, as well as for advanced economies, especially where education spending was severely curtailed in the years that followed the global financial crisis of 2007-2009. Although shrinking child-age cohorts could have a dampening effect on public spending thanks to lower benefit outlays, comprehensive data is unavailable, so we have excluded child benefit spending from our long-term fiscal projections. Moreover, the cohort effect may be offset by more generous benefits to encourage the dual objectives of boosting labor market participation and fertility. Overall, pensions remain the biggest spending item, followed by health care and long-term care (see table 1b in the Appendix).

Chart 3

Our simulation suggests large variations across countries in age-related expenditure pressures

Simulated change in age-related spending in "no policy change" scenario, 2022-2060

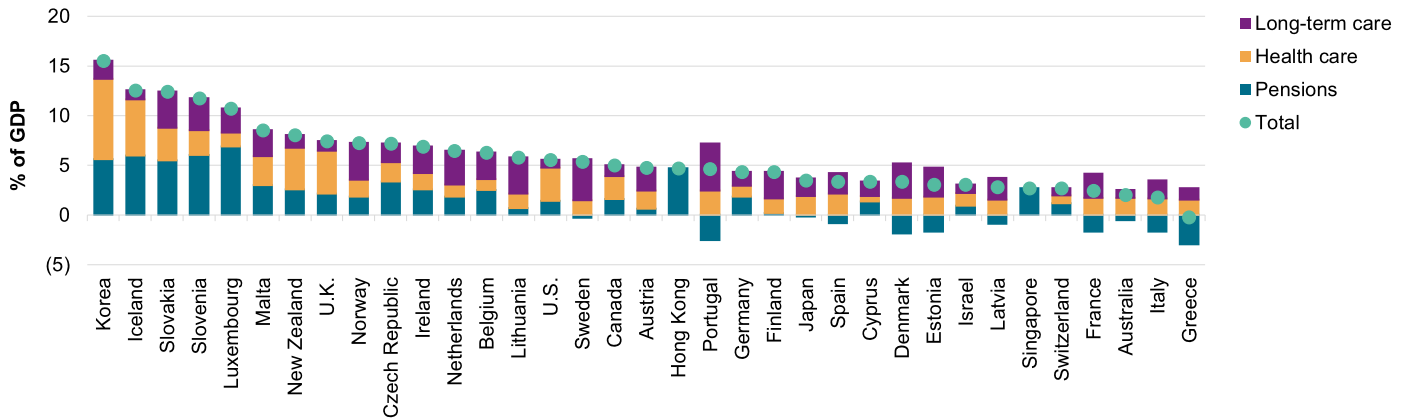


Source: S&P Global Ratings.
Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

Chart 4

Health and long-term care will drive most rich countries' spending pressures, while some countries could enjoy offsetting improvements in pension spending

Simulated change in annual age-related expenditure 2022-2060, by spending category



Source: S&P Global Ratings.
Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

The typical sovereign's pension spending will rise to over 9% of GDP by 2060

We expect pensions (including early retirement, surviving relative, and disability pensions) to rise on average by almost 4.5% of GDP by 2060, in our estimation, to 9.5% of GDP. However, there are large differences between countries. Intuitively, the more distorted a country's demographic profile is, the higher the increase in age-related spending is likely to be. But this is not always the case, because a country can significantly cushion the budgetary effects of aging by restructuring the revenue and spending side of a pension system. In other words, such pressure will more likely arise in sovereigns with growing financial imbalances in social programs, where changes to pay-as-you-go pension or health care systems are still pending, or where the demographic profiles appear to be the most unfavorable.

In general, we expect that the strongest pressure on government budgets stemming from a projected increase in pension spending will be in Saudi Arabia, Belarus, Uzbekistan, and Qatar. Generous public pension payouts combined with a significant expected demographic shift in the Gulf suggest that, without new policy adjustments, such payments could soon become fiscally unsustainable, despite these countries' large sovereign wealth funds. Much will also depend, at least indirectly, on immigration flows and the extent to which they differ from historical averages. Recent history suggests that even amid intense demographic pressures--such as those in Japan and Hungary, for example--immigration policies tend to be relatively rigid, and often politically contentious.

Pension reforms have not led to a significant easing of spending pressures among advanced sovereigns

Numerous changes in pension systems implemented in the advanced economies over recent years have overall not decisively contained the budgetary implications of population aging. In addition, the most recent set of demographic projections, compared with our previous projections, indicates a faster increase in the old-age dependency ratio, mostly driven by smaller population growth projections. In contrast with our previous reports on aging, in which we highlighted the accelerating implementation of pension reforms aimed at improving pension systems' financial sustainability, reforms have not been a key factor in our revised projections, because demographic assumptions appear more important. This suggests that, at least at the aggregate level, there has been some stalling of reform implementation in recent years in advanced economies, despite their gradually aging population profiles (for example, Canada, Czechia, Germany, Italy, the Netherlands, Poland, Slovakia, and Spain). While average retirement ages are (with some exceptions) increasing, this is not happening as quickly as the average life expectancy is rising, implying that the share of adult life spent in retirement continues to increase among most OECD members.

Some individual countries stand as exceptions to the rule, because policy measures have materially affected their revised pension spending projections, while in total other factors such as a worsened outlook for the demographic profile seem to be a more dominant factor. But there is good news, for example in Greece (not uncoincidentally the only sovereign of the 81 covered where we expect a fall in age-related spending by 2060) and Finland, which both implemented major pension reforms that significantly curbed the expected fiscal burden of future pensions. In Lithuania, tighter pension eligibility requirements and the consideration of sustainability factors also led to lower expected fiscal outlays. In Bulgaria, a revision in the accrual rate used in the pension formula has also led to a reduction in the expected cumulative benefit payout. In Estonia, the introduction of a link between the official retirement age and life expectancy by 2027 has also

led to an improved outlook for the long-term sustainability of its pension system. Sweden has increased the minimum retirement age for public worker pensions. At the other end of the spectrum, Slovenia's implementation of adequacy-improving reforms in 2019 is expected to lead to materially higher pension spending over the simulation period. Poland, Denmark, Ireland, Italy, Lithuania, the Netherlands, the Czech Republic, and Slovakia have all either limited the increase in the average retirement age, broadened early retirement opportunities, or both (although Poland's Recovery and Resilience Plan, should it be implemented, will introduce tax incentives to encourage longer working lives, and later retirement). Germany has increased pension benefits for low earners, while lowering their contributions. Meanwhile, Hungary's introduction of a 13th-month pension in 2021 and Lithuania's pension transfer reforms of 2019 have worsened both countries' projections.

Still, the overall trend appears to be that of a relative stabilization in the long-term trajectory of advanced economy pension spending throughout our simulation period, with some exceptions. This bodes well for the pension system's financial sustainability, although it also creates concerns about pension adequacy, especially because significant reductions in pension benefits without the appropriate measures may increase the risk of poverty among beneficiaries, leading to increased social and political pressures. Most recently, the rapid increase in inflation in most countries has triggered demands to increase pensions accordingly to prevent the erosion of purchasing power, and we expect many governments will incorporate this in their 2023 budgets. Concerns around pension adequacy are also already directing future retirees toward alternative sources of retirement income, and we expect this trend to expand.

Emerging market sovereigns face rising pension pressures

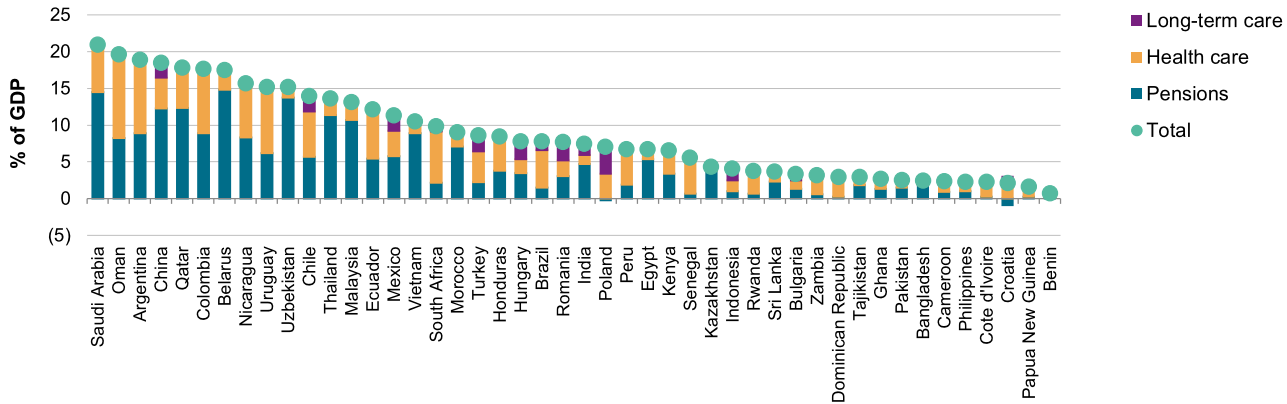
Given the reform efforts among advanced sovereigns, emerging market sovereigns appear on average to be in a comparatively weaker position. This is because of the projected significant shift in their demographic structure, although they typically have relatively lower publicly funded pension system coverage. With a few exceptions, these sovereigns have significantly lower pension spending to GDP than advanced economies. Nevertheless, in our view, the significant future risk to public finances from pensions is underappreciated. Their generally younger populations combined with falling fertility rates mean that old-age dependency ratios are likely to rise faster than for a typical advanced economy, even though by 2060 they may still have relatively lower old-age dependency ratios. It's important to note, however, that these long-term pension projections are based on the assumption that pension coverage and adequacy won't change through the period. The eventual broadening of the pension system's coverage is therefore not incorporated in our projections, and any such adequacy-improving measures would add to the fiscal burden. As these economies develop and their social fabrics change, government welfare spending may well grow faster than GDP--as happened in advanced economies during the latter half of the 20th century.

According to the International Labour Organization's (ILO's) 2020-2022 World Social Protection report, several emerging markets have recently been successful in expanding social protection coverage for their elderly populations--including Bangladesh, Belarus, Ecuador, India, Korea, and Vietnam. In general, this has been achieved through the expansion of noncontributory pension schemes, which give some basic level of social protection for elderly populations, while in some cases contributory schemes have been expanded to previously uncovered sections of the population. Some countries have also introduced tax-financed mechanisms, which increased effective coverage, but--at least by the ILO's reckoning--those schemes often have benefit levels that are inadequate to fully protect older persons from required health and other living costs. While some emerging markets (in particular Armenia and Azerbaijan, not covered in this report)

have in fact reduced effective coverage of their pensions, and others have delivered some important reforms--for example, Brazil's major reforms of 2019 imposed minimum early retirement ages and revised its formula for the calculation of benefits--those countries are largely outliers, and the broader trend observed for emerging markets is a general expansion of pension coverage. And as this continues, the budgetary pressure will grow.

Chart 5

Emerging market sovereigns in general appear to have larger age-related spending pressures, even in our potentially optimistic "no policy change" scenario
 Simulated change in annual age-related expenditure 2022-2060, by spending category



Source: S&P Global Ratings
 Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

Median public health care spending will rise to 6.9% of GDP by 2060

In the wake of the COVID-19 pandemic, health spending has been at the forefront of government agendas. Still, we expect health care spending will surpass its pandemic era peak. Our simulation anticipates that between 2022 and 2060, additional health care spending will be 2.7 percentage points (pps) of GDP higher for the median sovereign. Again, we expect to see stark discrepancies between advanced and emerging market countries, with the median of those groups seeing additional spending of 2 pps and 3 pps of GDP, respectively.

However, rising age-related health expenditure in the coming decades will be partially offset by falling pandemic-related health expenditure, at least in the near term. Although COVID-19-related health care spending is not aimed only at the elderly, it is difficult to fully disentangle from exclusively old-age-related health expenditure. For example, the fact that COVID-19 has higher mortality rates for older persons has meant that a large focus of health care spending (vaccines and treatments) in recent years has been majorly targeted at this population. Arguably, since advanced economies have a greater share of the world's elderly population (certainly on a per capita basis), this effect is more dampening for our estimate of old-age health spending for these countries. Nonetheless, we see advanced economies' median health care spending rising to 7.8% of GDP by 2060, which will be challenging to support in the context of shrinking working age populations.

For the EU sovereigns and Norway, we applied the EU Ageing Working Group (AWG) risk scenario projections that include excess cost growth through technological and institutional changes. As indicated by alternative long-term projections of health care spending, there are real risks that

nondemographic drivers could lead to further increases in health care outlays, beyond the AWG risk scenario. This supports the idea that health care costs will likely be the biggest driver of higher age-related spending in the coming decades.

Population aging implies that in the future there will be more recipients of health care services and fewer contributors to fund the system. Health care spending already represents the majority of the increase in age-related spending for many sovereigns we have reviewed. In our view, this is yet another indicator that, in general, policymakers have focused more on other areas of age-related spending--particularly pensions--while the focus should now shift toward improving the design of health care systems and containing health care spending. In our view, this is explained by the fact that it is technically easier to strengthen pension systems by modifying a few key parameters, because the underlying demographic developments appear rather predictable. Politically, it may also be relatively more feasible, because the sacrifices for the population are usually many years away and myopic voters can often disregard this impact far into the future, or do not fully comprehend it to begin with. In contrast, health sector reform tends to be technically much more complex and involve ethically highly charged trade-offs, while the reduction of service levels can be immediately witnessed by voters, as has been the case since the pandemic in many countries.

For emerging market sovereigns, the task of funding health care systems is likely to be even more difficult. By 2060, our simulation points to the median sovereign needing to allocate 5.6% of GDP in spending for health, up from 2.6% in 2022. For these sovereigns, the challenge of containing future health care costs will be made more daunting by the likely expansion of health care coverage to a wider section of the population, in light of the emerging market sovereigns' growing income levels and increasing demand for wider health care coverage to replace out-of-pocket spending by households. Indeed, ILO data indicate that about a third of the world's population is without any form of legal health coverage, with significant regional variations. For example, coverage is nearly 100% across Europe, but drops to as low as 16% and 23% in sub-Saharan Africa and southern Asia, respectively.

Long-term care costs are also a growing burden

By 2060, we project that the median cost of long-term care for the frail and elderly will increase by 2.2 pps of GDP to 3.5% of GDP for a typical advanced economy. As with our health care projections, for the EU sovereigns and Norway we applied the AWG risk scenario for long-term care, which includes demographics, health status, the impact of additional costs, and the implications of growing income levels, among other things. In addition to the AWG projections, long-term care spending projections are available for some national sources and OECD sovereigns (OECD, 2013). Projections of long-term care dynamics aren't available for all emerging market sovereigns. Currently, in many emerging economies, long-term care depends on informal family networks rather than formal assistance. Still, the increase in median long-term care costs for advanced countries constitutes an upside risk for emerging economies as they expand and as demand for government-financed support grows. At the same time, potential savings from lower spending on education, given the shrinking younger segment of the population pyramid, are likely to be negligible.

Assumptions In Our Simulations

Our spending projections for this study are based on national estimates, multilateral research projects conducted by the European Commission, the IMF, the U.N., the OECD, and S&P Global Market Intelligence's long-term economic projections, and S&P Global Ratings' own calculations.

Global Aging 2023: The Clock Ticks

When interpreting the data and fiscal consequences simulated below, it is important to note that they may not be perfectly comparable from one country to another. Although these international organizations and S&P Global Ratings aim to correct for undue optimism or pessimism in nationally compiled figures, the success of these harmonization attempts can only be partial. Nevertheless, we believe the methodologies underpinning the national and multilateral projections are sufficiently consistent for our analytical purposes, especially over longer timeframes. Where differences exist between international organizations' projections of trends for the same spending item (for example, health care), these ranges can quantify upside or downside risks to the projections.

Based on the 2025-2060 country-specific profiles of age-related government spending (see table 1b in the Appendix), including all the intermediate years not presented, we calculated various scenarios to assess the importance of demography on government budgets, debt burdens, and sovereign credit ratings.

The simulations share two key assumptions, unless stated otherwise:

The "fiscal autopilot"

In this scenario, we assume that government primary balance positions in 2025, as forecast by S&P Global Ratings (see "Sovereign Risk Indicators," published Dec. 12, 2022, and at <http://www.spratings.com/sri/>), are maintained every year throughout the simulation period, excluding the effect of incremental future age-related expenditure after 2025 and changes to interest payments originating from fluctuating government debt levels relative to 2025. In other words, the primary balance of 2025 sets the level of total revenue and non-age-related expenditure as constant throughout the projection period. We selected the 2025 cut-off because we believe it provides an appropriate starting point for simulations of long-term budgetary trends, considering the post-pandemic and energy shock budgetary consolidation expected to be underway among most sovereigns.

Constant not common interest rates

Unlike in our previous reports, we no longer suppose that all countries will trend toward a common assumed interest rate. Instead, each country's interest rate is based on an average of their own observed and expected (by S&P Global Ratings analysts) interest rate over 2020-2022. We chose this period because it has the appropriate blend of observed data points and analyst expectations to remain both robust and recent. While we do not necessarily believe these interest rates would remain constant in reality, this change of assumption allows our simulated fiscal balances to stem mostly from demography-related trends, rather than financial assumptions. Indeed, our prior approach of having a common interest rate meant that for those (mostly emerging market) countries currently facing higher debt costs, the impact of aging pressures was excessively masked by a forced fall in interest costs, and vice versa for the (mostly developed) countries enjoying relatively low interest rates.

