

## **2** Revisiting sovereign refinancing risk in light of COVID-19 crisis

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Sovereign refinancing risk is attracting more attention due to the impact of the COVID-19 shock on sovereign borrowing needs. The surge in government borrowings to finance COVID-19 stimulus and related bailout packages throughout 2020 mechanically increased the outstanding debt that must be refinanced in the future.

While most governments in the OECD area today are paying very little interest to new borrowings across all maturities, the risk associated with the refinancing of debt at substantially higher rates is more of a medium- and long-term concern for most countries and a potential short-term concern for at least some countries. Against this backdrop and from the perspective of a public debt manager, this chapter discusses how to identify measure and mitigate refinancing risk in light of possible scenarios as well as country experiences.

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## 2.1. Introduction

What if existing debt needs to be refinanced at considerably higher interest rates in the future or, in the worst-case scenario, what if it cannot be rolled over at all? This is a key question for sovereigns who wish to manage their debt portfolio prudently. As the COVID-19 shock exemplified in 2020, various factors from market turbulence to a sudden increase in government borrowing needs can elevate the perception of sovereign refinancing risk. When realised, the refinancing risk may not only complicate government debt management, but also threaten a country's credibility and financial stability.

What are the key factors affecting vulnerability to refinancing risk? Why do some countries with high debt levels seem to be less vulnerable than others? Would high average maturity be sufficient to address the risk? What are the means of managing refinancing risk? This chapter addresses these questions by examining risk management techniques, including the role of building flexibility, and provides theoretical and practical examples.

### Key findings

- Perceived sovereign refinancing risk reflects a confluence of factors including macroeconomic fundamentals, the degree of development of the domestic debt market, access to contingency funding tools as well as the size and composition of the outstanding debt stock. The perceived safety of debt is relatively higher in countries with stronger macroeconomic fundamentals, financial and political stability and access to liquid markets.
- Refinancing risk for a given country is considered elevated – *ceteris paribus* – when refinancing needs are high and the maturity profile of debt is short and/or is concentrated on or around a particular period.
- The upsurge in debt issuance by OECD governments in the wake of the COVID-19 crisis has mechanically increased the absolute amount of debt to be repaid or refinanced in the future. In tandem, the average maturity of sovereign borrowing, particularly at the initial stage of the crisis, has shortened considerably, as much of the additional cash needed by governments was financed through short-term debt.
- To better identify refinancing risk, common indicators such as average time-to-maturity, rollover ratios and interest re-fixing share of the debt should be complemented by a detailed examination of the debt redemption profile for redemption peaks.
- From a debt management perspective, the existing refinancing risk of a debt portfolio is managed strategically through new debt issuance and liability management operations such as outright buyback and switch operations.
- In terms of portfolio design for the future, use of simulation models such as 'Cost-at-Risk' can help sovereign issuers to assess the potential impact of borrowing strategies with different maturity and interest rate compositions. Judgements will need to be made to supplement the modelling results.
- A key element in managing refinancing risk, especially in view of the uncertain global outlook and increased refinancing needs, is building flexibility into sovereign financing programmes through contingency tools such as building up liquidity buffers, establishing credit lines and ensuring access to money markets.
- Timely and accurate communication of financing needs to investors is likely to reduce uncertainty, leading to more credible debt management and lower borrowing costs. In the wake of the COVID-19 crisis, sovereign issuers can benefit from fine-tuning their investor relations programmes with more frequent communication and effective use of digital communication tools.

## 2.2. Sovereign refinancing risk

In addition to financing budget deficits, sovereign debt management offices are in charge of refinancing previously issued debt, unless it is amortised. Even in the case of a balanced budget, principal redemptions will generally be funded by new issuance, that is, by rolling over debt. When a bond matures, the borrower's refinancing cost is affected by interest rate levels and credit market conditions at that time. In debt management, "refinancing or rollover risk" refers to situations in which debt may have to be rolled over at an unusually high interest cost or in which debt cannot be rolled over at all.

More broadly, refinancing risk is being comprised of two slightly separate parts: repricing or "re-fixing" risk and rollover risk. In this respect, managing refinancing risk is also about managing the risk between debt and cash management, with the latter carrying an imperative (i.e. meeting all payments as they come due) that does not apply to debt management (which is more about making active decisions with different options).

Refinancing risk is closely interlinked with interest rate risk (risk premia), as investors demand to be compensated for greater uncertainty. The greater the perceived refinancing risk, the higher the risk premiums on sovereign debt. It should be noted that the distinction between interest-rate risk and refinancing risk may be less pronounced in countries with stable macroeconomic conditions and well-developed markets.

The analysis of refinancing risk also contains useful information for debt sustainability analysis and, *vice versa*, in terms of forming a view of how current liabilities are likely to evolve over time. Clearly, debt sustainability is a broader concept that involves fiscal policy, so as to ensure prudent debt levels via government expenditures and taxes.<sup>1</sup> Granular analysis of refinancing risk and debt rollover cost are an integral part of debt sustainability analysis. Then again, if investors perceived a risk to debt sustainability, they would demand a higher risk premium for their investment (i.e. higher interest rates) which in turn increases the cost of debt refinancing.

### 2.2.1. Assessment of sovereign refinancing risk

When sovereign refinancing risk is perceived as high by investors, it is likely to create a circumstance where investors become reluctant to buy longer-term government bonds as these involve more lengthy exposure to the issuer and higher price risk to exit. Instead, they may limit themselves to investing in (very) short-term debt, thereby making the debt portfolio even more vulnerable. Given the scale of debt operations, heightened concerns about refinancing risk may not only make government debt management more challenging, but also threaten financial stability in a country. Economic literature presents abundant evidence of self-fulfilling debt crises, in particular in emerging countries (Cole and Kehoe, 2000<sup>[1]</sup>) (Arellano and Ramanarayanan, 2012<sup>[2]</sup>). Against this backdrop, proper assessment, management and communication of refinancing risk are of paramount importance to sovereign issuers.

In general, refinancing risk is more pronounced when refinancing needs are high, when the debt is denominated in foreign currency, and when the maturity profile of debt is short and/or is concentrated on or around a particular period.<sup>2</sup> As discussed in Section 2.4, a number of indicators can be used to measure and assess sovereign refinancing risk including average time-to-maturity, rollover ratio and maturity profile. While these indicators provide important insights into the assessment of refinancing risk, there are other factors affecting a sovereign's exposure to refinancing risk through liquidity and perceived safety of debt. A country can have the longest average maturity in the world but unless government is confident of meeting its debt obligation on maturity, it may not be of much use. Greece, for example, was one of the countries with the longest average maturity of its debt portfolio before the 2008 financial crisis. Conversely, a country with a relatively low average maturity may be perceived as less vulnerable to refinancing risk in view of other factors. For example, the United States has an average maturity of about 5 years, which was lower than the OECD

average of 7.7 years in 2020. Yet, the United States is among the countries with the lowest perceived refinancing risk, largely due to its strong macroeconomic fundamentals, high credit ratings and access to the most liquid government securities markets.

The perceived safety of debt is relatively lower in countries that are characterised by volatile market conditions, rapidly deteriorating economic indicators, lower credit ratings, perception of poor governance, high political risk, high indebtedness, and financial distress (Jonasson and Papaioannou, 2018<sup>[3]</sup>). The ability to refinance debt at reasonable cost and desirable maturity requires, above all, a well-functioning, stable and liquid local currency bond market. Countries that can issue domestic currency debt generally face much lower refinancing risk, particularly for very short-term (T-bills) that are accepted as collateral by the domestic central bank. In the OECD area, for example, governments predominantly finance their budget deficits through local currency denominated debt. Local currency share of total central government marketable debt in the OECD area was about 95% as of 2020. Countries with shallow domestic debt markets or constrained market access, on the other hand, are often more vulnerable to changes in market conditions than mature market countries. In the wake of the COVID-19 shock, for example, investor concerns over sovereign refinancing risk in emerging market economies have heightened in view of pre-existing vulnerabilities. As discussed in Chapter 3, some countries lacking deep and liquid local currency bond markets, have faced serious financing challenges as their access to international capital markets impaired significantly, in particular at the initial stage of the COVID-19 crisis. Lacking the resources and borrowing capacity of advanced economies, the countries with heavy debt burdens have benefited from international efforts to avoid a liquidity crisis (i.e. financial support from IMF and World Bank, and G20 Debt Service Suspension Initiative).

A reliable and broadly diversified investor base is important for refinancing risk assessment as it supports stability and liquidity in government securities markets. Central banks and other institutional investors such as pension funds that give priority to credit quality and liquidity, and are less sensitive to interest rate developments, are considered to be stable investors. In this respect, several advanced economies such as Australia, Japan and the United States are viewed as countries with a particularly solid investor base (Arslanalp and Tsuda, 2014<sup>[4]</sup>). Conversely, heavy reliance on foreign investors (in particular foreign nonbank investors) in relatively small countries is associated with higher refinancing risk, as sovereign exposure to sudden investor outflows can obstruct the refinancing of debt. While of great importance for developing or maintaining liquid local bond markets, the share of the yield sensitive to foreign investors in an investor base requires careful consideration due to the risk of sudden investor outflow.<sup>3</sup>

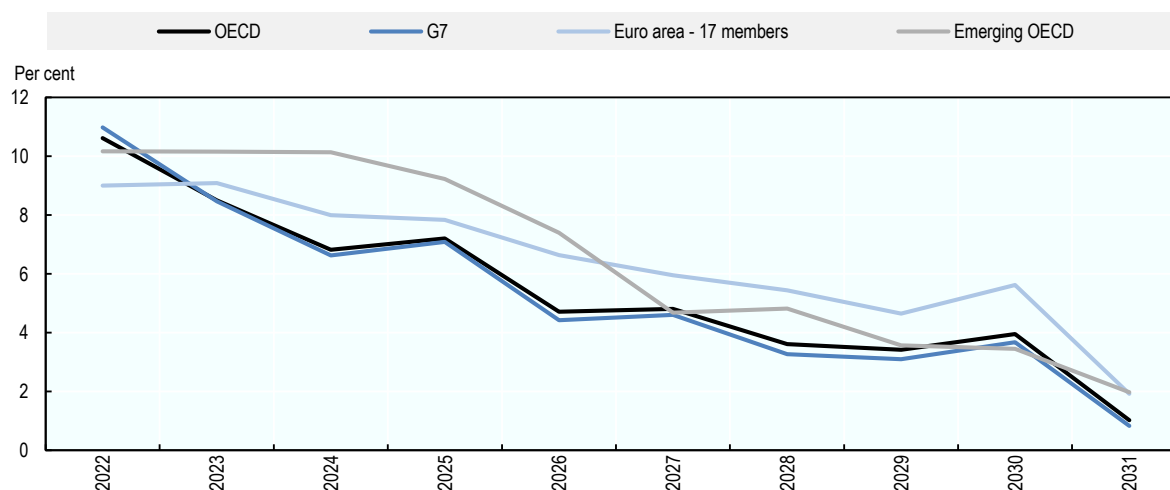
It should be noted that in most cases, maturity composition of the debt issuance is also determined by investor preferences and market trends. For example, usually central banks, having conservative investment strategies, prefer short-dated securities for reserve management purposes, while institutional investors such as insurance companies and pension funds invest in long-term bonds to match the maturity of their liabilities. Strong demand for long-term assets from pension funds in the United Kingdom, and life insurance companies in Japan enable respective sovereign debt management offices (DMOs) to sell super long-term bonds (i.e. bonds with a 30-year maturity or more).<sup>4</sup> Irrespective of the fiscal outlook in these countries, the cost of refinancing existing debt has remained low amid high liquidity and perceived safety of debt in part thanks to their stable investor base.

One of the major shifts in the investor base in advanced economies in recent years has been the greater role of domestic central banks in government bond markets. Even before the pandemic, central banks became the dominant holders of government bonds in several countries as a result of the quantitative easing policies launched by major central banks.<sup>5</sup> In the wake of the COVID-19 crisis, central bank purchases that sought to restore smooth market functioning and support inflation and or economic objectives have had an impact on the market perception of sovereign refinancing risk. Increased net government bond purchases by major central banks have helped to absorb increased supply and eased interest rate risk for their countries by keeping borrowing costs very low at least over the near future.

### 2.3. Impact of the epidemic on sovereign refinancing needs in the OECD area

The COVID-19 crisis has taken a heavy toll on public finances across the OECD area. As presented in Chapter 1, the gross borrowings of OECD governments from the markets are expected to jump 60% to USD18 trillion in 2020. As a result of the upsurge in debt issuance, the outstanding level of central government debt securities is estimated to have risen to USD 55 trillion by the end of 2020 (see Chapter 1 for more information). Hence, the absolute amount of debt to be repaid or refinanced in the future has reached an unprecedented level. Figure 2.1 illustrates central government marketable debt redemption projections as a percentage of outstanding debt in the OECD area between 2022 and 2031. The overall debt redemption profile is projected to decrease gradually over time, although redemptions will be relatively high in 2025 and 2030, largely due to the increase in 5- and 10-year benchmark bond issues in 2020.