From these assumptions, we then simulate debt and deficit trajectories for all sovereigns under a variety of scenarios. Based on the fiscal outcomes, we derive a calculated, hypothetical sovereign rating. In practice, we take a larger number of factors into consideration when deriving our actual sovereign credit ratings (see "Sovereign Rating Methodology," published Dec. 18, 2017). Over the very long term, however, prolonged fiscal imbalances, together with economic growth trends, tend to become dominant factors, which we have captured in our simplified hypothetical sovereign ratings model. As we expanded the scope of our study to include more rated sovereigns, which

makes the sample more heterogeneous, we included GDP per capita as a variable in the hypothetical sovereign rating simulations. To arrive at our anticipated direction of sovereign ratings, we believe it is appropriate to consider each country's simulated general government balance alongside the median budget balance for each rating category, averaged over 2017-2019, together with the level of outstanding debt and GDP per capita on an annual basis. For a more detailed description of the methodology, assumptions and data, please see annex "Methodological And Data Supplement".

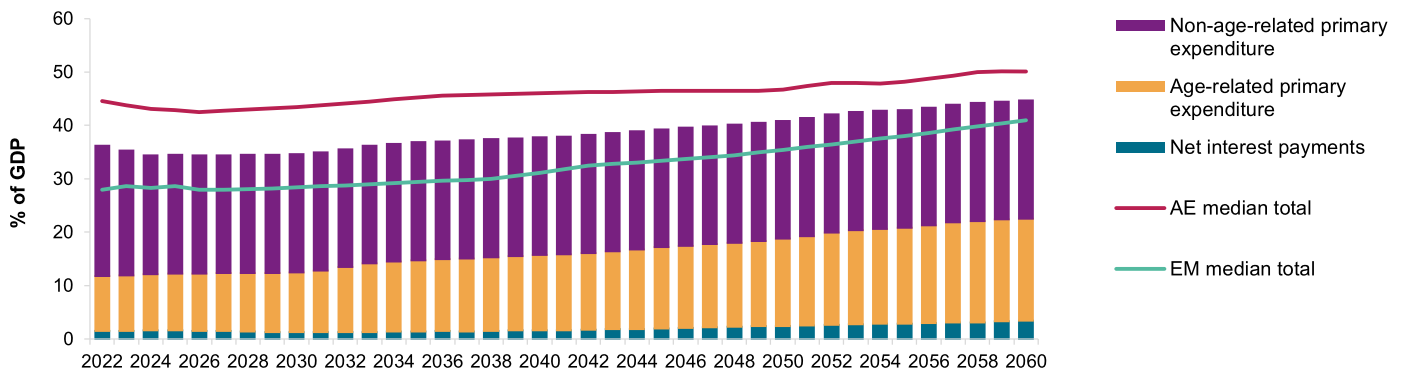
No-Policy-Change Scenario

Under our baseline no-policy-change scenario, the government refrains from adjusting either its fiscal stance as described above or any policies governing age-related spending. In other words, the government takes no additional steps after 2025, which is our cut-off year, except for borrowing for any budget shortfall that may materialize. We selected 2025 because we believe that the size of current budget deficits in many countries will gradually improve and an earlier year could in many cases imply a much higher deficit, which would overstate the magnitude of the long-term challenge. As age-related outlays creep upward, followed by the additional interest costs of rising national debt, total government expenditure gradually increases. Currently, the median of the sample for general government spending to GDP is about 37% for 2022 (down from 39% in 2020, during the peak of the pandemic). Following the fiscal consolidation expected for most sovereigns until 2025, our simulation projects spending to GDP will remain fairly stable until the early 2030s, reflecting moderate age-related spending increases. This delicate balance will, by our projections, break down thereafter, as age-related spending starts to accelerate, leading to higher deficits and interest payments. By 2060, we anticipate that total government spending would account for about 46% of GDP for a median sovereign (see chart 6).

Chart 6

Age-related expenditure could make up more than two-fifths of government spending by 2060

Median general government expenditure, by spending category



AE--Advanced economies. EM--Emerging markets. Source: S&P Global Ratings. Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

As a result of the higher cost of age-related spending for advanced sovereigns compared with emerging market sovereigns, based on our current projections and assumptions, the difference in government spending profiles between the two groups is significant. We expect the ratio of

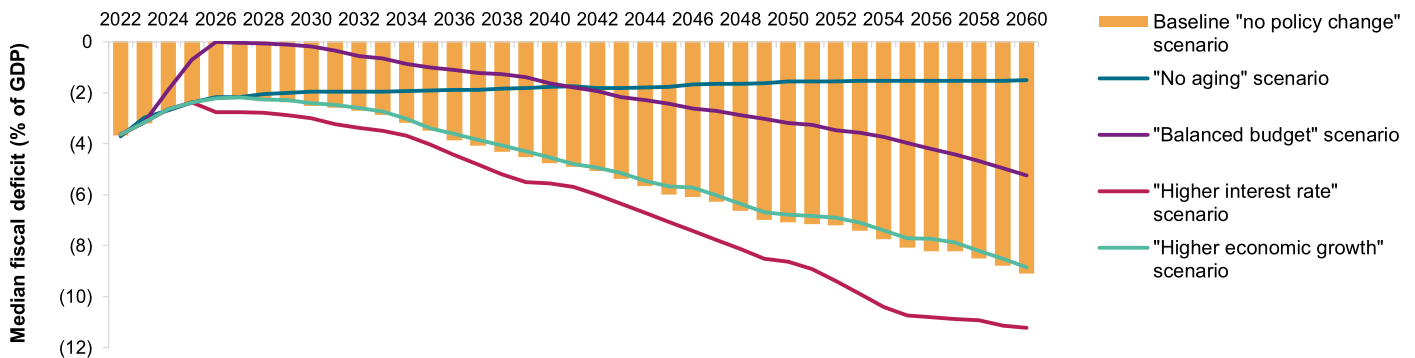
government spending to GDP for advanced sovereigns to fall from a pandemic high of 48% in 2020 to 43% by 2025. However, our simulation suggests that progress will be entirely unwound, because spending is projected to gradually increase thereafter and hit 50% of GDP by 2060. For emerging market sovereigns, the reversal is on average even worse. The group had median spending to GDP of 29% in 2020, and we project that will hit a low of 28% of GDP in 2027 following a decline in pandemic-related expenditure and broader fiscal consolidation following the energy shock. However, our simulation points to the ratio rising well above pandemic levels and reaching 41% of GDP by 2060.

Based on the assumptions of unchanged revenue and the dynamics in age-related spending as described above, a typical advanced sovereign would likely reduce annual deficits until 2025 (see chart 6), bringing the median accumulation of net debt to GDP down from 6.9% in 2020 to 1.3% in 2025. Thereafter, a steady deterioration over the simulation period will see the funding gap rise to 5.6% in 2060. Similarly, we expect emerging markets to see this ratio fall from a pandemic high of 6.4% to 2.6% in 2025. Thereafter, we think the typical emerging market will see its balance worsen, rising gradually at first, then--as interest payments increase because of higher debt levels--accelerate to 15.9% in 2060. About 6 pps of this deterioration happens in the final 10 years, over 2050-2060, highlighting the spiraling effect of cumulative interest should future fiscal problems not be tackled sufficiently early.

Chart 7

Fiscal balances are highly sensitive to demographic, fiscal policy, and interest rate assumptions

Median annual general government balance as a % of GDP under each scenario



Source: S&P Global Ratings.

Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

For the combined pool of sovereigns in the study, we project that burgeoning deficit ratios will push the median net debt ratio to 142% of GDP in 2060, from 48% of GDP currently, as the snowball effect of rising interest payments accelerates the negative budgetary impact (see chart 8). Again, we see diverging trends between advanced and emerging market countries. Despite both groups starting the simulation from fairly similar positions (44% of GDP in advanced markets; 48% of GDP in emerging markets), the typical advanced economy is expected to see its net debt to GDP level approximately double to 102% by 2060, compared with the trebling for the median emerging market government to 155% by 2060. In 2060, our simulation suggests eight sovereigns could have net debt levels above 250%: Belarus, Colombia, Oman, Qatar, Saudi Arabia, Slovakia, Slovenia, and South Africa.

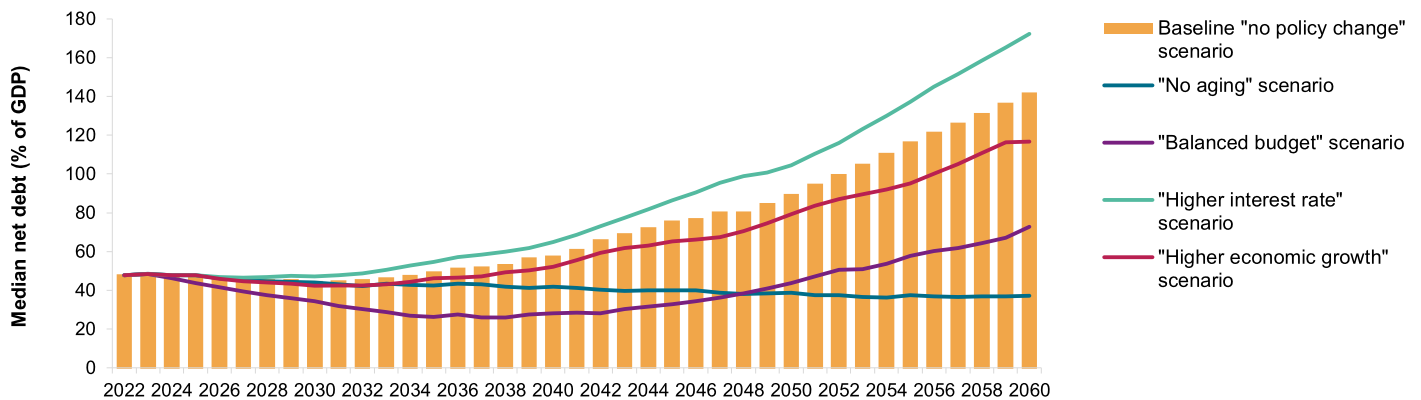
Putting these high debt ratios into perspective, both New Zealand and Australia had government debt burdens in excess of 150% of GDP on the brink of World War II, while the U.K.'s debt reached 252% in 1946, up from 30% in 1913. Of course, these were isolated instances related to sudden shocks such as war and the Great Depression, and were mitigated in the aftermath through high levels of growth caused by positive demographic trends or rising inflation.

More recently, in 2020, the net general government debt ratio in Greece peaked at just under 190% of GDP, while 2022 net government debt in Japan and Italy is estimated at 168% and 140% of GDP, respectively. Our current projections, in contrast, suggest a generalized and sustained fiscal deterioration stemming from a well-understood and predictable phenomenon: population aging.

Still, there is an important caveat. When S&P Global Ratings analysts estimate net debt, they deduct only assets deemed liquid and otherwise at least arm's length away from government control. This is to ensure that only securities that could be readily sold and are therefore available for debt service are included. However, and when thinking about the longer term--as this reports aims to do--we may be omitting some portion of public sector assets that could ultimately be available to liquidate to fund growing fiscal needs. According to the IMF (see the 2019 report, "A Global Picture of Public Wealth"), which has looked at assets for 38 countries, this pool of assets can in some cases be substantial. For instance, Japan's enormous debt burden is seemingly fully offset by public sector assets, while Uzbekistan, Kazakhstan, and South Africa each have significant positive public sector net worth according to IMF estimates. A lack of timely, consistent, and cross-country data on such assets prevents us from including additional considerations into our aging simulations for now, but they could become a factor for future reports should data quality improve.

Chart 8

Timely age or other fiscal reforms are key for containing debt risks
 Median net general government debt as a % of GDP, under each scenario



Source: S&P Global Ratings.
 Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

Trends in hypothetical long-term creditworthiness

Gradually rising deficits would likely lead to downward pressure on our hypothetical sovereign ratings (see chart 1). Initially, the credit deterioration is concentrated at the higher end of the

rating spectrum; a number of downgrades out of the 'aaa' category take place between the late-2020s and mid-2030s, while the related rise in 'aa' category ratings is only short-lived, because downgrades out of this category take place at a similar magnitude and even extend until the late-2030s. Ratings in the lower half of the investment-grade category--namely 'a' and 'bbb' ratings--are the main beneficiaries of this credit worsening, as each sees their rating share expand until about 2040. Our simulation then expects 'a' ratings to start facing downgrade pressures in the late-2040s, with smaller renewed downward pressure also occurring in both 'aa' and 'aaa' categories. Our simulation ends with just two sovereigns rated in each of the 'aa' and 'aaa' categories. At the other end of the spectrum, the number of sovereigns simulated to have speculative-grade ratings is generally fairly stable, hovering between 30%-35% of our sample. Of course, this aggregate figure masks that some sovereigns will fall in and out of the category throughout. However, downgrades from the 'bbb' category do become noticeable from the 2050s and begin to accelerate quite rapidly. In fact, a total of 13 sovereigns are simulated to lose investment-grade status in the 2050s, as the cumulative aging and interest bills take their toll. Most of those sovereigns are emerging markets, although there are notable exceptions, including Japan and the U.S.

We derived the hypothetical ratings evolution shown here by taking into account GDP per capita, general government balances, and net debt levels. We do not intend them to serve as a prediction of actual outcomes. In practice, the hypothetical ratings may overstate the changes in creditworthiness. They are benchmarked against budget balances, net debt, and GDP per capita levels today, whereas it is possible, of course, that the medians themselves could worsen as more rated sovereigns are squeezed by the costs of their aging populations. Moreover, S&P Global Ratings may give more credence to mitigating credit strengths than we have assumed in this simplified model for simulation of sovereign credit ratings. As mentioned above, the methodology underlying the simulation of hypothetical long-term sovereign credit ratings cannot be directly compared with our methodology for assigning sovereign credit ratings, on which current ratings are based, and other mitigants such as illiquid public sector assets may also become relevant as an offset to growing age-related fiscal pressures. The hypothetical ratings should therefore be regarded as a mere illustration of the credit dimension and profile of the demographic challenge that governments face, and not as an indication of expected credit performance.

Alternative Scenarios

Analysis of variations from our base-case scenario is helpful in assessing the relative power of the multiple forces at work that determine future fiscal performance and hypothetical rating trends. The first two scenarios deviate from our fiscal autopilot assumption, and illustrate the importance of policy strategies--resulting from either budgetary consolidation or structural reform implementation--in dealing with the budgetary impact of population aging. The other scenarios gauge the impact of external influences.

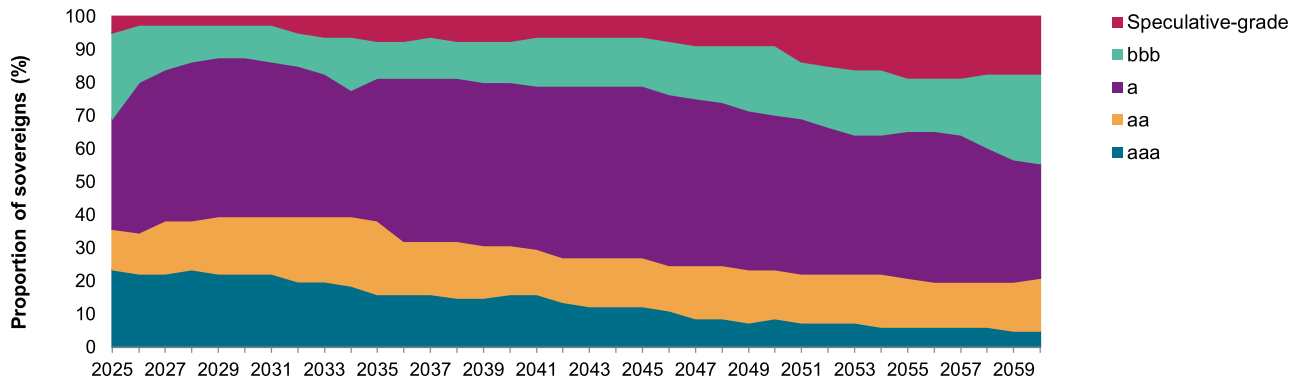
"Balanced budget" scenario

In this scenario, we assume that budgetary adjustments lead to a balanced budget by 2026 for all sovereigns. Once this is achieved, the governments revert to the fiscal autopilot scenario and take no further action, except for borrowing to pay for incremental age-related (and interest) expenditure as it occurs. Deficits and debt will be much more contained, but for some of the sovereigns, the containment is insufficient to prevent unsustainable results later. The improvement compared with the base-case scenario is particularly notable in sovereigns that currently have large general government imbalances, since the main assumption requires these

sovereigns to take relatively larger budgetary steps by 2026. We do not pretend to model here the more complex aspect of such fiscal consolidation--for example, on growth--and nor do we comment on the political feasibility of such actions. However, overall, this scenario illustrates the potential power that budgetary consolidation has in offsetting the projected adverse effects of age-related spending (see chart 9).

Chart 9

Early efforts to address fiscal imbalances would help offset longer-term rating pressure stemming from age-related expenditure
 Hypothetical long-term sovereign ratings distribution, under "balanced budget" scenario



Source: S&P Global Ratings.
 Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

For governments generating surpluses, this scenario is equivalent to a loosening of fiscal policy and therefore has a negative budgetary impact. For those running deficits up to 1% of GDP, the difference in results from the base-case scenario is relatively small. Following an initial period of significant upgrades, where two of our three simulated rating factors (fiscal flows and fiscal stocks) show enormous improvement for most sovereigns, aging again starts to affect median creditworthiness from about 2030. The results show that, despite balancing their budgets by 2026, many governments with significant increases in age-related costs would still end up with very high net debt. Nevertheless, the situation is much better than that modeled in our no-policy-change scenario.

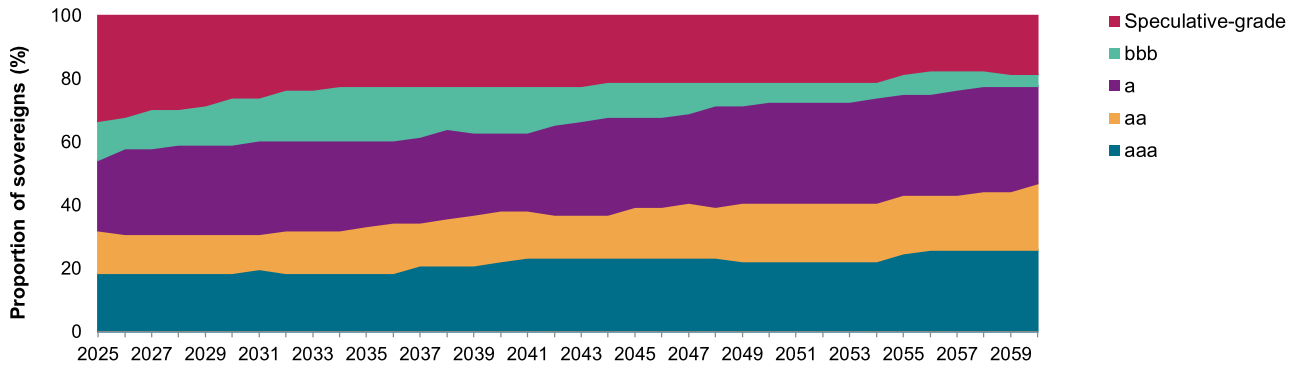
"No aging" scenario

In this scenario, we assume that governments enact legislation to fully contain future increases in age-related spending over the projection period, illustrating the benefits of related restructuring measures. As such, the scenario captures in isolation the effect of the sovereigns' starting budgetary positions. Besides the effect of the current outstanding stock of government net debt on future budgets, the government primary balance is of particular relevance, because it is assumed unchanged from 2025. Therefore, while overall debt at the end of this scenario will be lower, sovereigns with relatively high expected government deficits in 2025 will see their debt burden grow faster than those of their peers with more balanced budgets, despite having eliminated future increases in age-related spending (see chart 10).

Chart 10

Arresting age-related spending pressure could allow some sovereigns to "grow" up the rating scale

Hypothetical long-term sovereign ratings distribution under "no aging" scenario



Source: S&P Global Ratings.

Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

Unsurprisingly, given the magnitude of the projected increase in age-related spending over the next 40 years, the median in the no aging scenario compares favorably with that in the no-policy-change or balanced budget scenarios. Deficits and debt would, in our view, remain well contained under such a robust policy approach, despite budget deficits at the beginning of the projection period, and would in most cases effectively underpin the maintenance of the sovereigns' hypothetical ratings and in several cases even support hypothetical upgrades. Upgrades in this scenario are mostly concentrated around the lower rated emerging market sovereigns, and relate to projected economic growth feeding into higher per capita wealth levels. Our simulation predicts the median net debt to GDP level will fall to 37% by 2060 from 48% in 2022.

"Higher interest rate" scenario

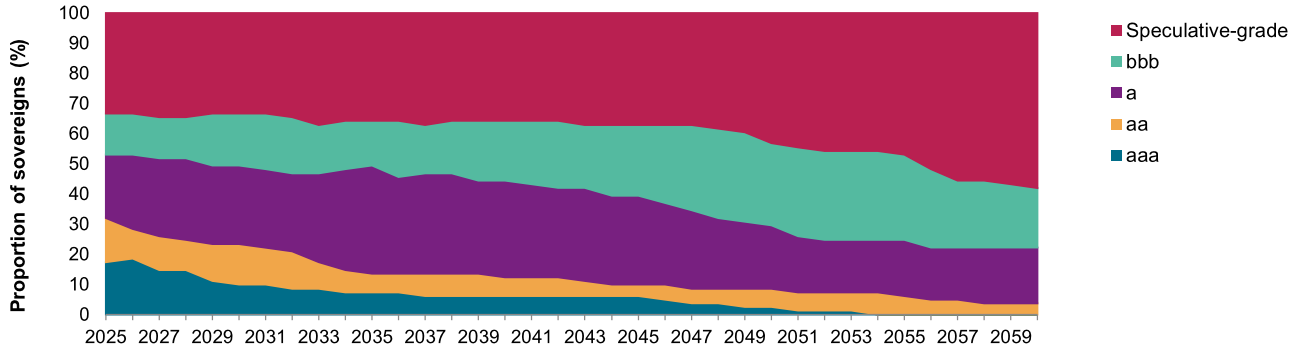
Instead of assuming that interest rates will remain broadly flat in line with each individual country's recent history, we present in this scenario the outcome whereby average interest costs increase by 1 percentage point in 2025 and stay at this more elevated level throughout the simulation. Although this is arguably only a modest increase in funding costs, it is harsher than a theoretical one point increase in the marginal cost of funding, because it effectively assumes that all existing debt is immediately reset at the higher rate. Indeed, those sovereigns that locked in rates with very long maturity issuances in the recent period of low interest rates would in reality be shielded from such a hike in marginal interest costs, although we do not model for that here (see "Take a Hike 2022: Which Sovereigns Are Best And Worst Placed To Handle A Rise In Interest Rates," published June 22, 2022, for more analysis on this topic).

The simulation's result is that the general credit deterioration happens sooner and in greater magnitude. Particularly notable is that the increase in speculative-grade simulated ratings, which was previously observed toward the end of the simulation, now occurs gradually from the start. In this scenario, net debt to GDP ends higher, at 172% for the median country (125% for advanced economies; 181% for emerging economies).

Chart 11

Sustained higher interest rates would hasten the need to tackle demographic pressures

Hypothetical long-term sovereign ratings distribution under "higher interest" rate scenario



Source: S&P Global Ratings.
 Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

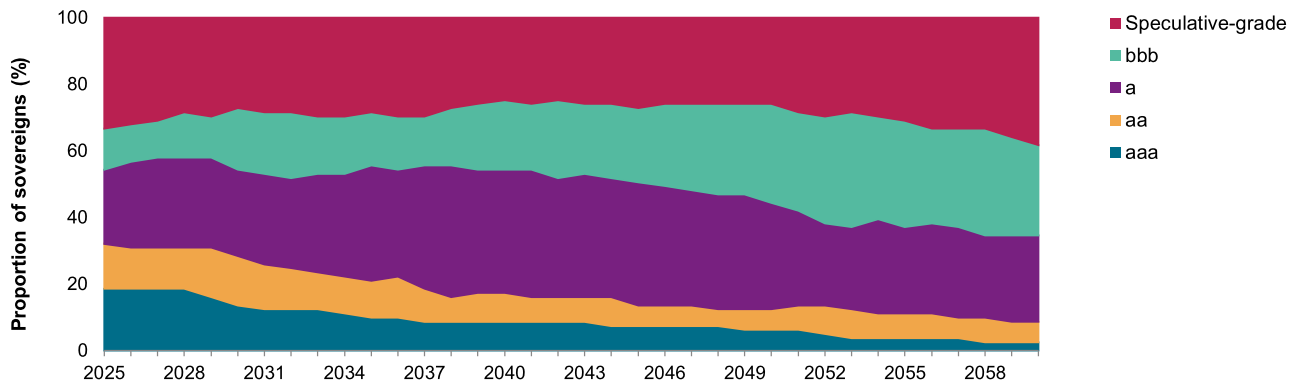
Still, these medians mask differing impacts across various sovereigns. For instance, those sovereigns that start the simulation with large net asset positions enjoy some benefit, at least in the start, as higher asset returns offset the impending aging pressures. At the other end of the spectrum, those sovereigns that start the simulation with the highest debt burdens unsurprisingly face the largest additional fiscal pressure from the rising funding costs. For example, the likes of Japan, Italy, U.K., and U.S.--some of the most indebted sovereigns we rate--reach 2060 with debt burdens of about 40 pps-60 pps of GDP higher.

"Higher economic growth" scenario

Chart 12

Higher growth alone is unlikely to be adequate in dealing with demographic-related pressures

Hypothetical long-term sovereign ratings distribution under "higher growth" scenario



Source: S&P Global Ratings.

Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

In this scenario, projected GDP growth is 1 percentage point higher across the projection period. A more buoyant growth environment would by 2060 lead to a lower median net debt for the whole sample--117% of GDP (advanced sovereigns 85%; emerging market sovereigns 133%) compared with 142% (102%; 155%) in the base case. The ratings distribution is somewhat better than in the base-case scenario, illustrating the benefit of higher economic growth for the long-term sustainability of public finances. Yet, with debt levels still pretty much doubling for the median sovereign, this scenario also illustrates that higher growth is no panacea, and certainly no replacement for prudent fiscal policy.

The Policy Implications

Based on our framework, we believe that governments can deal with the future imbalances in two key ways, besides structural reforms aimed at raising employment for older workers and boosting economic growth. First, through a sustained consolidation in budgetary positions; second, through changes to social security systems.

Given the growing urgency of tackling the budgetary implications of population aging and the capacity of governments to influence the outcomes of policy, these two options have been deployed by policymakers in recent years. Charts 13a and 13b below show the difference in the reduction in projected net general government debt in 2060 through stabilizing age-related spending as a percentage of GDP in 2025 (mitigating policies) and through achieving a balanced budget in 2026 (fiscal consolidation), with the absolute difference between the two expressed as the policy balance.

At one end of the spectrum, for sovereigns we expect to be relatively close to fiscal balance or even in surplus in 2025--such as Korea, Luxembourg, Saudi Arabia, and Qatar--the marginal extra consolidation would have a very limited effect on the future trajectory of the debt burden. On the other hand, if they were successful in preventing age-related spending from rising in the future, they would effectively improve the sustainability of their debt. Conversely, France, Japan, Sri Lanka, and Ghana have more to gain for fiscal sustainability from focusing on consolidating their

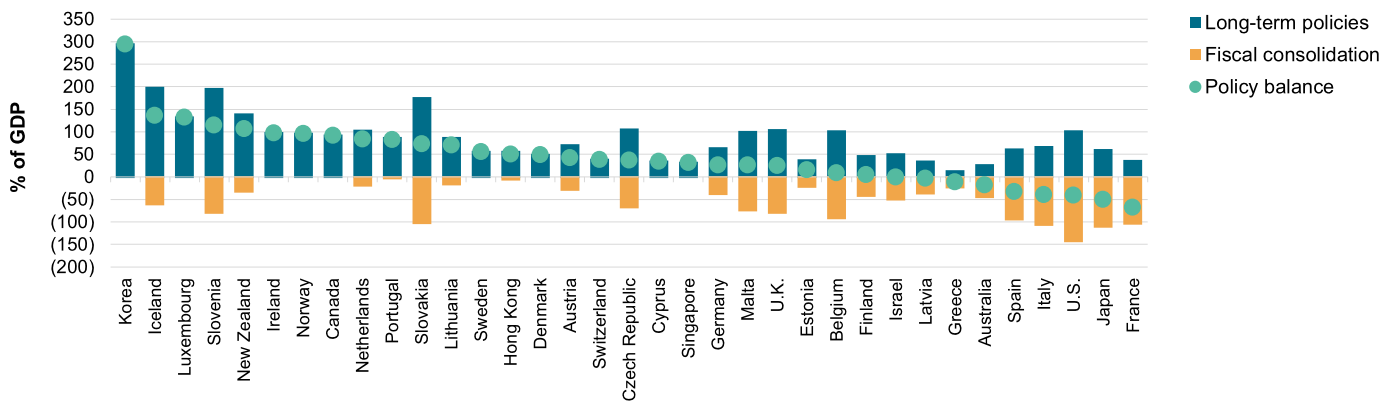
Global Aging 2023: The Clock Ticks

current budgets. To some extent, and particularly in the advanced economies named, this may reflect that aging pressures have already made their way into current fiscal imbalances. For most countries, a combination of the two directions is likely to be effective, but the relative mix is likely to differ. The absolute length of the bars in the chart is also important, indicating both the magnitude of the problem and suggesting the extent to which a sovereign can likely deal with stabilizing the government debt through either policy option. For example, even if Brazil fully contained the projected increase in its aging costs, it could still face a sustainability gap without further consolidation. A combination of the two policy options would of course unleash a much more powerful effect.

Chart 13a

Advanced economies: Combining mitigating policies and fiscal consolidation is likely to be effective for most countries

Sovereign policy priorities

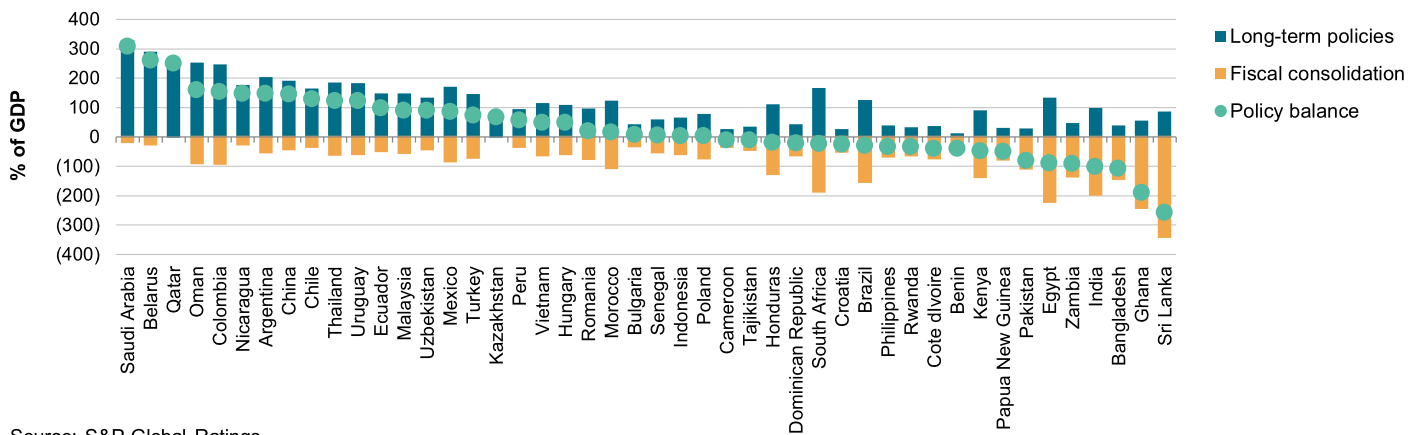


Source: S&P Global Ratings.
Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

Chart 13b

Emerging markets: The relative mix of policy approaches is likely to differ among countries

Sovereign policy priorities



Source: S&P Global Ratings.
Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

Political Hostility Threatens Governments' Reform Strategies

Despite the significant progress governments have already made in reforming social security systems, especially among advanced sovereigns, many potential political stumbling blocks lie ahead, as signaled over the past few years by sovereigns that have implemented pension reform reversals, or that are unable to bring in reforms. Total age-related spending in a typical advanced sovereign today represents about two-fifths of a government's total primary spending (total government expenditure without interest payments, including spending on education). This implies that the related spending items will be an important part of any government's budgetary strategy, especially if--as is currently the case--it is aimed at reducing budget deficits in the aftermath of the successive health, food, and energy crises. Moreover, new policy priorities have been gaining importance in governments' budgets--for example, costs related to climate change mitigation, or an increase in military spending--which suggest that government spending is unlikely to decline much over the coming years, even when the current economic downturn is overcome. The longer it takes governments to implement the necessary steps to boost economic recovery, the greater the opposition to pension and health care entitlement reductions will be--especially for advanced economies in Europe. This risk may prove socially and politically costly, and could result from the projected increase in the median voting age.

Moreover, implementing such reforms in the near term risks introducing a potentially negative pro-cyclical effect on economic growth, as we saw in the wake of the eurozone debt crisis. Given the political dimension that any changes to social spending entitlements entail, we continue to see a risk of policy reversals that, in turn, reinforce opposition to future adjustments. In this context, we observe that rationalizing public pension and health care systems can, if embraced early on, help spread the impact of such unpopular policy measures over an extended period, with the consequently lower burden of adjustment shared across generations of taxpayers and voters. We have seen that such policy behavior is important for managing the expectations of economic agents, thus avoiding sudden policy shifts that could alienate the electorate or undermine economic growth performance.

For emerging market sovereigns, the policy issues are complex and diverging, particularly across regions. For instance, practically all of sub-Saharan Africa appears to face limited immediate pressure from old-age related expenditure, because it is the only region globally with a fertility rate above the replacement rate. The implication is that the region will effectively be a monopolist as a net contributor of additional working age adults to the global workforce as we progress deeper into the 21st century, and this may eventually prove a valuable asset. Still, despite having the freedom to focus on other policy issues, it remains to be seen whether African governments will be able to capitalize on their demographic dividend, particularly in the context of currently sizable debt burdens whose debt-servicing costs already occupy a disproportionate share of tax revenue collected (see "African Domestic Debt: Assessing The Continent's Vulnerabilities," published May 10, 2022).

For other emerging market regions, the picture is generally less rosy. Of particular concern is the rapid projected increase in old-age expenditure for the Gulf countries under a no-policy-change scenario. The outlook is similarly bleak for much of Latin America, as well as pockets of Asia (most importantly, China and Korea). The common thread among all these emerging market sovereigns is that age-related expenditure currently occupies modest proportions of government budgets. However, the fall in fertility rates in past decades (which in itself is understood to have supported economic development) will soon lead to shifting age dependency ratios. As the elderly populations begin to bulge in these countries, governments will be forced to make choices on the generosity of existing government support for the elderly (including on retirement ages), which will

undoubtedly prove politically contentious. Decisive action in making sure such support systems are calibrated correctly is therefore likely to be critical, as the longer such policies are in place--and the larger the population that begins to enjoy them--the harder it will be to change course. The alternative, as our projections illustrate, could be a costly increase in debt for many future generations to bear.