**Figure 2.1. Ten-year redemptions of central government marketable debt in OECD country groupings, as a percentage of debt stock**



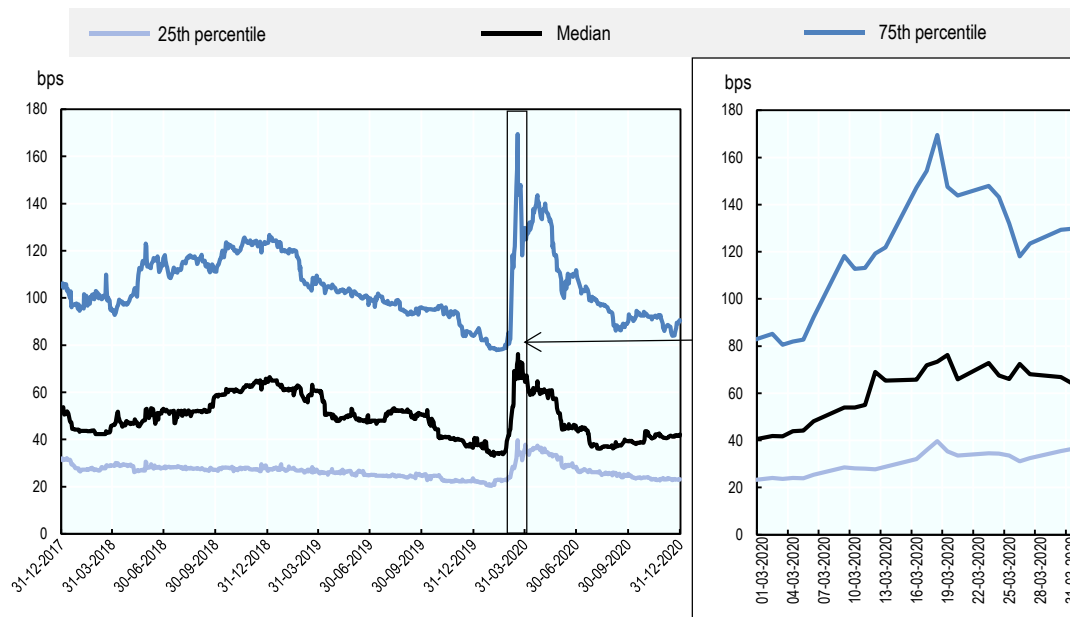
Note: Using the debt comparable application data, calculated on USD amounts outstanding as at 19 January 2021.  
Source: OECD calculations based on data from Refinitiv.

The abrupt increase in borrowing needs has altered the maturity profile of debt issuance. In 2020, the average maturity of sovereign borrowing shortened considerably, as most of the additional cash needs of governments was financed through short-term debt (e.g. Treasury Bills and commercial paper). Chapter 1 offers a comprehensive assessment of the trends in terms of key indicators of refinancing risk. For example, the share of short-term instruments in central government marketable debt issuance in the OECD area increased from 40% in 2019 to 48% in 2020. Correspondingly, key indicators of refinancing risk exposure such as rollover ratio and average term-to-maturity (ATM) of outstanding debt worsened. As of January 2021, 25% of the outstanding amount of government securities is due in the next 12 months; and 45% is due in next 36 months. The resulting dynamics implies a general rise in sovereign refinancing risk.

Despite the unprecedented increased refinancing needs, interest rates on government securities have remained low, and even declined further in most OECD countries after a period of high turbulence in funding markets in March. Unlike the aftermath of both the 2008 financial crisis and the euro area sovereign debt crisis, this time around, OECD governments have not experienced major changes in their sovereign credit ratings, except for a few countries including Mexico, Turkey and the United Kingdom. Overall, risk spreads on sovereign bonds have remained stable in recent years, except for a few episodes of heightened volatility (e.g. December 2018, September 2019 and March 2020) (Figure 2.2). A major factor behind the

benign risk assessments is medium-long term impact of the fiscal stimulus programmes on the economic growth. As economies are expected to recover on the back of expansionary monetary and fiscal policy, so as the debt repayment capacities.

**Figure 2.2. 10-year CDS spreads**



Note: The chart includes 10 year CDS spreads for Australia, Austria, Belgium, Canada, Chile, Colombia, Czech, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Mexico, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and the United States.

Source: Bloomberg.

To some extent, it can be argued that sovereign risk assessment currently benefits from the current low interest rate environment which is, in part, supported by the quantitative easing (QE) programmes of major central banks. The increased net purchases of government bonds by major central banks helped to absorb the steep increase in bond supply. In 2020, while net marketable debt issuance by OECD governments is estimated at USD 8.6 trillion, net purchases of government bonds by major central banks exceeded USD 4.5 trillion. At the same time, however, central banks have become the single largest creditors to their sovereigns in a number of countries, as they have been engaged in QE programmes since 2009, which were reinforced during the COVID-19 shock. Once the global economy is on firmer footing with higher inflation expectations, the outlook for monetary policy will need to shift, which may result in tapering/withdrawing of some QE programmes. Tapering of QE programmes has important implications for financial markets in general, and for sovereign funding conditions in particular, mainly through changes in borrowing interest rates and the investor base. The impact of higher interest rates on the cost of debt would initially be relatively low in countries where new borrowing needs are limited and the share of fixed-rate debt with long maturity is high. In terms of the investor base, a lower level of involvement of central banks as large buyers should lead to increased funding needs from other investors such as commercial banks.

## 2.4. Measuring refinancing risk through key indicators

Among all the financial risks (refinancing risk, liquidity risk, market risk and credit risk), refinancing risk and short-term liquidity risk likely represent the most significant financial risk for sovereigns. For most countries,

and particularly after the COVID-19 shock, in each calendar year there is a budget deficit, because government revenues are lower than the expenditures. The deficit for a calendar year is added to the debt redemption schedule constructed from previously accumulated budget deficits. The ability of a country to finance both the budget deficit and the debt maturing in a calendar year is crucial. A clear methodology to identify, measure and mitigate the refinancing risk is needed. This section presents the main indicators to measure the refinancing risk and, equally importantly, explains their limitations using theoretic examples.

### 2.4.1. Key indicators

#### *Average Time to Maturity (ATM)*

The most common indicator used to measure the refinancing risk is Average Time to Maturity (ATM). This indicator measures the weighted average time to maturity of all the principal payments in a debt portfolio. The higher this figure, the lower the refinancing risk because on average there is more time to repay the principal's payments. The Equation [1] in Box 2.1 presents the calculation of the ATM.

#### *Rollover Ratio (ROR 1Y)*

The rollover ratio for one year (ROR 1Y) measures the percentage of short-term debt up to one year divided by the total debt. The lower this ratio, the lower the refinancing risk. The added value of this indicator is a better understanding of the immediate financial needs which must be rolled over in that year. Equation [2] in Box 2.1 presents the calculation of the ROR for one year.

$$[2] \text{ RoR } 1Y = \frac{R_1}{\text{Total Debt}}$$

#### *Rollover Ratio (ROR 3Y)*

For the purpose of having wider perspective of the refinancing risk, a complementary indicator is the rollover ratio for three years (ROR 3Y). This indicator measures the percentage of debt maturing in the next three years as a percentage of total debt. Similar to the rollover ratio for one year, the lower this ratio, the lower the debt maturing in the next three years and therefore the lower the refinancing risk. Equation [3] in Box 2.1 presents the calculation of the ROR for three years.

### Box 2.1. Mathematical Equations

Equation [1] presents the calculation of the ATM:

$$[1] \text{ ATM} = \frac{\sum_{t=1}^n R_t \times t}{\text{Total Debt}}$$

Where: ATM is the average time to maturity

- t is the time to maturity
- $R_t$  is the amount of redemption in each year
- Total Debt is the total redemption calculated as  $\sum_{t=1}^n R_t$

Equation [2] presents the calculation of the ROR for one year:

$$[2] \text{ ROR } 1Y = \frac{R_1}{\text{Total Debt}}$$

Where: ROR 1Y is the rollover ratio for one year

- $R_1$  is the amount of redemption up to one year
- Total Debt is the total redemption calculated as  $\sum_{t=1}^n R_t$

Equation [3] presents the calculation of the ROR for three years

$$[3] \text{ RoR } 3Y = \frac{\sum_{t=1}^3 R_t}{\text{Total Debt}}$$

Where: ROR 3Y is the rollover ratio for three years;

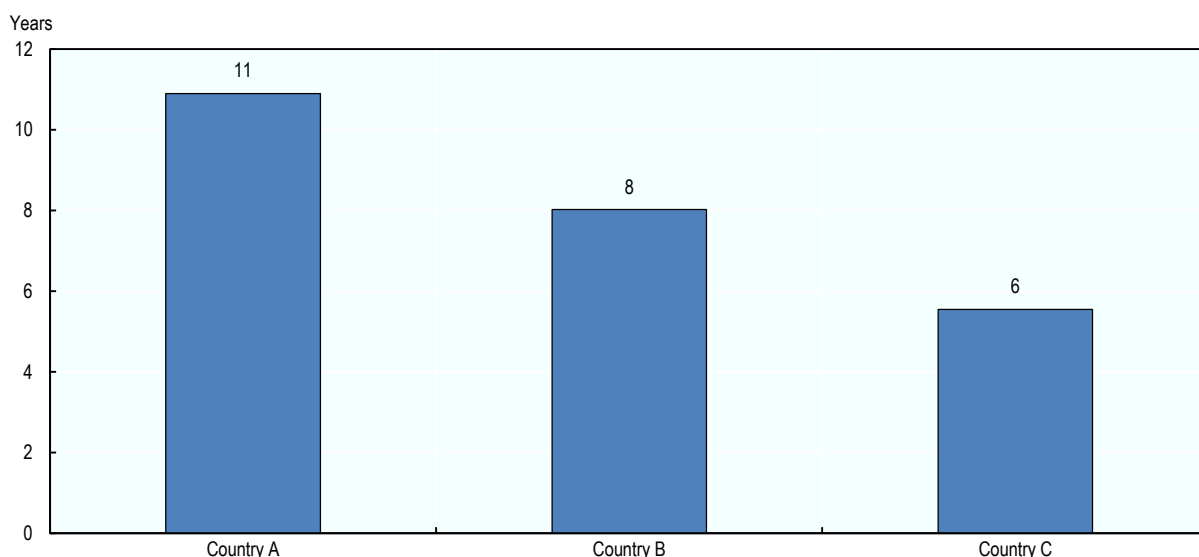
- $t$  is the time to maturity
- $R_t$  is the amount of redemption in each year
- Total Debt is the total redemption calculated as  $\sum_{t=1}^n R_t$

### 2.4.2. Limitations of indicators

This section provides some stylised examples to demonstrate some misconceptions about refinancing risk and, in particular, how a simple reliance on ATM may be misleading.

**Example 1:** Consider three countries with total debt of 500 billion US dollars. Using Equation [1] the ATM for each country can be calculated. As shown in Figure 2.3 the ATM of country A is 11 years, country B is 8 years and for country C the ATM is 6 years. Based on this measurement, country A is the most prudent in terms of refinancing risk because it has the highest ATM.

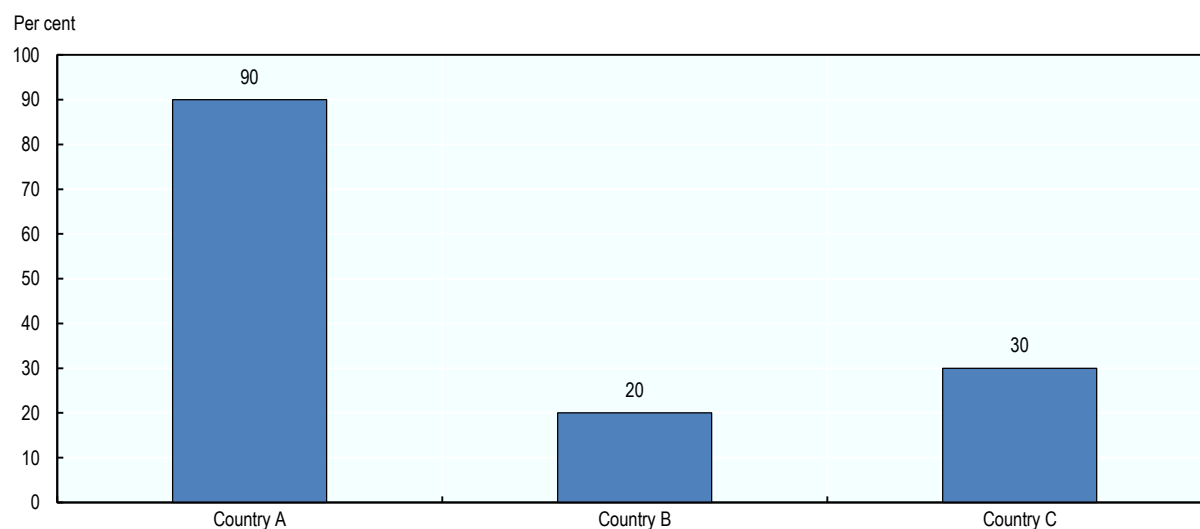
**Figure 2.3. Average term to maturities for three synthetic scenarios**



Note: This figure presents the average term to maturities for three theoretical scenarios. Each scenario denominated by a different country. Source: Illustrative example.