Related Criteria And Research

Publications by S&P Global Ratings

- Sovereign Risk Indicators, Dec. 12, 2022
- Take a Hike 2022: Which Sovereigns Are Best And Worst Placed To Handle A Rise In Interest Rates, June 22, 2022
- African Domestic Debt: Assessing The Continent's Vulnerabilities, May 10, 2022
- Sovereign Rating Methodology, Dec. 18, 2017
- Global Aging 2016: 58 Shades Of Gray, April 28, 2016
- Global Aging 2013: Rising To The Challenge, March 20, 2013
- Mounting Medical Care Spending Could Be Harmful To The G-20's Credit Health, Jan. 26, 2012
- Global Aging 2010: An Irreversible Truth, Oct. 7, 2010
- Global Aging 2010: An Irreversible Truth--Methodological And Data Supplement, Oct. 7, 2010
- What A Change A Year Makes: Standard & Poor's 2007 Global Graying Progress Report, Sept. 19, 2007
- Global Graying: Aging Societies And Sovereign Ratings, June 27, 2006
- Western Europe Past Its Prime--Sovereign Rating Perspectives In The Context Of Aging Populations, Jan. 9, 2002
- Western Europe Past Its Prime--Sovereign Rating Perspectives in the Context of Aging Populations: Methodological and Data Supplement, Jan. 9, 2002

Other references

- CBO (2022). Congressional Budget Office (United States of America), "The 2022 Long-Term Budget Outlook," July 2022, <https://www.cbo.gov/publication/57971>
- OECD (2013). de la Maisonneuve, C. and J. Oliveira Martins, "Public Spending on Health and Long-term Care: A new set of projections," June 2013, OECD Economic Policy Papers, No. 6, OECD Publishing, Paris, <https://doi.org/10.1787/5k44t7jwwr9x-en>
- EC (2021). Economic Policy Committee and European Commission, "The 2021 Ageing Report: Economic And Budgetary Projections For The EU 28 Member States (2019-2070)," May 2021, [https://economy-finance.ec.europa.eu/publications/2021-ageing-report-economic-and-budgetary-projections-eu-member-states-2019-](https://economy-finance.ec.europa.eu/publications/2021-ageing-report-economic-and-budgetary-projections-eu-member-states-2019-2070)
- FFA (2021). Federal Finance Administration FFA (Switzerland), "2021 report on the long-term sustainability of public finances in Switzerland," November 2021, Berne, <https://www.efd.admin.ch/efd/en/home/fiscal-policy/report-long-term-sustainability-public-finances.html>

Global Aging 2023: The Clock Ticks

- ILO (2021). International Labour Organization, "World Social Protection Report 2020–22: Social protection at the crossroads – in pursuit of a better future", September 2021, https://www.ilo.org/global/publications/books/WCMS_817572/lang--en/index.htm
- IMF (2022). International Monetary Fund, "Fiscal Monitor - Helping People Bounce Back", October 2022, <https://www.imf.org/en/Publications/FM/Issues/2022/10/09/fiscal-monitor-october-22>
- IMF (2019). International Monetary Fund, "A Global Picture of Public Wealth," June 2019, <https://www.imf.org/en/Blogs/Articles/2019/06/18/blog-a-global-picture-of-public-wealth>
- TNZ (2021). The Treasury (New Zealand), "He Tirohanga Mokopuna 2021," September 2021, <https://www.treasury.govt.nz/publications/ltfp/he-tirohanga-mokopuna-2021>
- OBR (2022). Office for Budget Responsibility (United Kingdom), "Fiscal risks and sustainability," July 2022, <https://obr.uk/frs/fiscal-risks-and-sustainability-july-2022/>
- TCA (2021). The Treasury (Commonwealth of Australia), "2021 Intergenerational Report," June 2021, <https://treasury.gov.au/publication/2021-intergenerational-report>
- MFJ (2018). Ministry of Finance and Ministry of Health, Labor, and Welfare (Japan), "Future Prospects for Social Security Looking toward 2040," May 2018, <https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000207382.html>
- UN (2022). United Nations - Population Division of the Department of Economic and Social Affairs, "World Population Prospects 2022", July 2022, <https://population.un.org/wpp/>
- SPGMI (2022). S&P Global Market Intelligence, "Global Economy – New" dataset, accessed via Connect, <https://connect.ihsmarkit.com/>

Appendix 1: Data And Scenario Results

Table 1a

Socioeconomic indicators

Entity name	ISO2	FC rating as of Jan 02, 2023	Population in million		Old-age-dependency ratio		Real GDP growth (%)			Long-term GDP deflator growth (%)	Long-term interest rate (%)
			2022	2060	2022	2060	2025	2060	Avg. 2025-2060		
Argentina	AR		45.5	52.3	20.8	40.7	2.0	1.8	2.2	3	1.6
Australia	AU	AAA	26.2	33.7	28.6	49.8	2.4	2.3	2.6	2	2.7
Austria	AT	AA+	9.0	9.3	32.7	54.8	1.7	1.4	1.4	2	1.4
Bangladesh	BD	BB-	171.2	206.9	8.9	31.9	7.0	3.1	4.2	3	6.5
Belarus	BY	SD	9.5	8.0	28.2	57.3	2.0	1.0	1.5	3	4.5
Belgium	BE	AA	11.6	11.9	34.5	51.8	1.5	1.4	1.2	2	1.6
Benin	BJ	B+	13.4	30.0	5.6	8.8	6.8	2.7	3.7	3	4.3
Brazil	BR	BB-	215.3	227.0	15.8	48.1	2.2	3.1	3.1	3	5.7
Bulgaria	BG	BBB	6.8	5.3	38.1	66.2	3.3	1.3	1.3	3	2.1
Cameroon	CM	B-	27.9	60.0	4.8	8.9	4.4	3.0	3.2	3	2.5
Canada	CA	AAA	38.5	47.6	31.7	50.3	1.9	1.7	1.7	2	3.3

Table 1a

Socioeconomic indicators (cont.)

Chile	CL	A	19.6	20.3	20.9	60.3	0.3	3.0	2.8	3	2.6
China	CN	A+	1425.9	1205.0	21.6	71.4	4.6	3.1	3.5	3	0.8
Colombia	CO	BB+	51.9	56.5	14.5	47.5	3.3	3.4	3.4	3	5.1
Cote d'Ivoire	CI	BB-	28.2	60.3	4.3	8.1	6.8	2.7	3.0	3	3.8
Croatia	HR	BBB+	4.0	3.2	37.7	61.5	3.5	1.0	1.4	3	2.1
Cyprus	CY	BBB	0.9	1.1	28.1	45.3	2.8	1.6	2.1	2	1.9
Czech Republic	CZ	AA-	10.7	10.4	34.8	59.2	2.3	1.7	1.6	2	2.1
Denmark	DK	AAA	5.9	6.1	35.9	51.2	2.0	1.6	1.6	2	1.4
Dominican Republic	DO	BB	11.2	13.4	13.0	34.1	5.0	3.6	3.8	3	4.7
Ecuador	EC	B-	18.0	23.0	13.6	38.2	2.5	2.7	2.7	3	3.4
Egypt	EG	B	111.0	174.3	9.0	21.0	4.0	3.5	3.7	3	9.1
Estonia	EE	AA-	1.3	1.2	36.0	61.5	3.0	1.4	1.8	2	0.4
Finland	FI	AA+	5.5	5.1	41.3	58.2	1.3	1.2	1.3	2	0.9
France	FR	AA	67.6	69.7	38.7	55.9	1.5	1.5	1.4	2	1.2
Germany	DE	AAA	83.3	81.8	38.3	54.3	1.3	1.4	1.2	2	1.0
Ghana	GH	SD	33.5	58.1	6.0	13.3	5.1	3.5	3.9	3	8.4
Greece	GR	BB+	10.6	9.0	40.1	67.3	2.8	1.5	1.6	2	1.3
Honduras	HN	BB-	10.4	15.1	6.5	22.5	3.6	3.3	3.4	3	5.0
Hong Kong	HK	AA+	7.5	6.5	32.0	99.6	2.0	1.7	1.7	2	0.3
Hungary	HU	BBB	9.7	9.1	34.1	57.0	2.8	1.4	1.8	3	3.0
Iceland	IS	A	0.4	0.4	25.5	55.9	2.3	2.3	2.4	2	4.2
India	IN	BBB-	1417.2	1695.3	11.7	32.7	6.9	4.9	5.2	3	5.9
Indonesia	ID	BBB	275.5	319.4	11.5	28.8	5.0	3.8	4.2	3	5.3
Ireland	IE	AA-	5.1	6.4	25.8	50.0	3.3	1.7	1.8	2	1.4
Israel	IL	AA-	9.0	14.3	23.1	32.6	3.5	2.7	2.9	2	4.2
Italy	IT	BBB	60.2	55.9	40.8	65.5	1.2	1.4	1.1	2	2.5
Japan	JP	A+	124.0	96.6	55.4	81.6	1.1	0.5	0.6	2	0.9
Kazakhstan	KZ	BBB-	19.4	27.7	14.6	24.2	3.8	1.7	2.6	3	4.1
Kenya	KE	B	54.0	94.3	4.8	11.4	5.6	4.5	4.9	3	6.2
Korea	KR	AA	51.8	40.9	26.3	95.8	2.1	0.9	1.1	2	3.3
Latvia	LV	A+	1.9	1.3	37.5	69.5	3.0	1.0	1.2	2	1.3
Lithuania	LT	A+	2.7	2.0	35.7	68.4	3.0	0.8	1.1	2	1.2
Luxembourg	LU	AAA	0.6	0.8	24.1	52.8	2.0	1.6	1.8	2	0.7
Malaysia	MY	A-	33.9	42.0	12.1	40.1	4.5	2.8	3.3	3	3.0
Malta	MT	A-	0.5	0.7	31.0	56.5	2.5	1.2	2.1	2	2.6
Mexico	MX	BBB	127.5	142.8	14.2	41.1	2.3	2.3	2.3	3	4.5
Morocco	MA	BB+	37.5	46.2	13.4	34.8	3.4	2.7	2.9	3	3.7

Table 1a

Socioeconomic indicators (cont.)

Netherlands	NL	AAA	17.6	18.0	35.1	51.4	1.6	1.4	1.4	2	1.1
New Zealand	NZ	AA+	5.2	6.1	27.7	51.4	2.4	1.2	1.6	2	2.9
Nicaragua	NI	B	6.9	9.5	8.1	26.6	3.5	1.7	2.0	3	1.9
Norway	NO	AAA	5.5	6.6	31.3	50.8	1.7	1.6	1.7	2	1.1
Oman	OM	BB	4.6	6.9	4.3	30.3	1.6	1.7	1.5	3	4.9
Pakistan	PK	CCC+	235.8	407.7	8.8	14.1	3.0	4.0	4.0	3	6.1
Papua New Guinea	PG	B-	10.1	16.2	5.1	13.7	3.0	2.0	2.4	3	5.1
Peru	PE	BBB	34.0	43.5	14.8	35.9	3.3	3.4	3.5	3	4.8
Philippines	PH	BBB+	115.6	168.0	9.9	22.7	6.3	2.9	3.7	3	5.0
Poland	PL	A-	37.7	32.4	32.5	68.2	2.8	1.1	1.5	3	2.5
Portugal	PT	BBB+	10.2	8.9	39.6	67.9	2.3	1.4	1.3	2	2.0
Qatar	QA	AA	2.7	3.6	1.9	24.2	2.8	1.3	2.0	3	3.3
Romania	RO	BBB-	18.9	14.5	33.7	64.3	3.8	1.2	1.7	3	3.0
Rwanda	RW	B+	13.8	26.1	5.5	12.0	7.5	6.1	6.6	3	2.3
Saudi Arabia	SA	A-	36.4	50.2	4.4	44.8	2.0	1.7	2.0	3	3.3
Senegal	SN	B+	17.3	38.8	5.7	11.7	5.5	4.2	3.4	3	3.1
Singapore	SG	AAA	6.0	6.1	22.0	76.1	3.0	1.9	2.1	2	0.0
Slovakia	SK	A+	5.5	4.9	28.9	66.3	3.1	1.3	1.4	2	2.1
Slovenia	SI	AA-	2.1	2.0	36.1	61.7	3.0	1.5	1.5	2	1.8
South Africa	ZA	BB-	59.9	75.7	10.3	24.4	1.7	1.8	2.1	3	6.2
Spain	ES	A	47.7	48.3	34.1	64.1	2.5	1.5	1.6	2	1.8
Sri Lanka	LK	SD	21.8	20.9	20.0	43.6	2.6	2.1	2.7	3	7.0
Sweden	SE	AAA	10.5	12.7	36.0	48.4	2.0	1.7	1.9	2	0.6
Switzerland	CH	AAA	8.7	9.9	31.8	60.6	1.6	1.5	1.5	2	1.0
Tajikistan	TJ	B-	10.0	16.8	5.8	16.1	6.0	3.3	3.4	3	3.0
Thailand	TH	BBB+	71.7	63.4	23.9	70.0	3.1	2.8	3.0	3	2.8
Turkiye	TR	B	85.3	96.0	14.2	46.8	3.2	2.4	2.4	3	5.3
U.K.	GB	AA	67.5	71.7	33.2	53.4	1.5	1.2	1.4	2	2.7
U.S.	US	AA+	338.3	380.9	29.4	47.0	1.8	1.5	1.6	2	2.4
Uruguay	UY	BBB	3.4	3.2	26.7	49.2	2.5	1.8	2.2	3	2.9
Uzbekistan	UZ	BB-	34.6	48.0	7.9	22.0	5.5	3.9	4.1	3	0.9
Vietnam	VN	BB+	98.2	106.1	13.3	40.2	6.7	4.5	5.3	3	3.1
Zambia	ZM	SD	20.0	43.9	3.2	8.8	3.2	4.0	3.9	3	5.3

Table 1a

Socioeconomic indicators (cont.)

Medians

	Old-age-dependency ratio		Real GDP growth (%)		
	2022	2060	2025	2060	Avg.
					2025-2060
Whole sample	23.9	49.2	2.8	1.7	2.1
Advanced economies	33.2	55.9	2.1	1.5	1.6
Emerging markets	11.9	33.4	3.5	2.8	3.0
Regions					
Sub-Saharan Africa	5.5	11.4	5.5	3.5	3.7
Americas	14.8	41.1	2.5	2.7	2.7
Western and Northern Europe	33.9	53.1	1.7	1.5	1.5
Eastern and Southern Europe	35.3	64.2	2.8	1.4	1.5
Central and Western Asia and North Africa	8.5	27.3	3.5	2.6	2.8
Southern and Eastern Asia and Pacific	13.2	34.3	3.0	2.8	3.0
Rating categories*					
AAA	31.7	51.3	2.0	1.6	1.6
AA	32.7	54.8	2.1	1.3	1.4
A	30.0	65.2	2.7	1.3	1.4
BBB	26.7	49.2	3.3	1.8	1.7
Speculative-grade	8.8	24.4	3.5	3.1	3.1

*Rating categories are referring to actual ratings as of Jan 2, 2023. AE--Advanced economies. EM--Emerging markets. FC--Foreign currency. Source: S&P Global Ratings.

Table 1b

Total age-related spending and components

Entity name	ISO2	FC rating as of Jan 02, 2023	Total age-related spending (% GDP)			Age-related spending by component (% GDP)					
			2022	2060	Change 2022-2060	Pension spending (% GDP)		Health care spending (% GDP)		Long-term care spending (% GDP)	
						2022	2060	2022	2060	2022	2060
Argentina	AR	CCC+	15.1	33.9	18.9	9.1	18.0	6.0	15.9	0.0	0.0
Australia	AU	AAA	9.2	11.2	2.0	3.5	2.9	4.5	6.2	1.3	2.1
Austria	AT	AA+	22.9	27.7	4.8	13.9	14.6	7.1	8.9	1.9	4.2
Bangladesh	BD	BB-	1.2	3.6	2.4	0.8	2.7	0.4	0.9	0.0	0.0
Belarus	BY	SD	5.5	22.9	17.4	1.5	16.3	4.0	6.6	0.0	0.0

Table 1b

Total age-related spending and components (cont.)