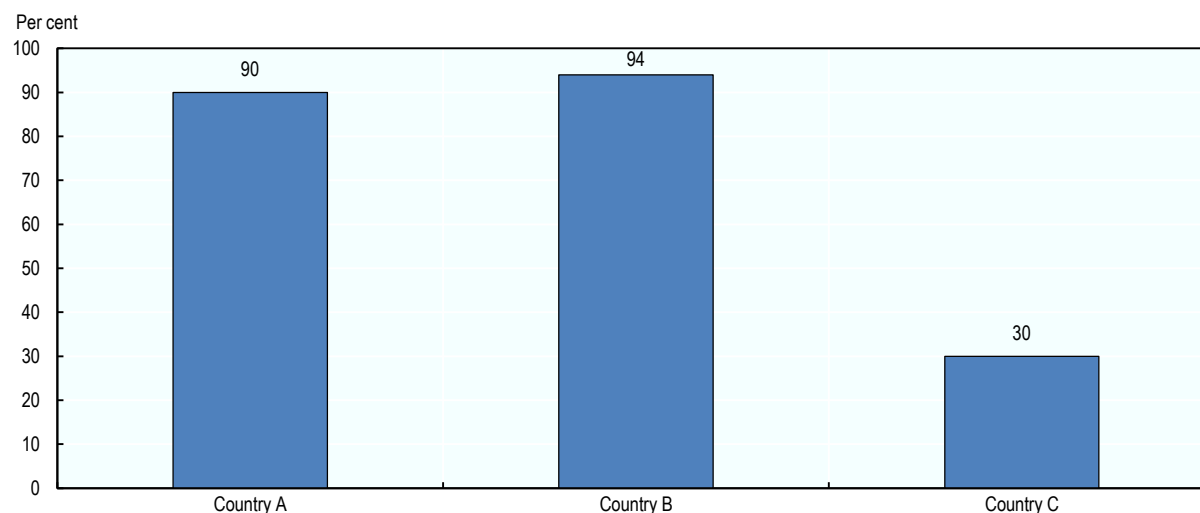
Using Equation [2] and the debt redemption schedule of each country described in Figure 2.6, the rollover ratio for each country is presented in Figure 2.4. The rollover ratio of country A is  $90\% = \frac{450}{500}$ , while for country B it is  $20\% = \frac{100}{500}$  and 30% for country C. Although the ATM of country A is the longest at 11 years, 90% of the debt is maturing in the next year which significantly increases the risk of failure to repay the debt. Therefore, based on the rollover ratio for one year country B is the most prudent for refinancing risk because it has the lowest rollover ratio.



**Figure 2.4. Rollover ratio for one year for three synthetic scenarios**

Note: This figure presents the rollover ratio for one year for three theoretical scenarios. Each scenario denominated by a different country.  
Source: Illustrative example.

Then, using Equation [3] and the debt redemption schedule of each country described in Figure 2.6, the rollover ratio for three years of each country can be calculated. As shown in Figure 2.5, the rollover ratio of country A is  $90\% = \frac{450}{500}$  while for country B it is  $94\% = \frac{470}{500}$  and 30% for country C. Notwithstanding that these examples represent a somewhat more extreme situation than is usually the case, they reveal that although the rollover ratio of country B is the lowest, the redemption in the next three years is 94% of the debt. Taking under consideration this indicator suggests that country C demonstrates lower refinancing risk.

**Figure 2.5. Rollover ratio for three years for three synthetic scenarios**

Note: This figure presents the rollover ratio for three year for three theoretical scenarios. Each scenario denominated by a different country.  
Source: Illustrative example.

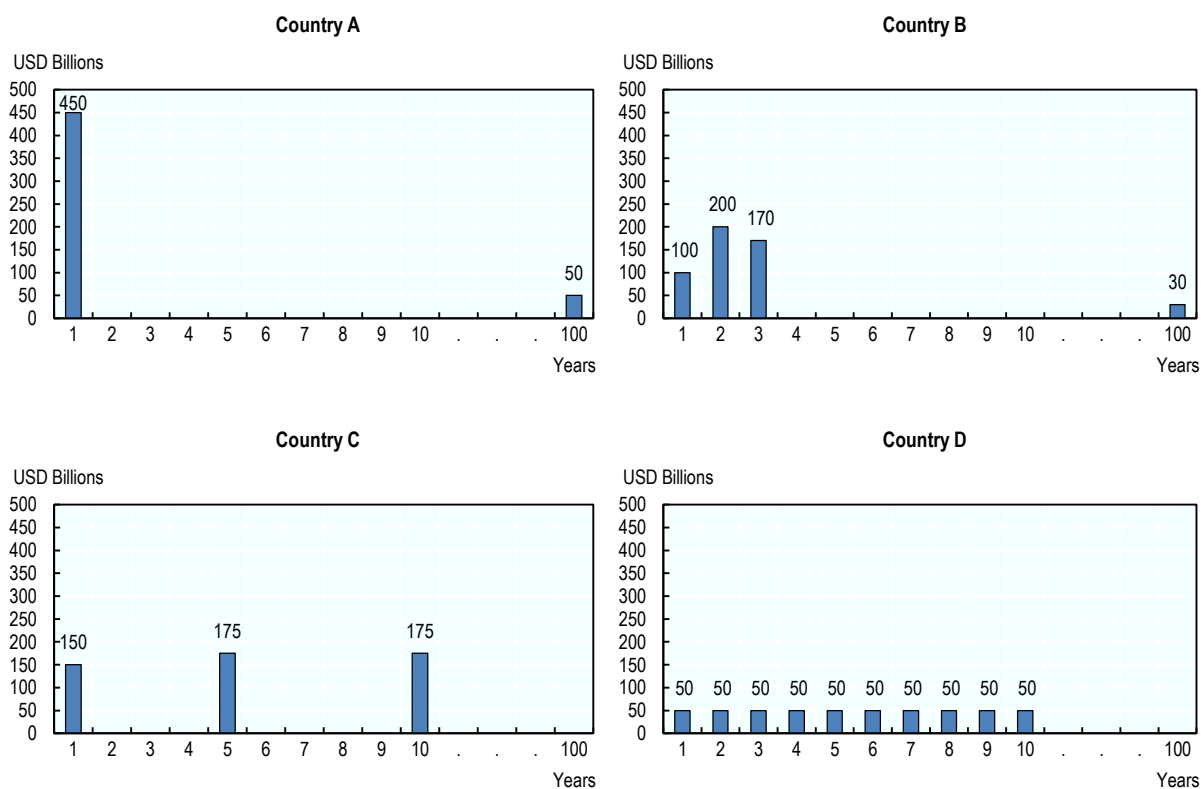
**Example 2:** Let's assume there is another country, country D. Applying Equation [1] and Equation [3] to the debt redemption scheduled described in in Figure 2.6, the ATM and the rollover ratio for three years calculations for country D yield identical figures to those of country D. This example demonstrates that, in some cases, even a combination of the ATM and rollover ratio is not enough to quantify the refinancing risk. In this example only after calculating the rollover ratio for one year and analysing the debt redemption profile one might argue that country D is more prudent in terms of refinancing risk than all the other countries.