Belgium	BE	AA	20.8	27.1	6.3	12.7	15.2	5.8	6.9	2.3	5.0
Benin	BJ	B+	0.9	1.6	0.7	0.4	0.5	0.5	1.1	0.0	0.0
Brazil	BR	BB-	13.8	21.6	7.7	9.8	11.3	4.0	9.1	0.1	1.2
Bulgaria	BG	BBB	13.5	16.8	3.3	8.5	9.8	4.7	5.8	0.3	1.2
Cameroon	CM	B-	1.0	3.3	2.3	0.8	1.7	0.2	1.6	0.0	0.0
Canada	CA	AAA	12.3	17.3	5.0	3.1	4.7	7.9	10.2	1.3	2.4
Chile	CL	A	7.8	21.8	13.9	3.0	8.7	4.6	10.8	0.2	2.3
China	CN	A+	8.6	27.0	18.4	5.4	17.7	3.0	7.2	0.2	2.1
Colombia	CO	BB+	9.0	26.7	17.6	3.5	12.3	5.6	14.3	0.0	0.0
Cote d'Ivoire	CI	BB-	2.3	4.6	2.3	1.1	1.4	1.2	3.2	0.0	0.0
Croatia	HR	BBB+	17.0	19.1	2.1	10.5	9.7	6.0	7.6	0.5	1.9
Cyprus	CY	BBB	12.7	16.1	3.4	9.4	10.7	2.9	3.5	0.4	1.8
Czech Republic	CZ	AA-	15.9	23.1	7.2	8.4	11.8	5.8	7.8	1.6	3.5
Denmark	DK	AAA	19.8	23.1	3.4	9.1	7.2	6.9	8.6	3.8	7.3
Dominican Republic	DO	BB	3.2	6.1	2.9	0.7	1.0	2.5	5.1	0.0	0.0
Ecuador	EC	B-	8.9	21.0	12.1	4.7	10.1	4.2	10.8	0.0	0.0
Egypt	EG	B	7.0	13.6	6.6	5.6	10.9	1.4	2.7	0.0	0.0
Estonia	EE	AA-	13.0	16.1	3.1	7.4	5.8	5.1	6.9	0.5	3.4
Finland	FI	AA+	21.8	26.2	4.3	13.3	13.5	6.3	7.7	2.3	4.9
France	FR	AA	25.7	28.2	2.5	15.1	13.4	8.7	10.4	2.0	4.4
Germany	DE	AAA	19.7	24.1	4.4	10.6	12.5	7.5	8.6	1.6	3.0
Ghana	GH	SD	2.3	4.9	2.7	0.8	2.2	1.4	2.7	0.0	0.0
Greece	GR	BB+	19.7	19.5	(0.2)	15.0	12.0	4.6	6.1	0.2	1.3
Honduras	HN	BB-	3.1	11.5	8.4	0.3	4.1	2.8	7.5	0.0	0.0
Hong Kong	HK	AA+	3.5	8.2	4.7	0.6	5.2	2.9	2.9	0.0	0.0
Hungary	HU	BBB	14.1	21.8	7.8	8.5	11.9	5.0	6.8	0.6	3.1
Iceland	IS	A	12.2	24.7	12.6	3.4	9.4	7.0	12.6	1.8	2.7
India	IN	BBB-	1.6	9.0	7.4	0.4	5.1	1.0	2.3	0.2	1.6
Indonesia	ID	BBB	2.5	6.6	4.1	0.9	2.0	1.4	2.9	0.2	1.7
Ireland	IE	AA-	10.5	17.4	6.9	4.9	7.5	4.2	5.8	1.4	4.1
Israel	IL	AA-	10.9	14.0	3.0	5.4	6.4	4.9	6.2	0.6	1.4
Italy	IT	BBB	23.7	25.5	1.8	15.8	14.1	6.1	7.8	1.8	3.5
Japan	JP	A+	19.0	22.4	3.5	9.7	9.6	7.1	9.1	2.1	3.8
Kazakhstan	KZ	BBB-	5.6	10.0	4.3	3.8	7.6	1.8	2.3	0.0	0.0
Kenya	KE	B	3.8	10.3	6.5	1.6	4.9	2.2	5.4	0.0	0.0
Korea	KR	AA	8.3	23.8	15.5	3.4	9.0	4.4	12.5	0.5	2.3
Latvia	LV	A+	12.5	15.4	2.8	7.1	6.2	4.9	6.4	0.5	2.7

Table 1b

Total age-related spending and components (cont.)

Lithuania	LT	A+	12.8	18.6	5.8	7.3	8.1	4.3	5.8	1.1	4.7
Luxembourg	LU	AAA	14.5	25.2	10.7	9.8	16.7	3.7	5.0	1.1	3.5
Malaysia	MY	A-	7.2	20.3	13.1	5.3	16.0	1.9	4.4	0.0	0.0
Malta	MT	A-	13.9	22.4	8.6	7.1	10.1	5.5	8.4	1.3	3.9
Mexico	MX	BBB	6.6	17.9	11.3	3.8	9.5	2.7	6.2	0.1	2.2
Morocco	MA	BB+	5.1	14.1	9.0	3.0	10.1	2.1	4.0	0.0	0.0
Netherlands	NL	AAA	16.8	23.2	6.4	7.0	8.9	5.8	7.0	3.9	7.3
New Zealand	NZ	AA+	12.6	20.7	8.1	5.0	7.6	6.3	10.4	1.4	2.7
Nicaragua	NI	B	9.3	25.0	15.7	4.2	12.5	5.2	12.5	0.0	0.0
Norway	NO	AAA	22.8	30.0	7.2	11.4	13.2	7.2	8.9	4.2	7.9
Oman	OM	BB	5.7	25.4	19.6	2.1	10.4	3.7	15.0	0.0	0.0
Pakistan	PK	CCC+	2.7	5.1	2.5	1.5	3.0	1.1	2.1	0.0	0.0
Papua New Guinea	PG	B-	2.7	4.3	1.6	1.0	1.3	1.7	3.0	0.0	0.0
Peru	PE	BBB	3.5	10.2	6.7	0.2	2.1	3.3	8.1	0.0	0.0
Philippines	PH	BBB+	2.2	4.5	2.3	0.8	1.9	1.4	2.6	0.0	0.0
Poland	PL	A-	17.5	24.6	7.0	11.0	10.8	5.6	9.0	0.9	4.8
Portugal	PT	BBB+	19.4	24.1	4.6	13.0	10.5	5.9	8.3	0.5	5.2
Qatar	QA	AA	2.9	20.7	17.8	1.0	13.3	1.9	7.4	0.0	0.0
Romania	RO	BBB-	15.2	22.8	7.6	10.6	13.6	4.2	6.3	0.4	2.8
Rwanda	RW	B+	2.7	6.5	3.7	0.3	1.0	2.4	5.5	0.0	0.0
Saudi Arabia	SA	A-	7.7	28.6	20.9	3.6	18.2	4.0	10.4	0.0	0.0
Senegal	SN	B+	3.0	8.6	5.5	2.1	2.8	0.9	5.8	0.0	0.0
Singapore	SG	AAA	6.2	8.9	2.7	4.0	6.7	2.2	2.2	0.0	0.0
Slovakia	SK	A+	16.2	28.7	12.5	9.0	14.5	6.2	9.5	1.0	4.7
Slovenia	SI	AA-	17.5	29.3	11.8	10.0	16.1	6.3	8.8	1.1	4.4
South Africa	ZA	BB-	6.4	16.2	9.8	1.6	3.7	4.6	11.5	0.2	0.9
Spain	ES	A	19.2	22.5	3.4	12.5	11.7	5.8	8.0	0.8	2.9
Sri Lanka	LK	SD	4.3	7.9	3.6	2.8	5.1	1.5	2.8	0.0	0.0
Sweden	SE	AAA	18.6	23.9	5.4	7.7	7.4	7.3	8.8	3.6	7.7
Switzerland	CH	AAA	12.0	14.7	2.7	8.6	9.8	2.6	3.4	0.9	1.6
Tajikistan	TJ	B-	5.5	8.4	2.9	3.5	5.3	2.0	3.1	0.0	0.0
Thailand	TH	BBB+	5.0	18.6	13.6	2.1	13.5	2.9	5.1	0.0	0.0
Turkiye	TR	B	10.2	18.8	8.6	6.9	9.1	3.2	7.4	0.1	2.3
U.K.	GB	AA	17.0	24.4	7.4	6.9	9.1	8.8	13.1	1.3	2.3
U.S.	US	AA+	11.2	16.8	5.5	5.2	6.6	3.6	6.9	2.4	3.2
Uruguay	UY	BBB	14.3	29.4	15.2	7.5	13.7	6.8	15.7	0.0	0.0
Uzbekistan	UZ	BB-	10.9	26.0	15.1	8.9	22.6	2.0	3.4	0.0	0.0

Table 1b

Total age-related spending and components (cont.)

Vietnam	VN	BB+	7.3	17.7	10.5	4.6	13.5	2.7	4.3	0.0	0.0
Zambia	ZM	SD	2.3	5.5	3.2	0.4	1.0	1.9	4.5	0.0	0.0
Medians											
			Total age-related spending (% GDP)			Age-related spending by component (% GDP)					
						Pension spending (% GDP)		Health care spending (% GDP)		Long-term care spending (% GDP)	
			Change								
			2022	2060	2022-2060	2022	2060	2022	2060	2022	2060
Whole sample			10.2	19.1	8.9	5.0	9.5	4.2	6.9	0.2	1.6
Advanced economies			15.9	23.1	7.2	8.4	9.6	5.8	7.8	1.3	3.5
Emerging markets			5.6	16.5	10.9	2.9	9.3	2.6	5.6	0.0	0.0
Regions											
Sub-Saharan Africa			2.3	5.5	3.2	0.8	1.7	1.4	4.5	0.0	0.0
Americas			9.0	21.0	11.9	3.8	9.5	4.2	10.2	0.0	0.0
Western and Northern Europe			19.1	24.6	5.4	9.4	11.1	7.0	8.6	2.0	4.3
Eastern and Southern Europe			15.5	22.5	7.0	9.2	11.3	5.3	7.2	0.6	3.2
Central and Western Asia and North Africa			6.4	16.5	10.1	3.7	10.2	2.1	5.1	0.0	0.0
Southern and Eastern Asia and Pacific			5.0	9.0	3.9	2.8	5.2	2.2	3.0	0.0	0.0
Rating categories*											
AAA			15.6	23.2	7.5	8.1	8.2	6.4	7.8	1.5	3.3
AA			13.0	23.1	10.1	6.9	9.1	5.8	7.7	1.4	3.4
A			12.6	22.5	9.9	7.1	10.5	5.2	8.7	0.9	2.8
BBB			12.7	17.9	5.2	7.5	9.8	3.3	6.2	0.2	1.7
Speculative-grade			5.1	11.5	6.4	2.1	5.1	2.2	5.1	0.0	0.0

*Rating categories are referring to actual ratings as of Jan. 2, 2023. AE--Advanced economies. EM--Emerging markets. FC--Foreign currency. N/A--Not applicable. Source: S&P Global Ratings.

Table 2a

Fiscal indicators and hypothetical long-term ratings

Baseline "no policy change", "balanced budget", and "no aging" scenarios

Entity name	ISO2	FC rating as of Jan 02, 2023	Baseline "no policy change" scenario						"Balanced budget" scenario						"No aging" scenario					
			General govt. net borrowing (% GDP)		Net general govt. debt (% GDP)		Hypothetical long-term sovereign ratings		General govt. net borrowing (% GDP)		Net general govt. debt (% GDP)		Hypothetical long-term sovereign ratings		General govt. net borrowing (% GDP)		Net general govt. debt (% GDP)		Hypothetical long-term sovereign ratings	
			2025	2060	2025	2060	2025	2060	2025	2060	2025	2060	2025	2060	2025	2060	2025	2060	2025	2060
Argentina	AR	CCC+	(3.6)	(23.6)	39	238	a	spec	(1.1)	(20.4)	25.8	186.7	a	bbb	(3.6)	(2.1)	39.2	37.9	a	aa
Australia	AU	AAA	(1.7)	(4.5)	33	63	aaa	aa	(0.7)	(1.7)	29.8	19.1	aaa	aaa	(1.7)	(1.7)	33.3	37.1	aaa	aaa
Austria	AT	AA+	(1.1)	(5.1)	69	102	aa	bbb	(0.1)	(3.4)	66.3	69.5	aa	a	(1.1)	(0.2)	68.6	30.8	aa	aaa
Bangladesh	BD	BB-	(4.3)	(13.2)	34	142	spec	spec	(1.3)	(0.4)	28.5	(2.3)	a	a	(4.3)	(8.7)	33.7	105.3	spec	spec
Belarus	BY	SD	(0.5)	(25.6)	38	266	spec	spec	0.1	(24.2)	29.1	242.1	spec	spec	(0.5)	2.5	37.6	(20.4)	spec	a
Belgium	BE	AA	(3.2)	(10.3)	98	199	aa	bbb	(0.9)	(5.5)	94.4	107.7	aaa	a	(3.2)	(3.1)	98.2	98.7	aa	aa
Benin	BJ	B+	(1.9)	(2.2)	40	32	spec	spec	(0.8)	1.5	38.0	(15.1)	bbb	a	(1.9)	(1.1)	40.2	23.7	spec	spec
Brazil	BR	BB-	(5.1)	(20.0)	71	217	spec	spec	(1.5)	(6.8)	61.5	56.3	bbb	a	(5.1)	(6.1)	70.6	94.4	spec	a
Bulgaria	BG	BBB	(1.3)	(5.2)	20	71	a	a	(0.4)	(3.3)	17.5	37.4	a	a	(1.3)	(1.4)	19.8	30.0	a	a
Cameroon	CM	B-	(1.7)	(4.4)	36	52	spec	spec	(0.3)	(1.9)	33.7	17.2	bbb	spec	(1.7)	(1.5)	36.5	28.2	spec	spec
Canada	CA	AAA	0.6	(3.6)	49	51	aaa	a	0.3	(5.1)	46.7	72.4	aaa	a	0.6	3.9	49.3	(40.8)	aaa	aaa
Chile	CL	A	(1.4)	(18.5)	30	185	a	bbb	(0.6)	(16.1)	28.6	151.7	a	bbb	(1.4)	(1.2)	29.8	22.6	a	aa
China	CN	A+	(2.4)	(21.3)	58	228	bbb	spec	(0.8)	(18.3)	53.3	184.7	a	bbb	(2.4)	(2.2)	57.5	39.7	bbb	aa
Colombia	CO	BB+	(3.3)	(30.5)	60	284	spec	spec	(1.1)	(22.8)	55.9	190.5	bbb	spec	(3.3)	(2.0)	59.9	40.1	spec	a
Cote d'Ivoire	CI	BB-	(2.8)	(6.3)	47	83	spec	spec	(1.0)	(0.9)	44.1	10.0	bbb	bbb	(2.8)	(2.8)	47.0	50.1	spec	spec
Croatia	HR	BBB+	(2.1)	(3.2)	61	62	bbb	a	(0.6)	(0.3)	58.4	12.1	a	aa	(2.1)	(1.1)	60.8	37.9	bbb	aa
Cyprus	CY	BBB	1.3	0.3	65	-7	a	a	0.7	(1.9)	66.1	30.7	a	a	1.3	3.6	65.0	(41.2)	a	aaa
Czech Republic	CZ	AA-	(2.3)	(11.4)	34	168	aa	bbb	(0.7)	(7.6)	31.5	100.1	aa	bbb	(2.3)	(2.8)	34.2	62.7	aa	aa
Denmark	DK	AAA	0.8	(2.4)	11	29	aaa	aa	0.3	(3.3)	8.9	46.1	aaa	aa	0.8	1.3	10.5	(19.5)	aaa	aaa
Dominican Republic	DO	BB	(3.0)	(5.9)	53	68	spec	a	(1.0)	(0.2)	48.0	(1.2)	bbb	aa	(3.0)	(1.2)	53.2	26.6	spec	a
Ecuador	EC	B-	(1.9)	(17.9)	57	181	spec	spec	0.5	(14.4)	51.4	131.5	bbb	spec	(1.9)	(1.5)	56.6	35.0	spec	bbb
Egypt	EG	B	(4.9)	(17.0)	71	155	spec	spec	(1.4)	2.9	63.5	(41.9)	bbb	a	(4.9)	0.1	70.9	24.0	spec	a
Estonia	EE	AA-	(0.9)	(4.2)	11	59	aa	a	(0.3)	(3.2)	9.6	37.1	aa	aa	(0.9)	(0.9)	10.9	21.7	aa	aaa
Finland	FI	AA+	(1.6)	(5.6)	38	92	aaa	a	(0.4)	(3.5)	35.3	47.9	aaa	aa	(1.6)	(1.5)	38.5	44.7	aaa	aaa
France	FR	AA	(4.3)	(6.4)	102	152	aa	bbb	(1.3)	(0.6)	97.4	42.0	aaa	aaa	(4.3)	(4.2)	102.2	116.3	aa	aa
Germany	DE	AAA	(1.4)	(5.4)	55	104	aaa	a	(0.2)	(3.6)	52.7	67.1	aaa	aa	(1.4)	(1.0)	54.9	39.5	aaa	aaa
Ghana	GH	SD	(4.0)	(6.5)	53	68	spec	spec	(1.5)	7.2	49.4	(71.2)	a	a	(4.0)	0.1	53.0	16.0	spec	a
Greece	GR	BB+	(1.3)	(0.2)	144	57	bbb	a	0.1	1.2	141.4	30.3	a	aa	(1.3)	0.3	143.9	44.9	bbb	aa

Table 2a

Fiscal indicators and hypothetical long-term ratings (cont.)

Honduras	HN	BB-	(4.3)	(20.6)	54	210	spec	spec	(1.3)	(10.3)	45.8	82.4	a	spec	(4.3)	(7.3)	53.7	101.7	spec	spec
Hong Kong	HK	AA+	(0.1)	(4.7)	-23	54	aaa	a	0.0	(4.4)	(23.6)	48.2	aaa	a	(0.1)	(0.2)	(23.2)	(2.1)	aaa	aaa
Hungary	HU	BBB	(2.6)	(10.9)	59	134	a	bbb	(0.9)	(7.1)	57.3	73.5	a	a	(2.6)	(0.6)	59.4	27.6	a	aaa
Iceland	IS	A	(1.6)	(21.1)	40	230	aa	spec	(0.6)	(17.0)	38.2	170.9	aaa	bbb	(1.6)	(1.1)	40.3	31.9	aa	aa
India	IN	BBB-	(8.0)	(21.3)	83	205	spec	spec	(2.6)	(3.0)	75.4	10.3	a	a	(8.0)	(9.0)	83.2	110.7	spec	spec
Indonesia	ID	BBB	(2.4)	(8.8)	36	90	bbb	bbb	(0.8)	(3.7)	33.7	31.8	a	bbb	(2.4)	(1.8)	36.4	28.0	bbb	a
Ireland	IE	AA-	0.7	(6.1)	33	81	aaa	a	0.5	(6.8)	32.6	95.0	aaa	a	0.7	1.5	32.5	(16.8)	aaa	aaa
Israel	IL	AA-	(1.9)	(4.9)	56	72	aa	a	(0.6)	(1.2)	54.6	18.0	aaa	aaa	(1.9)	(0.2)	56.4	21.7	aa	aaa
Italy	IT	BBB	(3.4)	(4.0)	141	156	a	bbb	(1.0)	1.9	137.2	49.4	a	aaa	(3.4)	(1.3)	141.1	89.1	a	aa
Japan	JP	A+	(4.1)	(7.6)	167	214	a	spec	(1.5)	(2.6)	161.6	103.5	a	aa	(4.1)	(3.7)	166.8	153.6	a	a
Kazakhstan	KZ	BBB-	0.1	(5.9)	2	61	bbb	bbb	0.9	(6.1)	(1.7)	63.7	bbb	bbb	0.1	0.5	1.6	(6.6)	bbb	a
Kenya	KE	B	(5.5)	(16.1)	64	150	spec	spec	(2.0)	(3.2)	56.7	12.8	bbb	bbb	(5.5)	(4.6)	64.3	62.3	spec	spec
Korea	KR	AA	1.5	(20.3)	9	234	aa	spec	0.5	(23.2)	8.6	284.6	a	spec	1.5	3.8	9.3	(60.7)	aa	aaa
Latvia	LV	A+	(1.4)	(4.2)	38	74	a	a	(0.6)	(2.3)	37.1	35.2	a	aa	(1.4)	(1.2)	38.4	40.3	a	aa
Lithuania	LT	A+	(0.7)	(6.5)	31	103	a	bbb	(0.1)	(5.6)	29.3	82.6	a	a	(0.7)	(0.2)	30.5	16.4	a	aa
Luxembourg	LU	AAA	1.9	(8.9)	-11	88	aaa	a	0.8	(10.8)	(11.7)	124.9	aaa	bbb	1.9	2.1	(11.3)	(43.5)	aaa	aaa
Malaysia	MY	A-	(2.6)	(17.7)	68	172	bbb	bbb	(0.7)	(13.7)	62.8	117.2	a	bbb	(2.6)	(1.0)	67.7	27.7	bbb	aa
Malta	MT	A-	(2.5)	(13.4)	49	166	a	bbb	(0.7)	(9.1)	48.4	92.1	aa	a	(2.5)	(2.9)	49.5	66.3	a	a
Mexico	MX	BBB	(2.6)	(21.0)	46	225	bbb	spec	(0.8)	(14.8)	42.3	141.0	a	bbb	(2.6)	(3.2)	46.1	56.8	bbb	a
Morocco	MA	BB+	(4.0)	(17.5)	67	201	spec	spec	(1.2)	(9.6)	63.0	94.8	bbb	spec	(4.0)	(4.7)	66.6	79.9	spec	spec
Netherlands	NL	AAA	(0.6)	(7.2)	44	124	aaa	bbb	(0.1)	(6.2)	42.8	103.4	aaa	bbb	(0.6)	(0.2)	43.5	20.7	aaa	aaa
New Zealand	NZ	AA+	(0.9)	(11.6)	31	150	aaa	bbb	(0.8)	(9.7)	28.6	116.6	aaa	bbb	(0.9)	0.1	30.6	10.7	aaa	aaa
Nicaragua	NI	B	(1.2)	(18.9)	48	192	spec	spec	(0.2)	(17.3)	42.8	165.6	spec	spec	(1.2)	(0.4)	47.8	18.3	spec	spec
Norway	NO	AAA	11.6	1.4	-259	-176	aaa	a	4.5	(12.7)	(268.4)	85.9	a	a	11.6	8.9	(259.0)	(271.7)	aaa	aa
Oman	OM	BB	(2.0)	(37.2)	1	344	a	spec	1.6	(31.0)	(8.4)	253.8	a	spec	(2.0)	(6.9)	1.2	95.4	a	a
Pakistan	PK	CCC+	(4.6)	(3.4)	72	40	spec	bbb	(1.9)	6.2	65.5	(68.2)	bbb	a	(4.6)	0.4	71.8	13.9	spec	a
Papua New Guinea	PG	B-	(2.4)	(4.4)	50	64	spec	spec	(1.0)	1.5	47.7	(12.9)	bbb	a	(2.4)	(1.6)	50.1	37.3	spec	spec
Peru	PE	BBB	(1.3)	(11.7)	23	110	bbb	spec	(0.5)	(9.0)	21.4	76.3	bbb	bbb	(1.3)	(1.1)	23.2	19.6	bbb	a
Philippines	PH	BBB+	(2.4)	(6.4)	41	75	bbb	spec	(0.7)	(1.0)	37.7	8.2	a	a	(2.4)	(2.5)	40.7	39.7	bbb	bbb
Poland	PL	A-	(2.8)	(9.8)	48	128	a	bbb	(1.0)	(5.4)	44.9	55.0	aa	a	(2.8)	(2.3)	47.9	52.6	a	a
Portugal	PT	BBB+	0.1	(4.2)	94	98	a	a	0.4	(4.0)	93.3	94.3	a	a	0.1	1.5	94.2	11.2	a	aaa
Qatar	QA	AA	0.7	(29.1)	-133	268	aaa	spec	3.8	(30.1)	(121.5)	287.0	aaa	spec	0.7	(4.2)	(132.7)	18.3	aaa	a
Romania	RO	BBB-	(2.8)	(10.3)	44	152	a	bbb	(0.9)	(5.5)	40.5	75.7	a	a	(2.8)	(2.9)	43.8	58.7	a	a
Rwanda	RW	B+	(4.9)	(8.4)	71	78	spec	spec	(1.6)	(2.5)	61.6	14.1	bbb	bbb	(4.9)	(4.1)	70.8	48.6	spec	spec
Saudi Arabia	SA	A-	(0.3)	(35.1)	-55	376	aa	spec	2.4	(34.0)	(63.3)	357.8	aa	spec	(0.3)	(4.6)	(55.0)	51.3	aa	a
Senegal	SN	B+	(2.9)	(9.1)	60	94	spec	spec	(1.5)	(4.7)	57.0	36.5	spec	spec	(2.9)	(1.9)	60.0	37.4	spec	bbb

Table 2a

Fiscal indicators and hypothetical long-term ratings (cont.)

Singapore	SG	AAA	1.6	(0.9)	-48	-10	aaa	aaa	0.6	(2.4)	(48.4)	19.5	aaa	aa	1.6	1.6	(47.6)	(42.1)	aaa	aaa
Slovakia	SK	A+	(3.4)	(18.5)	53	270	a	spec	(1.0)	(13.0)	49.2	166.9	aa	bbb	(3.4)	(4.0)	53.0	94.5	a	a
Slovenia	SI	AA-	(2.6)	(17.2)	56	267	a	spec	(0.6)	(13.1)	52.7	189.1	aa	bbb	(2.6)	(2.7)	56.2	71.8	a	aa
South Africa	ZA	BB-	(4.4)	(24.3)	75	258	spec	spec	(1.4)	(9.3)	68.6	72.3	bbb	spec	(4.4)	(5.3)	75.0	94.8	spec	spec
Spain	ES	A	(3.4)	(8.1)	101	172	a	bbb	(1.0)	(3.0)	97.4	78.0	a	aa	(3.4)	(4.0)	100.5	111.1	a	a
Sri Lanka	LK	SD	(8.3)	(15.7)	138	208	spec	spec	(3.1)	15.3	128.5	(144.4)	bbb	a	(8.3)	(6.7)	137.6	125.6	spec	spec
Sweden	SE	AAA	0.1	(5.1)	21	57	aaa	a	0.1	(5.1)	21.3	56.9	aaa	a	0.1	0.3	21.4	1.0	aaa	aaa
Switzerland	CH	AAA	0.6	(2.0)	15	29	aaa	aaa	0.3	(2.6)	15.4	39.8	aaa	aa	0.6	0.8	15.1	(10.4)	aaa	aaa
Tajikistan	TJ	B-	(2.2)	(5.5)	37	65	spec	spec	(0.7)	(2.4)	29.5	20.6	bbb	spec	(2.2)	(1.9)	37.1	32.7	spec	spec
Thailand	TH	BBB+	(2.4)	(19.8)	43	222	bbb	spec	(0.6)	(15.5)	39.3	162.0	a	bbb	(2.4)	(2.2)	42.8	40.0	bbb	a
Turkiye	TR	B	(2.7)	(15.3)	34	155	spec	spec	(1.0)	(9.6)	30.9	82.7	bbb	bbb	(2.7)	0.0	33.8	11.3	spec	a
U.K.	GB	AA	(2.6)	(12.4)	94	183	aa	bbb	(0.3)	(7.9)	90.5	103.0	aaa	bbb	(2.6)	(2.3)	94.0	79.0	aa	aa
U.S.	US	AA+	(4.9)	(13.2)	99	229	aa	spec	(1.6)	(4.9)	93.8	81.7	aaa	aa	(4.9)	(5.0)	98.7	127.0	aa	aa
Uruguay	UY	BBB	(2.6)	(20.8)	61	217	a	spec	(0.8)	(17.0)	53.3	157.1	a	bbb	(2.6)	(1.4)	61.5	37.2	a	aaa
Uzbekistan	UZ	BB-	(2.6)	(17.9)	23	168	spec	spec	(0.8)	(14.7)	17.9	125.1	bbb	spec	(2.6)	(2.6)	22.7	37.0	spec	spec
Vietnam	VN	BB+	(3.3)	(16.9)	34	158	spec	bbb	(1.0)	(11.7)	30.4	96.1	bbb	a	(3.3)	(3.7)	34.0	47.0	spec	a
Zambia	ZM	SD	(5.9)	(5.8)	110	76	spec	spec	(1.9)	6.0	102.5	(61.4)	bbb	a	(5.9)	(0.5)	109.7	32.2	spec	a

Medians

	Baseline "no policy change" scenario				"Balanced budget" scenario				"No aging" scenario			
	General		Net general		General		Net general		General		Net general	
	govt. net	govt. net	govt. debt	govt. debt	govt. net	govt. net	govt. debt (%)	govt. debt (%)	govt. net	govt. net	govt. debt (%)	govt. debt (%)
	borrowing	borrowing	govt. debt	govt. debt	borrowing	borrowing	govt. debt (%)	govt. debt (%)	borrowing	borrowing	govt. debt (%)	govt. debt (%)
(% GDP)	(% GDP)	(% GDP)	(% GDP)	(% GDP)	(% GDP)	(% GDP)	(% GDP)	(% GDP)	(% GDP)	(% GDP)	(% GDP)	(% GDP)
	2025	2060	2025	2060	2025	2060	2025	2060	2025	2060	2025	2060
Whole sample	(2.4)	(9.1)	47.8	141.6	(0.7)	(5.1)	44.1	72.4	(2.4)	(1.5)	47.8	37.1
Advanced economies	(1.3)	(5.6)	43.5	101.6	(0.3)	(4.4)	42.8	78.0	(1.3)	(0.2)	43.5	30.8
Emerging markets	(2.6)	(15.9)	47.8	155.1	(0.9)	(6.4)	44.5	68.0	(2.6)	(2.0)	47.8	37.4

Regions

Sub-Saharan Africa	(4.0)	(6.5)	60.0	78.1	(1.5)	(1.9)	56.7	12.8	(4.0)	(1.9)	60.0	37.4
Americas	(2.6)	(18.9)	53.2	209.6	(0.8)	(14.4)	46.7	131.5	(2.6)	(1.5)	53.2	37.2
Western and Northern Europe	(0.8)	(5.8)	39.4	96.6	(0.1)	(5.3)	36.7	77.7	(0.8)	(0.2)	39.4	25.8
Eastern and Southern Europe	(2.2)	(7.3)	51.2	130.6	(0.6)	(4.7)	48.8	74.6	(2.2)	(1.3)	51.2	42.6
Central and Western Asia and North Africa	(2.1)	(17.2)	28.2	161.7	(0.7)	(9.6)	23.7	88.7	(2.1)	(2.3)	28.2	28.3

Table 2a

Fiscal indicators and hypothetical long-term ratings (cont.)

Southern and Eastern Asia and Pacific (2.4) (11.6) 40.7 149.6 (0.8) (3.0) 37.7 31.8 (2.4) (1.8) 40.7 37.3

Rating categories*

AAA	0.6	(4.1)	18.2	53.7	0.3	(4.3)	18.3	62.0	0.6	1.0	18.2	(14.9)
AA	(1.6)	(10.3)	38.5	152.3	(0.4)	(5.5)	35.3	95.0	(1.6)	(1.5)	38.5	30.8
A	(2.5)	(15.6)	48.7	178.5	(0.7)	(11.1)	46.6	110.4	(2.5)	(2.2)	48.7	45.8
BBB	(2.4)	(8.8)	46.1	110.1	(0.7)	(4.0)	42.3	63.7	(2.4)	(1.4)	46.1	37.2
Speculative-grade	(3.3)	(15.7)	53.2	154.8	(1.1)	(3.2)	48.0	30.3	(3.3)	(1.9)	53.2	37.4

*Rating categories are referring to actual ratings as of Jan. 2, 2023. AE--Advanced economies. EM--Emerging markets. FC--Foreign currency. Source: S&P Global Ratings.

Table 2b

Fiscal indicators and hypothetical long-term ratings

Baseline "no policy change", "higher interest rate" and "higher economic growth" scenarios

Entity name	ISO2	FC rating as of Jan 02, 2023	Baseline "no policy change" scenario						"Higher interest rate" scenario				"Higher economic growth" scenario							
			General govt. net borrowing (% GDP)		Net general govt. debt (% GDP)		Hypothetical long-term sovereign ratings		General govt. net borrowing (% GDP)		Net general govt. debt (% GDP)		Hypothetical long-term sovereign ratings		General govt. net borrowing (% GDP)		Net general govt. debt (% GDP)		Hypothetical long-term sovereign ratings	
			2025	2060	2025	2060	2025	2060	2025	2060	2025	2060	2025	2060	2025	2060	2025	2060	2025	2060
			Argentina	AR	CCC+	(3.6)	(23.6)	39.2	237.8	a	spec	(3.6)	(26.4)	39.2	262.3	a	spec	(3.6)	(23.3)	39.2
Australia	AU	AAA	(1.7)	(4.5)	33.3	63.2	aaa	aa	(1.7)	(5.7)	33.3	80.0	aaa	a	(1.7)	(4.2)	33.3	53.7	aaa	aa
Austria	AT	AA+	(1.1)	(5.1)	68.6	101.6	aa	bbb	(1.1)	(6.7)	68.6	125.7	aa	bbb	(1.1)	(4.8)	68.6	84.6	aa	a
Bangladesh	BD	BB-	(4.3)	(13.2)	33.7	141.6	spec	spec	(4.3)	(16.8)	33.7	172.3	spec	spec	(4.3)	(12.0)	33.7	120.3	spec	spec
Belarus	BY	SD	(0.5)	(25.6)	37.6	266.2	spec	spec	(0.5)	(30.2)	37.6	306.0	spec	spec	(0.5)	(24.5)	37.6	237.2	spec	spec
Belgium	BE	AA	(3.2)	(10.3)	98.2	199.5	aa	bbb	(3.2)	(13.4)	98.2	244.7	aa	spec	(3.2)	(9.8)	98.2	167.4	aa	bbb
Benin	BJ	B+	(1.9)	(2.2)	40.2	32.3	spec	spec	(1.9)	(3.0)	40.2	43.3	spec	spec	(1.9)	(1.9)	40.2	25.6	spec	spec
Brazil	BR	BB-	(5.1)	(20.0)	70.6	216.7	spec	spec	(5.1)	(25.2)	70.6	266.2	spec	spec	(5.1)	(18.3)	70.6	184.2	spec	bbb
Bulgaria	BG	BBB	(1.3)	(5.2)	19.8	70.5	a	a	(1.3)	(6.2)	19.8	82.9	a	a	(1.3)	(5.0)	19.8	61.9	a	a
Cameroon	CM	B-	(1.7)	(4.4)	36.5	51.7	spec	spec	(1.7)	(5.2)	36.5	61.5	spec	spec	(1.7)	(4.2)	36.5	45.1	spec	spec
Canada	CA	AAA	0.6	(3.6)	49.3	50.8	aaa	a	0.6	(5.3)	49.3	75.7	aaa	a	0.6	(3.3)	49.3	40.4	aaa	aa
Chile	CL	A	(1.4)	(18.5)	29.8	184.8	a	bbb	(1.4)	(21.0)	29.8	207.7	a	spec	(1.4)	(18.0)	29.8	167.8	a	bbb
China	CN	A+	(2.4)	(21.3)	57.5	227.8	bbb	spec	(2.4)	(23.9)	57.5	253.4	bbb	spec	(2.4)	(21.1)	57.5	208.8	bbb	spec
Colombia	CO	BB+	(3.3)	(30.5)	59.9	284.2	spec	spec	(3.3)	(35.7)	59.9	329.0	spec	spec	(3.3)	(29.0)	59.9	252.2	spec	spec
Cote d'Ivoire	CI	BB-	(2.8)	(6.3)	47.0	82.8	spec	spec	(2.8)	(8.1)	47.0	102.2	spec	spec	(2.8)	(5.8)	47.0	69.5	spec	spec

Table 2b

Fiscal indicators and hypothetical long-term ratings (cont.)