**Table 2.1. Summary of key indicators**

	Country A	Country B	Country C	Country D
ATM	11.0	8.0	6.0	6.0
RoR 3Y	90%	94%	30%	30%
RoR 1Y	90%	20%	30%	10%

In addition to the indicators solely focus on maturity profile, indicators aiming to capture interest rate risk can reveal important insights into refinancing risk assessments. For example, a Floating Rate Note (FRN) can have a very long time to maturity when issued but has the same risk exposure to changes in short-term interest rates as a T-bill. In this respect, measuring 'interest rate composition' and 'time-to-Refixing' of a debt portfolio can shed additional light on the refinancing risk.<sup>6</sup>

**Figure 2.6. Debt redemption schedule**



Note: This figure presents the debt redemption scheduled for three theoretical scenarios. Each scenario denominated by a different country. Source: Illustrative example.

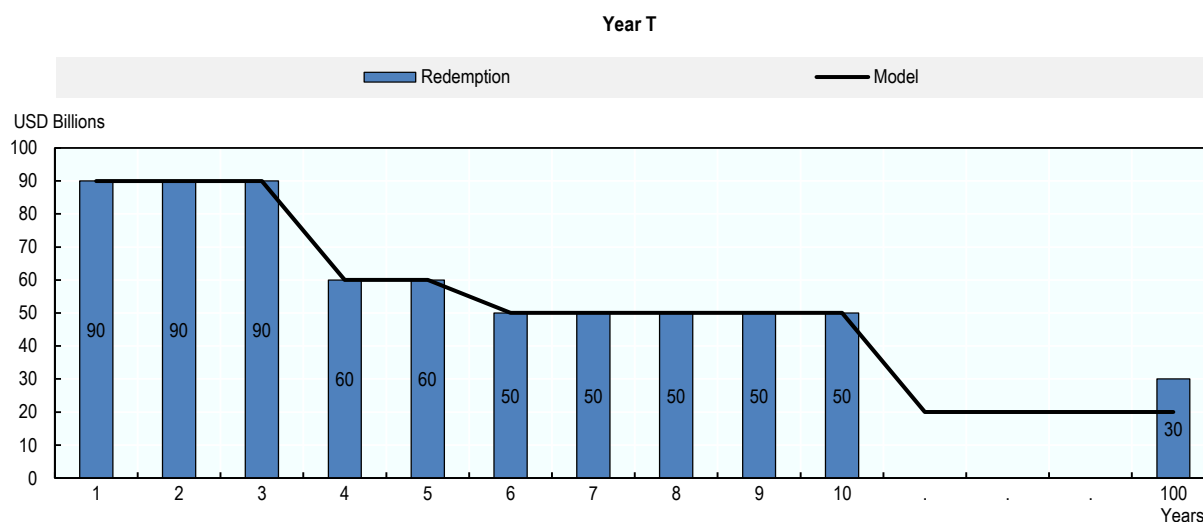
## 2.5. Means of managing refinancing risk

A comprehensive approach to managing refinancing risk combines the use of strategic design and contingency funding tools. The key point is to balance consistency in the funding strategy with sufficient flexibility in case of market disruption. While a theoretical model can be useful for representing a benchmark redemption profile with desired features, it may prove to be difficult, if not impossible, to achieve. Often sovereign debt managers design short, medium and long-term funding strategies by taking into account the profile of future redemptions. In this regard, analyses of expected cost and risk of alternative strategies through models can provide useful information to compare different borrowing scenarios. In addition, introducing pre-event contingency tools, such as credit lines with central banks or commercial banks and liquidity buffers along with post-event tools such as money market instruments, help to mitigate temporary cash shortfalls and reduce the refinancing risk.

### 2.5.1. Benchmark redemption profile of a theoretical model

One effective model for managing the refinancing risk is to plan the debt redemption profile according to a theoretical model based on a desired cost-risk trade-off. As described in the previous section, the debt redemption profile basically determines the key risk indicators, such as the ATM and rollover ratio of the debt portfolio. The model is based on the idea of maintaining the same redemption profile every year, which can be achieved by issuing fixed amount to the same benchmark term (see the example below). To illustrate the model, let's assume that the desired debt redemption profile for a debt stock of USD 670 billion is according to Figure 2.7. Key risk indicators for the refinancing risk can be calculated based on this example: Equation [1] on ATM yields 9.1 years; Equation [2] on rollover ratio for one year yields  $13.4\% = \frac{90}{670}$  and; Equation [3] on the rollover ratio for three years yields  $40.2\% = \frac{270}{670}$ .

Figure 2.7. Debt redemption profile at year T

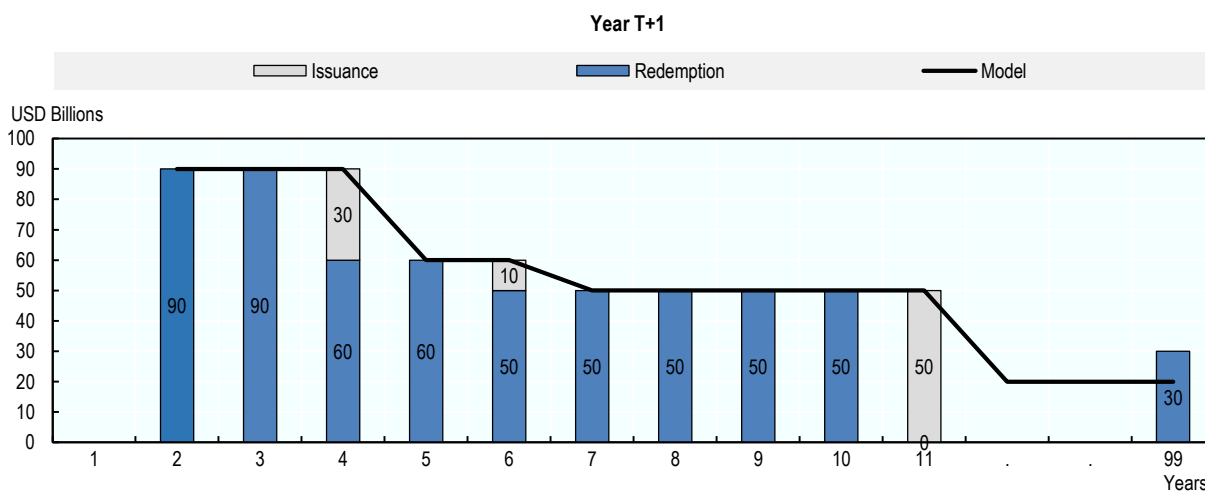


Source: Illustrative example.

For illustrative purposes, it is assumed that these indicators are consistent with the country risk appetite and issuer wishes to maintain this redemption profile next year. To do so, the first step is to understand that, in this example, the redemption profile is constructed by issuing three benchmarks (for simplicity, the benchmark for 100 years is ignored); 3 years, 5 years and 10 years. Hence, next year if the desire is to

maintain the same redemption profile, i.e. 90 billion US dollars in the first, second and third year, 60 billion US dollars in year 4 and 5 and 50 billion US dollars in year 6 to 10, then the country should issue 30 billion US dollars for 3 years, 10 billion US dollars for 5 years and 50 billion US dollars for 10 years. As shown in Figure 2.8 after one year the same redemption profile will be maintained.

**Figure 2.8. Debt redemption profile at year T+1**



Source: Illustrative example.

The rollover ratio for one and three years will remain the same, while the ATM is to decrease from 9.1 years to 8.9 years due to the maturity of the ultra-bond reduced to 99 years (instead of 100).

While the idea is very simple, actually keeping the redemption profile consistent to the theoretical model each year is very complex. First and foremost, the basic principle of the model is to issue fixed amounts at the same maturities each year. However, the actual financial requirements, which determine the amount to issue, might vary considerably from one year to the other. As well known, the financial needs each year consist of the redemption in the next year and the current deficit. Therefore, if the current redemption profile is volatile between the years the financial needs will be very different each year. Of course after implementing the model consistently with time the redemption schedule will fit the model profile. However, even in case the current redemption profile is based on the theoretical model, different budget executions through time will impact dramatically on the financial needs each year, which will make it very difficult to issue fixed amount at the same maturities each year. One way to handle the volatility in the budget execution is to issue the excess financial needs (financial needs which lead to deviations from the theoretical redemption profile) for medium-long maturities, so there will be enough time to smooth the redemption profile and reduce divergence with the theoretical model.

The second major challenge is the investor's appetite, which may vary across time, and therefore make it difficult to issue according to the theoretical model. For instance, in times of stress investor demand tends to focus on short-term bonds, which makes issuance of long-term maturities difficult. For countries issuing Inflation Linked Bonds (ILBs), the level of inflation and inflation expectations impact on the demand for conventional bonds and ILBs, and therefore on the ability to smooth the redemption profile through time according to the planned redemption profile.

### **2.5.2. Strategic design of funding strategies with refinancing risk considerations**

The profile of debt redemptions should be a key consideration when designing funding strategies, including setting the maximum amount that can be issued along the yield curve. Sovereign debt managers should seek to achieve a balance between the volume of debt due in each year and the monthly distribution of debt maturing within the individual years. Box 2.2. and 2.3 provide information on the experiences of Israeli and Italian debt management offices with financing risk modelling and implementation, respectively.

Models such as Cost-at-Risk can be used to assess alternative funding strategies from a cost at risk perspective as well as to optimise the interest rate risk strategy within certain constraints. Cost-at-Risk, which allows for quantification of risk in terms of the maximum costs that could occur with a given probability in a particular year, is one of the possible tools used to compare alternative debt structures. Implementing this approach requires first and foremost to define the policy objective. Usually, the main objective is to choose a financing strategy that minimizes the cost of debt, subject to certain risk appetite. Nevertheless, there could be another main objective and/or associated objectives, such as maintaining a well-functioning government bond market.

Second, debt managers should define how to measure cost and risk, which have a variety of dimensions. Firstly, cost and risk can be computed in absolute terms (i.e. billions of USD) or in relative terms such as a percentage of the outstanding debt stock or GDP, while the perspective of the calculation can be annual or cumulative (over the analysis horizon). Secondly, the measurement can be cost-related risk or budget-related risk. A key difference between the two approaches is the analysis horizon. While under the budget-related risk approach, the cost related risk refers to the fiscal year, the former approach take an intertemporal view when measuring the cost related risk. A useful measure for the cost is the debt service cost defined as the sum, in cash flow terms of the coupon payments over the analysis time horizon. In turn, the measurement for the risk captures the uncertainty surrounding the debt-service cost. A common measurement is the volatility in the debt service cost measured using the standard deviation. Other measures evaluate the tail risk such as the upper 95th percentile of the debt service cost distribution. A less common approach is to measure the refinancing risk using indicators such as the rollover (measuring the amount of debt that matured in a given period) or refixing share of the debt.