Croatia	HR	BBB+	(2.1)	(3.2)	60.8	61.6	bbb	a	(2.1)	(4.3)	60.8	79.4	bbb	a	(2.1)	(2.9)	60.8	49.7	bbb	aa
Cyprus	CY	BBB	1.3	0.3	65.0	(7.1)	a	a	1.3	0.2	65.0	(1.5)	a	a	1.3	0.3	65.0	(9.5)	a	a
Czech Republic	CZ	AA-	(2.3)	(11.4)	34.2	167.7	aa	bbb	(2.3)	(13.9)	34.2	197.1	aa	bbb	(2.3)	(10.9)	34.2	146.7	aa	bbb
Denmark	DK	AAA	0.8	(2.4)	10.5	29.3	aaa	aa	0.8	(2.9)	10.5	36.0	aaa	aa	0.8	(2.3)	10.5	26.4	aaa	aa
Dominican Republic	DO	BB	(3.0)	(5.9)	53.2	67.5	spec	a	(3.0)	(7.5)	53.2	84.2	spec	a	(3.0)	(5.4)	53.2	56.5	spec	a
Ecuador	EC	B-	(1.9)	(17.9)	56.6	180.6	spec	spec	(1.9)	(20.8)	56.6	208.4	spec	spec	(1.9)	(17.3)	56.6	160.7	spec	spec
Egypt	EG	B	(4.9)	(17.0)	70.9	155.4	spec	spec	(4.9)	(23.4)	70.9	209.1	spec	spec	(4.9)	(14.3)	70.9	122.5	spec	spec
Estonia	EE	AA-	(0.9)	(4.2)	10.9	58.9	aa	a	(0.9)	(4.9)	10.9	67.8	aa	a	(0.9)	(4.2)	10.9	52.7	aa	a
Finland	FI	AA+	(1.6)	(5.6)	38.5	91.6	aaa	a	(1.6)	(7.1)	38.5	114.8	aaa	bbb	(1.6)	(5.5)	38.5	78.8	aaa	a
France	FR	AA	(4.3)	(6.4)	102.2	152.3	aa	bbb	(4.3)	(8.8)	102.2	191.8	aa	bbb	(4.3)	(6.0)	102.2	125.1	aa	a
Germany	DE	AAA	(1.4)	(5.4)	54.9	103.8	aaa	a	(1.4)	(6.9)	54.9	125.3	aaa	bbb	(1.4)	(5.3)	54.9	88.5	aaa	a
Ghana	GH	SD	(4.0)	(6.5)	53.0	67.8	spec	spec	(4.0)	(9.6)	53.0	95.8	spec	spec	(4.0)	(5.1)	53.0	50.6	spec	spec
Greece	GR	BB+	(1.3)	(0.2)	143.9	57.3	bbb	a	(1.3)	(1.5)	143.9	86.0	bbb	a	(1.3)	0.0	143.9	39.4	bbb	aa
Honduras	HN	BB-	(4.3)	(20.6)	53.7	209.6	spec	spec	(4.3)	(24.9)	53.7	248.4	spec	spec	(4.3)	(19.4)	53.7	182.7	spec	spec
Hong Kong	HK	AA+	(0.1)	(4.7)	(23.2)	54.3	aaa	a	(0.1)	(5.5)	(23.2)	62.5	aaa	a	(0.1)	(4.7)	(23.2)	51.0	aaa	a
Hungary	HU	BBB	(2.6)	(10.9)	59.4	133.7	a	bbb	(2.6)	(13.2)	59.4	158.2	a	bbb	(2.6)	(10.4)	59.4	116.2	a	bbb
Iceland	IS	A	(1.6)	(21.1)	40.3	230.1	aa	spec	(1.6)	(25.3)	40.3	270.8	aa	spec	(1.6)	(19.9)	40.3	201.1	aa	spec
India	IN	BBB-	(8.0)	(21.3)	83.2	205.5	spec	spec	(8.0)	(26.0)	83.2	245.4	spec	spec	(8.0)	(19.8)	83.2	178.0	spec	spec
Indonesia	ID	BBB	(2.4)	(8.8)	36.4	90.2	bbb	bbb	(2.4)	(10.7)	36.4	107.4	bbb	spec	(2.4)	(8.2)	36.4	78.4	bbb	a
Ireland	IE	AA-	0.7	(6.1)	32.5	80.9	aaa	a	0.7	(7.1)	32.5	94.1	aaa	a	0.7	(5.9)	32.5	71.7	aaa	a
Israel	IL	AA-	(1.9)	(4.9)	56.4	72.0	aa	a	(1.9)	(6.7)	56.4	93.1	aa	a	(1.9)	(4.4)	56.4	58.0	aa	a
Italy	IT	BBB	(3.4)	(4.0)	141.1	155.6	a	bbb	(3.4)	(7.5)	141.1	213.1	a	spec	(3.4)	(3.1)	141.1	116.7	a	a
Japan	JP	A+	(4.1)	(7.6)	166.8	214.0	a	spec	(4.1)	(11.2)	166.8	283.4	bbb	spec	(4.1)	(7.2)	166.8	173.3	a	bbb
Kazakhstan	KZ	BBB-	0.1	(5.9)	1.6	61.0	bbb	bbb	0.1	(7.1)	1.6	73.4	bbb	bbb	0.1	(5.7)	1.6	55.1	bbb	a
Kenya	KE	B	(5.5)	(16.1)	64.3	150.2	spec	spec	(5.5)	(19.6)	64.3	180.0	spec	spec	(5.5)	(14.9)	64.3	129.8	spec	spec
Korea	KR	AA	1.5	(20.3)	9.3	234.3	aa	spec	1.5	(24.0)	9.3	271.3	aa	spec	1.5	(19.6)	9.3	211.6	aa	spec
Latvia	LV	A+	(1.4)	(4.2)	38.4	74.3	a	a	(1.4)	(5.3)	38.4	90.9	a	a	(1.4)	(4.0)	38.4	62.7	a	a
Lithuania	LT	A+	(0.7)	(6.5)	30.5	103.0	a	bbb	(0.7)	(7.9)	30.5	120.9	a	bbb	(0.7)	(6.4)	30.5	90.0	a	a
Luxembourg	LU	AAA	1.9	(8.9)	(11.3)	88.2	aaa	a	1.9	(9.9)	(11.3)	98.1	aaa	a	1.9	(8.8)	(11.3)	83.2	aaa	a
Malaysia	MY	A-	(2.6)	(17.7)	67.7	172.2	bbb	bbb	(2.6)	(20.2)	67.7	196.8	bbb	bbb	(2.6)	(17.2)	67.7	154.6	bbb	bbb
Malta	MT	A-	(2.5)	(13.4)	49.5	166.5	a	bbb	(2.5)	(16.0)	49.5	196.0	a	bbb	(2.5)	(12.9)	49.5	145.5	a	bbb
Mexico	MX	BBB	(2.6)	(21.0)	46.1	225.1	bbb	spec	(2.6)	(25.2)	46.1	263.4	bbb	spec	(2.6)	(19.9)	46.1	197.3	bbb	bbb
Morocco	MA	BB+	(4.0)	(17.5)	66.6	201.0	spec	spec	(4.0)	(21.0)	66.6	236.6	spec	spec	(4.0)	(16.6)	66.6	175.4	spec	spec
Netherlands	NL	AAA	(0.6)	(7.2)	43.5	123.6	aaa	bbb	(0.6)	(8.9)	43.5	145.9	aaa	bbb	(0.6)	(7.0)	43.5	107.2	aaa	bbb
New Zealand	NZ	AA+	(0.9)	(11.6)	30.6	149.6	aaa	bbb	(0.9)	(14.1)	30.6	178.3	aa	bbb	(0.9)	(11.1)	30.6	130.4	aaa	bbb
Nicaragua	NI	B	(1.2)	(18.9)	47.8	192.2	spec	spec	(1.2)	(21.3)	47.8	216.1	spec	spec	(1.2)	(18.5)	47.8	174.2	spec	spec

Table 2b

Fiscal indicators and hypothetical long-term ratings (cont.)

Norway	NO	AAA	11.6	1.4	(259.0)	(175.6)	aaa	a	11.6	1.4	(259.0)	(175.1)	aaa	a	11.6	0.9	(259.0)	(128.7)	aaa	a
Oman	OM	BB	(2.0)	(37.2)	1.2	344.2	a	spec	(2.0)	(43.7)	1.2	402.0	a	spec	(2.0)	(35.8)	1.2	311.6	a	spec
Pakistan	PK	CCC+	(4.6)	(3.4)	71.8	40.3	spec	bbb	(4.6)	(5.0)	71.8	58.5	spec	spec	(4.6)	(2.8)	71.8	29.3	spec	bbb
Papua New Guinea	PG	B-	(2.4)	(4.4)	50.1	64.4	spec	spec	(2.4)	(6.4)	50.1	86.9	spec	spec	(2.4)	(3.7)	50.1	49.9	spec	spec
Peru	PE	BBB	(1.3)	(11.7)	23.2	110.1	bbb	spec	(1.3)	(13.7)	23.2	127.3	bbb	spec	(1.3)	(11.2)	23.2	98.3	bbb	a
Philippines	PH	BBB+	(2.4)	(6.4)	40.7	74.6	bbb	spec	(2.4)	(8.3)	40.7	93.0	bbb	spec	(2.4)	(5.8)	40.7	62.6	bbb	bbb
Poland	PL	A-	(2.8)	(9.8)	47.9	127.5	a	bbb	(2.8)	(11.8)	47.9	151.3	a	bbb	(2.8)	(9.4)	47.9	110.5	a	bbb
Portugal	PT	BBB+	0.1	(4.2)	94.2	97.5	a	a	0.1	(6.0)	94.2	128.5	a	bbb	0.1	(3.8)	94.2	76.9	a	a
Qatar	QA	AA	0.7	(29.1)	(132.7)	267.5	aaa	spec	0.7	(33.1)	(132.7)	298.2	aaa	spec	0.7	(28.9)	(132.7)	259.1	aaa	spec
Romania	RO	BBB-	(2.8)	(10.3)	43.8	152.1	a	bbb	(2.8)	(12.8)	43.8	179.9	a	bbb	(2.8)	(9.7)	43.8	131.6	a	bbb
Rwanda	RW	B+	(4.9)	(8.4)	70.8	78.1	spec	spec	(4.9)	(9.5)	70.8	88.3	spec	spec	(4.9)	(8.2)	70.8	71.1	spec	spec
Saudi Arabia	SA	A-	(0.3)	(35.1)	(55.0)	376.4	aa	spec	(0.3)	(40.7)	(55.0)	424.6	aa	spec	(0.3)	(34.2)	(55.0)	346.9	aa	spec
Senegal	SN	B+	(2.9)	(9.1)	60.0	94.4	spec	spec	(2.9)	(10.6)	60.0	111.3	spec	spec	(2.9)	(8.7)	60.0	82.8	spec	spec
Singapore	SG	AAA	1.6	(0.9)	(47.6)	(9.9)	aaa	aaa	1.6	(1.4)	(47.6)	4.6	aaa	aa	1.6	(0.9)	(47.6)	(5.8)	aaa	aaa
Slovakia	SK	A+	(3.4)	(18.5)	53.0	270.1	a	spec	(3.4)	(22.4)	53.0	316.0	a	spec	(3.4)	(17.8)	53.0	236.1	a	spec
Slovenia	SI	AA-	(2.6)	(17.2)	56.2	266.9	a	spec	(2.6)	(21.1)	56.2	312.3	a	spec	(2.6)	(16.7)	56.2	233.7	a	spec
South Africa	ZA	BB-	(4.4)	(24.3)	75.0	257.7	spec	spec	(4.4)	(31.1)	75.0	321.6	spec	spec	(4.4)	(21.7)	75.0	213.7	spec	spec
Spain	ES	A	(3.4)	(8.1)	100.5	172.1	a	bbb	(3.4)	(11.0)	100.5	214.8	a	spec	(3.4)	(7.6)	100.5	142.8	a	bbb
Sri Lanka	LK	SD	(8.3)	(15.7)	137.6	208.2	spec	spec	(8.3)	(24.1)	137.6	292.5	spec	spec	(8.3)	(11.9)	137.6	153.1	spec	spec
Sweden	SE	AAA	0.1	(5.1)	21.4	56.5	aaa	a	0.1	(5.7)	21.4	64.5	aaa	a	0.1	(5.0)	21.4	51.1	aaa	a
Switzerland	CH	AAA	0.6	(2.0)	15.1	28.6	aaa	aaa	0.6	(2.4)	15.1	34.4	aaa	aa	0.6	(2.0)	15.1	25.1	aaa	aaa
Tajikistan	TJ	B-	(2.2)	(5.5)	37.1	64.5	spec	spec	(2.2)	(6.6)	37.1	76.5	spec	spec	(2.2)	(5.3)	37.1	56.3	spec	spec
Thailand	TH	BBB+	(2.4)	(19.8)	42.8	221.9	bbb	spec	(2.4)	(23.2)	42.8	254.2	bbb	spec	(2.4)	(19.2)	42.8	198.9	bbb	bbb
Turkiye	TR	B	(2.7)	(15.3)	33.8	154.8	spec	spec	(2.7)	(18.4)	33.8	182.1	spec	spec	(2.7)	(14.3)	33.8	135.3	spec	bbb
U.K.	GB	AA	(2.6)	(12.4)	94.0	182.8	aa	bbb	(2.6)	(15.7)	94.0	225.9	aa	spec	(2.6)	(11.7)	94.0	152.8	aa	bbb
U.S.	US	AA+	(4.9)	(13.2)	98.7	228.7	aa	spec	(4.9)	(17.2)	98.7	282.4	aa	spec	(4.9)	(12.3)	98.7	191.0	aa	bbb
Uruguay	UY	BBB	(2.6)	(20.8)	61.5	216.7	a	spec	(2.6)	(23.9)	61.5	247.6	a	spec	(2.6)	(20.2)	61.5	193.9	a	bbb
Uzbekistan	UZ	BB-	(2.6)	(17.9)	22.7	168.0	spec	spec	(2.6)	(19.8)	22.7	185.1	spec	spec	(2.6)	(17.8)	22.7	155.5	spec	spec
Vietnam	VN	BB+	(3.3)	(16.9)	34.0	158.0	spec	bbb	(3.3)	(19.2)	34.0	177.1	spec	bbb	(3.3)	(16.5)	34.0	144.1	spec	bbb
Zambia	ZM	SD	(5.9)	(5.8)	109.7	76.0	spec	spec	(5.9)	(8.3)	109.7	103.1	spec	spec	(5.9)	(4.9)	109.7	58.6	spec	spec

Table 2b

Fiscal indicators and hypothetical long-term ratings (cont.)

Medians

	Baseline "no policy change" scenario				"Higher interest rate" scenario				"Higher economic growth" scenario			
	General		Net general		General		Net general		General		Net general	
	govt. net borrowing (% GDP)		govt. debt (% GDP)		govt. net borrowing (% GDP)		govt. debt (% GDP)		govt. net borrowing (% GDP)		govt. debt (% GDP)	
	2025	2060	2025	2060	2025	2060	2025	2060	2025	2060	2025	2060
Whole sample	(2.4)	(9.1)	47.8	141.6	(2.4)	(11.2)	47.8	172.3	(2.4)	(8.8)	47.8	116.7
Advanced economies	(1.3)	(5.6)	43.5	101.6	(1.3)	(7.1)	43.5	125.3	(1.3)	(5.5)	43.5	84.6
Emerging markets	(2.6)	(15.9)	47.8	155.1	(2.6)	(19.4)	47.8	181.0	(2.6)	(14.3)	47.8	133.4
Regions												
Sub-Saharan Africa	(4.0)	(6.5)	60.0	78.1	(4.0)	(9.5)	60.0	102.2	(4.0)	(5.8)	60.0	69.5
Americas	(2.6)	(18.9)	53.2	209.6	(2.6)	(21.3)	53.2	247.6	(2.6)	(18.3)	53.2	182.7
Western and Northern Europe	(0.8)	(5.8)	39.4	96.6	(0.8)	(7.1)	39.4	120.1	(0.8)	(5.7)	39.4	83.9
Eastern and Southern Europe	(2.2)	(7.3)	51.2	130.6	(2.2)	(9.5)	51.2	154.8	(2.2)	(7.0)	51.2	113.3
Central and Western Asia and North Africa	(2.1)	(17.2)	28.2	161.7	(2.1)	(20.4)	28.2	197.1	(2.1)	(15.5)	28.2	145.4
Southern and Eastern Asia and Pacific	(2.4)	(11.6)	40.7	149.6	(2.4)	(14.1)	40.7	177.1	(2.4)	(11.1)	40.7	130.4
Rating categories*												
AAA	0.6	(4.1)	18.2	53.7	0.6	(5.5)	18.2	70.1	0.6	(3.8)	18.2	45.7
AA	(1.6)	(10.3)	38.5	152.3	(1.6)	(13.4)	38.5	191.8	(1.6)	(9.8)	38.5	130.4
A	(2.5)	(15.6)	48.7	178.5	(2.5)	(18.1)	48.7	211.2	(2.5)	(15.1)	48.7	161.2
BBB	(2.4)	(8.8)	46.1	110.1	(2.4)	(10.7)	46.1	128.5	(2.4)	(8.2)	46.1	98.3
Speculative-grade	(3.3)	(15.7)	53.2	154.8	(3.3)	(19.2)	53.2	180.0	(3.3)	(14.3)	53.2	129.8

*Rating categories are referring to actual ratings as of Jan. 2, 2023. AE--Advanced economies. EM--Emerging markets. FC--Foreign currency. Spec--Speculative-grade. Source: S&P Global Ratings.

Appendix 2: Data and Methodological Supplement

Data Sources

In addition to the outlines below, please see tables 1a and 1b for a comprehensive overview of all long-term assumptions and external sources. In our simulations, we consider only sovereigns that are currently rated by S&P Global Ratings.

Fiscal, economic, and demographic data

For historical periods and medium-term forecasts until 2025, we source figures for nominal GDP, real GDP growth, the GDP deflator, and figures for general government revenue, expenditure, interest paid, and debt (all in % of GDP) for all sovereigns from the "Sovereign Risk Indicators," published Dec. 12, 2022.

Economy classifications. We follow the IMF (2022)'s classifications of each sovereign's economy as reported in table A ("Economy Groupings"). However, we subsume "Low-Income Developing Countries" and "Emerging Market Economies" under a common emerging markets group.

Demographic indicators. For countries that are members of the EU and for Norway, we source population figures and old-age-dependency ratios from the European Commission (EC) (2021). For all remaining advanced economies and emerging market economies, as defined by the IMF (2022), we source population figures and old-age-dependency ratios from the U.N. (2022) following the EC's old-age dependency ratio definition of [65+/20-64]. However, for all "Low-Income Developing Countries" as defined by the IMF (2022), we apply the alternative old-age dependency ratio definition of [65+/15-64], to better capture labor market realities in the respective countries.

Economic growth. For EU members and Norway, we sourced long-term real GDP growth rates from the European Commission (2021). We rely on projections of long-term real GDP from national authorities for Australia (TCA, 2021), New Zealand (TNZ, 2021), Switzerland (FFA, 2021), the U.K. (OBR, 2022) and the U.S. (CBO, 2022). For all other sovereigns, we extracted long-term growth projections from S&P Global Market Intelligence (2022).

For all sovereigns, we let the respective real GDP growth series linearly converge from S&P Global Ratings' forecast for 2025 to the external long-term growth projection, as outlined above, by 2030. In all cases, we extract the external data in five-year intervals, which linearly interpolate for the periods in between. When long-term real GDP projections were not available over the full horizon, we kept growth rates constant from the last available reported year to the end of the projection horizon.

Price inflation. For each sovereign, we let the GDP deflator growth rate linearly converge from S&P Global Ratings' forecast for 2025 to a common long-term deflator growth rate in 2030, depending on the classification of the economy (advanced economies: 2%; emerging markets: 3%). We keep these long-term deflator growth rates constant afterwards until the end of the projection horizon.

Interest rate. In our exercise, the interest rate is based on the effectively paid interest by the government in 2025 as forecast by S&P Global Ratings and an assumption for a constant long-term interest rate that applies over 2030-2060. The long-term interest rate is defined as the three-year average of the effectively paid interest by the government over 2020-2022 and is calculated individually for each sovereign. We linearly interpolate over 2025-2030.

Long-term projections on age-related spending

We source the general government age-related spending data from the primary sources in five-year intervals and linearly interpolate values for in-between data points. All figures are expressed in % of GDP.

Pensions

- EU member countries and Norway: EC (2021). Public pensions as reported in Table III.1.67.
- Australia: TCA (2021). Total pension expenditure comprises age pension expenditure as reported in Chart 7.4.6, plus disability support pension as reported in Chart 7.5.1. We linearly interpolate disability support pension for periods in between of 2020 and 2060.
- Japan: MFJ (2018). "Nenkin" as reported in the baseline scenario. We assume the reported expenditure levels in 2018 remain stable until 2020. We extrapolate the spending path for the years from 2040 to 2060 based on developments of the old-age-dependency ratio.
- New Zealand: TNZ (2021). New Zealand Superannuation (NZS), main public pension as reported in the 2021 LTFM historical trends scenario.
- Switzerland: FFA (2021). We consider expenditure under the old-age and survivors' insurance and disability insurance in the positive scenario as reported in table 7 as public spending on pensions. We note that the reported figures in the alternative negative scenario do not materially differ from those reported in the positive scenario. We interpolate the reported 2019 and 2050 figures for the periods in between and extrapolate the expenditure path until the end of the projection horizon based on underlying developments of the old-age dependency ratio.
- U.K.: OBR (2022). We summarize state pensions and public service pensions as reported in table 4.9 and linearly interpolate for in-between periods.
- U.S.: CBO (2022). We consider all social security expenditure as reported in figure 2-2 as public pension spending. We extrapolate the projected spending path from 2052 to 2060 based on underlying developments of the old-age-dependency ratio.
- All other sovereigns IMF (2022) and ILO (2021). We consider old-age expenditure as reported in table A4.3 (ILO, 2021) as a proxy for general government pension spending in 2020. To obtain estimates over the full projection horizon, we extrapolate the estimated change in pension spending until 2030 as reported in table A23-25 (IMF, 2022), mirroring developments in the demographic profile in each country. The relationship between the change in pension spending as estimated by the IMF (2022) and the old-age-dependency ratio over 2021-2030 therefore determines the projected spending path until 2060.

Health care

- EU member countries and Norway: EC (2021). Health care spending as reported in the AWG risk scenario in table III.1.107. We choose the risk instead of the baseline scenario with larger projected increases in health care spending to better capture elevated expenditure pressures after the COVID-19 pandemic and to reflect a continuation of the historically observed expenditure growth path in anticipation of technological advancements.
- Australia: TCA (2021). Australian government health spending as reported in chart 7.1.6.
- Japan: MFJ (2018). "Iryo" as reported in the baseline scenario. We assume the reported expenditure levels in 2018 remain stable until 2020. We extrapolate the spending path for the years beyond 2040 based on developments of the old-age-dependency ratio.
- New Zealand: TNZ (2021). Health expenses (Core Crown) as reported in the 2021 LTFM historical trends scenario.
- Switzerland: FFA (2021). Healthcare expenditure as reported in the positive scenario in table 7. The reported figures in the alternative negative scenario do not materially differ from those reported in the positive scenario. We interpolate the reported 2019 and 2050 figures for the

periods in between and extrapolate the expenditure path until the end of the projection horizon based on underlying developments of the old-age dependency ratio.

- U.K.: OBR (2022). We consider the spending projections for health as reported in table 4.9 and linearly interpolate for in-between periods.
- U.S.: CBO (2022). Public health care spending comprises all expenditure under the Medicare program as reported in figure 2-4. We extrapolate the projected spending path from 2052 to 2060 based on underlying developments of the old-age-dependency ratio.
- Hong Kong and Singapore: For Hong Kong, we source 2020 health expenditure as reported by the Financial Services and the Treasury Bureau (see table 194). For Singapore, we source general government health expenditure for 2020 from table A4.3 (ILO, 2021). We set the projected change in public health care spending to zero by assumption, because we assess the health care sectors as very mature for both sovereigns.
- All other sovereigns: IMF (2022) and ILO (2021). We source general government health expenditure for 2020 from table A4.3 (ILO, 2021). To obtain estimates over the full projection horizon, we extrapolate the estimated change in health care spending until 2030 as reported in table A23-25 (IMF, 2022), mirroring developments in the demographic profile of each country. The relationship between change in health care spending as estimated by the IMF (2022) and the estimated old-age-dependency ratio from 2021 to 2030 therefore determines the projected spending path until 2060.

Long-term care

- EU member countries and Norway: EC (2021). Long-term care spending as reported in the AWG risk scenario in table III.1.109. We choose the risk instead of the baseline scenario with larger projected increases in long-term care spending to better capture elevated expenditure pressures after the COVID-19 pandemic and to reflect convergence with regards to long-term care coverage and costs among EU countries.
- Australia: TCA (2021). Aged care spending as reported in chart 7.2.1.
- Japan: Ministry of Finance and Ministry of Health, Labor, and Welfare, "Future Prospects For Social Security Looking Toward 2040". "Kaigo" as reported in the baseline scenario. We assume the reported expenditure levels in 2018 remain stable until 2020. We extrapolate the spending path for the years beyond 2040 based on developments of the old-age-dependency ratio.
- Switzerland: FFA (2021). Health care expenditure as reported in the positive scenario in table 7. The reported figures in the alternative negative scenario do not materially differ from those reported in the positive scenario. We interpolate the reported 2019 and 2050 figures for the periods in-between and extrapolate the expenditure path until the end of the projection horizon based on underlying developments of the old-age dependency ratio.
- U.K.: OBR (2022). We consider spending projections for adult social care as reported in table 4.9 and linearly interpolate for in-between periods.
- U.S.: CBO (2022). We consider all expenditure stemming from Medicaid, CHIP, and Marketplace Subsidies as reported in figure 2-4 as long-term care spending. We extrapolate the projected spending path from 2052 to 2060 based on underlying developments of the old-age-dependency ratio.
- We sourced public spending data on long-term care expenditure (cost-pressure scenario) from the OECD (2013) for the following countries: Argentina, Brazil, Canada, Chile, China, Iceland, India, Indonesia, Israel, Korea, Mexico, New Zealand, South Africa, Turkiye. We linearly

interpolated values between 2020 and 2060.

- For all other sovereigns we assume current and projected expenditure for long-term care to be zero by assumption because of a lack of data. While we assume that in most of these sovereigns, long-term care costs are currently negligible, we believe that the demand for such services will increase and as such constitutes an upside risk to the overall projections of age-related spending.

Simulation Of Fiscal Ratios

General government interest expenditure and receipts

Interest expenditure and receipts are calculated in each period based on the country's gross and net debt position in the previous period. We calculate interest expenditure in the current year by multiplying the sovereigns' interest rate with its general government gross debt level of the previous year. Interest receipts are calculated as the difference between gross and net debt in the previous year, multiplied with the interest rate. The interest rate as defined above applies uniformly to both interest expenditure and receipts. Net interest expenditure is simply calculated as interest expenditure minus interest receipts.

General government balance

When calculating the budget balance, we assume that governments make no discretionary fiscal policy choices after 2025. We therefore assume that general government revenue and non-age-related primary expenditure are constant from 2025, based on S&P Global Ratings' forecast for that year. Therefore, we implicitly consider 2025 as the base year that broadly reflects the long-term structural position of each sovereign absent any significant temporary fiscal burdens or windfalls. Still, the age-related expenditure components--pension, health care, and long-term care--and net interest expenditure evolve dynamically over the projection horizon. Under this fiscal autopilot assumption, the government simply observes the deficit and borrows whatever is necessary to cover it at the given interest rate. If it runs a surplus, any outstanding public debt is paid down first. If debt were to become zero, the surplus would be used to accumulate assets.

General government gross and net debt

We apply a basic stock-flow mechanism to determine the gross and net debt ratios, which are over the projection horizon the result of the debt ratios in 2025 as forecast by S&P Global Ratings, adjusted for projected deficits or surpluses. We assume that the government does not change the debt level through asset sales or acquisitions, debt repudiation, or third-party debt. We assume that all government debt is denominated in local currency, eliminating the effect of exchange-rate fluctuations on debt ratios.

Derivation Of Hypothetical Sovereign Ratings

In practice, S&P Global Ratings takes a large number of factors into consideration when analyzing and assigning actual sovereign credit ratings. In the long term, however, prolonged fiscal imbalances, debt levels, and economic prosperity tend to be the dominant factors determining a

credit assessment.

In the context of this report, a hypothetical sovereign rating is obtained from a bidimensional matrix, depending on a hypothetical fiscal score and a hypothetical economic score and reflecting the heterogeneity of sovereign's credit quality in this sample. We calculate hypothetical ratings at the rating category level only, not considering notches ('+' or '-') within a rating category. We subsume under "spec" all rating categories that are considered speculative-grade: i.e., below "bbb".

Deriving hypothetical ratings

	Fiscal score					
	1	2	3	4	5	
Economic score	1	aaa	aa	a	bbb	spec
	2	aaa	aa	a	bbb	spec
	3	aa	a	a	bbb	spec
	4	a	a	bbb	spec	spec
	5	a	bbb	spec	spec	spec

Source: S&P Global Ratings.

Fiscal score

The hypothetical fiscal score is defined as the simple average of the hypothetical budgetary performance score and the hypothetical debt score at any point in time over the projection horizon.

Budgetary performance score. The sovereign's fiscal balance is defined as the three-year (t-1,t, and t+1) average of the general government balance in a given year adjusted for a constant structural adjustment factor, to reflect the sovereign's initial fiscal strength within its initial rating category.

This structural adjustment factor is calculated as the difference between the long-term structural budgetary performance as forecast in 2025 minus the median of the observed budget balance (as % of GDP, average over 2017-2019) for the respective rating category. We include this adjustment to reflect the fact that many sovereigns' budgetary performances in the sample deviate quite substantially from the median for their rating category. We assume that mitigating factors offset the much weaker or much stronger budgetary performances in the long run, and we thereby emphasize the role of age-related expenditure as the main driver for budgetary performance in our simulation.

The thresholds for each budgetary performance score level are determined by the median of the observed budget balance (as % of GDP, average over 2017-2019) for each rating category from "aaa" to "spec", where the latter comprises all speculative-grade rating categories below "bbb". We calculate each threshold for the respective category through interpolation to obtain a smoother transition of median fiscal balances and rating levels, as follows:

- Hypothetical budgetary performance (BP) score of "1": A projected sovereigns' fiscal balance above 0.6%, which corresponds to the observed median general government balances (as % of GDP, average 2017-2019) of the "aaa" category;

Global Aging 2023: The Clock Ticks

- BP score of "2": Projected fiscal balance above -1.0% and below 0.6%, corresponds to the "aa" category;
- BP score of "3": Projected fiscal balance above -1.8% and below -1.0%, corresponds to the "a" category;
- BP score of "4": Projected fiscal balance above -2.8% and below -1.8%, corresponds to the "bbb" category; and
- BP score of "5": Projected fiscal balance below -2.8%, corresponds to the "spec" category.

To obtain the hypothetical BP score in each period, we compare the sovereign's fiscal balance in each year with the above thresholds. For example, if in 2040 the sovereign's fiscal balance--which is the three-year average (2039-2041) of the projected general government balance minus the constant structural adjustment factor--falls below of what is considered typical for a sovereign rated "aa" (that is, a median balance lower threshold of -1.0%), we would lower the hypothetical BP score in 2040 to "3" from "2".

Debt score. To obtain the hypothetical debt score, we compare sovereigns' net debt level drawn from the simulations described above in any year between 2025 and 2060 against certain fixed thresholds for net debt levels. For example, if a sovereign's net debt (as % of GDP) rises from 100%-150% in 2039 to 150%-200% of GDP in 2040, the debt score moves from "3" to "4".

Deriving the hypothetical debt score

	Net general government debt level (% of GDP)				
	< 50	50 - 100	100 - 150	150 - 200	200 <
Debt score	1	2	3	4	5

Source: S&P Global Ratings.

Economic score. The hypothetical economic score is derived from the sovereign's projected GDP per capita levels in U.S. dollars. The long-term evolution of the GDP per capita series is determined by 2025 GDP levels as forecast by S&P Global Ratings, which we extend with projected long-term real GDP growth rates and projected population growth dynamics. We compare a sovereign's real GDP per capita level at any point in time over the projected horizon with the 2022 median GDP per capita levels, as forecast by S&P Global Ratings for each current rating category. This allows us to mitigate long-term inflationary or exchange-rate effects.

Deriving the hypothetical economic score

	GDP per capita (\$000s)				
	> 64.4	64.4 - 49.2	49.2 - 22.8	22.8-12.0	12.0 >
Economic score	1	2	3	4	5

Source: S&P Global Ratings.

Dive deeper into our latest research in our [Sovereigns Spotlight](#).

This report does not constitute a rating action.

Copyright © 2023 by Standard & Poor's Financial Services LLC. All rights reserved.

No content (including ratings, credit-related analyses and data, valuations, model, software or other application or output therefrom) or any part thereof (Content) may be modified, reverse engineered, reproduced or distributed in any form by any means, or stored in a database or retrieval system, without the prior written permission of Standard & Poor's Financial Services LLC or its affiliates (collectively, S&P). The Content shall not be used for any unlawful or unauthorized purposes. S&P and any third-party providers, as well as their directors, officers, shareholders, employees or agents (collectively S&P Parties) do not guarantee the accuracy, completeness, timeliness or availability of the Content. S&P Parties are not responsible for any errors or omissions (negligent or otherwise), regardless of the cause, for the results obtained from the use of the Content, or for the security or maintenance of any data input by the user. The Content is provided on an "as is" basis. S&P PARTIES DISCLAIM ANY AND ALL EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, FREEDOM FROM BUGS, SOFTWARE ERRORS OR DEFECTS, THAT THE CONTENT'S FUNCTIONING WILL BE UNINTERRUPTED OR THAT THE CONTENT WILL OPERATE WITH ANY SOFTWARE OR HARDWARE CONFIGURATION. In no event shall S&P Parties be liable to any party for any direct, indirect, incidental, exemplary, compensatory, punitive, special or consequential damages, costs, expenses, legal fees, or losses (including, without limitation, lost income or lost profits and opportunity costs or losses caused by negligence) in connection with any use of the Content even if advised of the possibility of such damages.

Credit-related and other analyses, including ratings, and statements in the Content are statements of opinion as of the date they are expressed and not statements of fact. S&P's opinions, analyses and rating acknowledgment decisions (described below) are not recommendations to purchase, hold, or sell any securities or to make any investment decisions, and do not address the suitability of any security. S&P assumes no obligation to update the Content following publication in any form or format. The Content should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions. S&P does not act as a fiduciary or an investment advisor except where registered as such. While S&P has obtained information from sources it believes to be reliable, S&P does not perform an audit and undertakes no duty of due diligence or independent verification of any information it receives. Rating-related publications may be published for a variety of reasons that are not necessarily dependent on action by rating committees, including, but not limited to, the publication of a periodic update on a credit rating and related analyses.

To the extent that regulatory authorities allow a rating agency to acknowledge in one jurisdiction a rating issued in another jurisdiction for certain regulatory purposes, S&P reserves the right to assign, withdraw or suspend such acknowledgment at any time and in its sole discretion. S&P Parties disclaim any duty whatsoever arising out of the assignment, withdrawal or suspension of an acknowledgment as well as any liability for any damage alleged to have been suffered on account thereof.

S&P keeps certain activities of its business units separate from each other in order to preserve the independence and objectivity of their respective activities. As a result, certain business units of S&P may have information that is not available to other S&P business units. S&P has established policies and procedures to maintain the confidentiality of certain non-public information received in connection with each analytical process.

S&P may receive compensation for its ratings and certain analyses, normally from issuers or underwriters of securities or from obligors. S&P reserves the right to disseminate its opinions and analyses. S&P's public ratings and analyses are made available on its Web sites, www.standardandpoors.com (free of charge), and www.ratingsdirect.com and www.globalcreditportal.com (subscription), and may be distributed through other means, including via S&P publications and third-party redistributors. Additional information about our ratings fees is available at www.standardandpoors.com/usratingsfees.

STANDARD & POOR'S, S&P and RATINGSDIRECT are registered trademarks of Standard & Poor's Financial Services LLC.