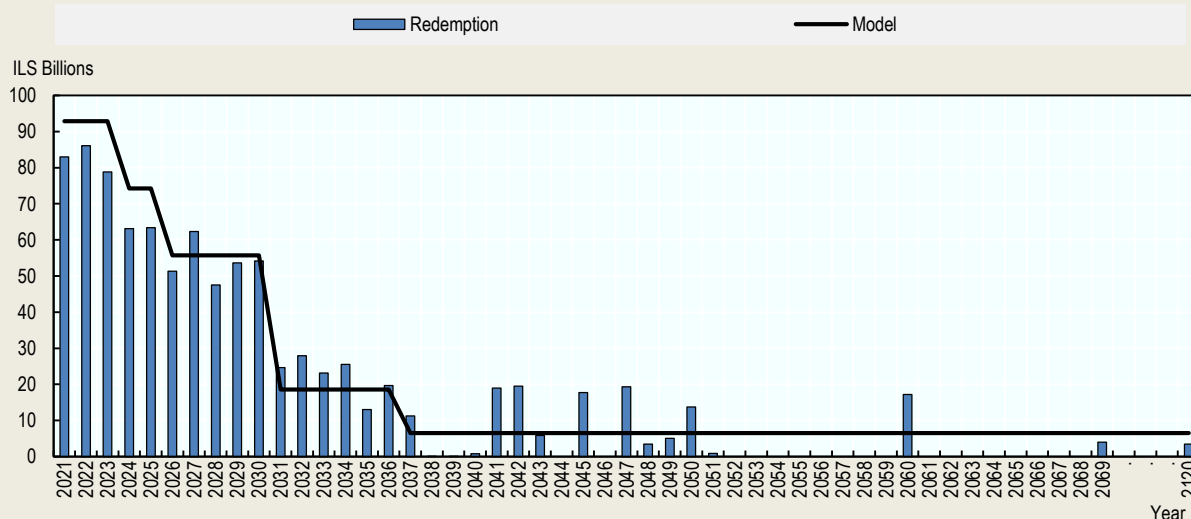
Third, debt managers should choose the specification of the optimization model and particularly the stochastic procedures. The stochastic simulation assists in dealing with uncertainty of market key risks (such as interest rates, FX exposure and inflation rates), macro economy policy and the interrelationships between these factors. Model risk in debt strategy analysis can be reduced by using several specifications and by testing the robustness of the model to different parameters, assumptions and interactions of the variables.

Finally, one could run a wide range of financing strategies and calculate the cost-risk trade-off of each one and their ability to achieve the policy objective. In that regard it is important to mention that the objective of this model is not to choose one "optimal" financing strategy, but rather to illustrate the cost risk trade-off of different issuance strategies and to shed additional light on the refinancing risk. Furthermore, modelling outputs will need to be evaluated using careful judgements about the other salient factors behind the final choice of the debt strategy, including investor demand and primary market intermediation capacity, as well as any limitations of the model.

### Box 2.2. Debt redemption model: The case of Israel

As described in detail in Section 2.5 and shown in Figure 2.9 the debt redemption profile is managed carefully according to a debt redemption model, which determines the key risk indicators, such as the Average Time to Maturity (ATM), rollover ratio for one and three years and the smoothness of the redemption profile. Other indicators such as the share of floating rate and the Average Time to Re-fixing (ATR) are also used to measure the refinancing risk. The ATM of the total debt is quite long standing at roughly 9.5 years, and the rollover ratio for one and three years is relative low standing on roughly 8% and 25% respectively. The level of these indicators depends on the risk appetite and the desired cost-risk trade-off. The ATR is 9.2 years and the share of floating rate as a percentage of the debt is roughly 4%.

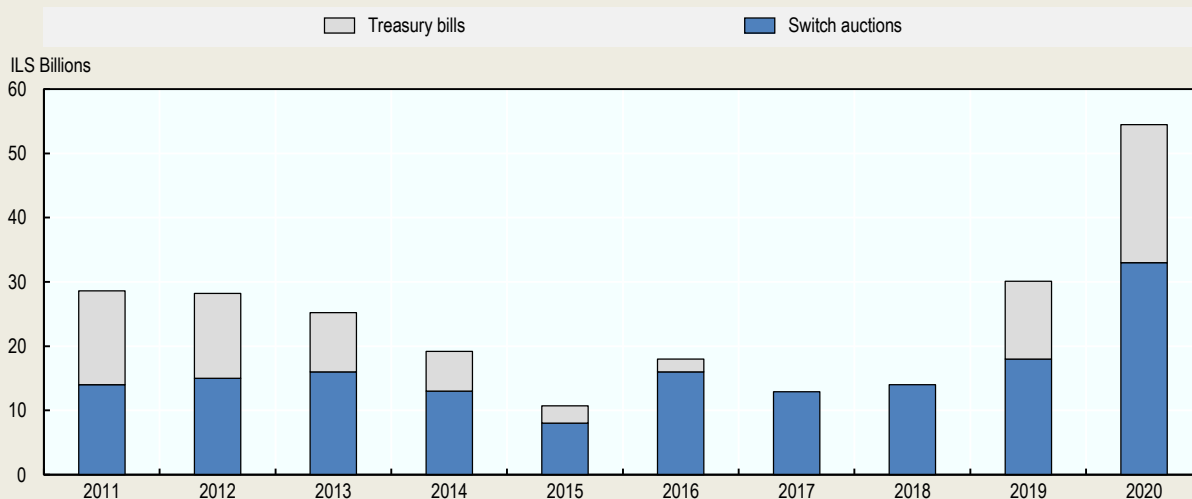
Figure 2.9. Debt redemption profile (as of September 2020)



Note: This Figure presents the government debt redemption profile.

Source: Israel Government Debt Management Unit, Accountant General, Ministry of Finance.

The funding strategy is diversified between markets (domestic versus global) and instruments (conventional bonds, inflation-linked bonds and floating rate notes). In the domestic market, tradable benchmark bonds are issued for 1, 3, 5, 10 and 30 years. In 2020, a 20-year maturity bond was introduced due to the COVID-19 shock. In the global markets the steady state strategy is to issue once a year a benchmark size, usually dual-tranche rotating each year between US dollar and euros. For example, in January 2020 a dual-tranche benchmark issuance was executed for 10 and 30 years. However, due to the COVID-19 shock in March, a three-tranche, dollar-denominated issuance of USD 5 billion was executed for 10-years, 30-years and for the first time 100-years (century bond) and in April a USD 5 billion 40-year bond was issued in the Asian market. The ultra-long issuances increased the ATM dramatically but not necessarily the refinancing risk – at least not in the short-medium period. In addition, switch operations are implemented on a regular basis to manage the refinancing risk and to support other targets, such as enhancing liquidity in the secondary market. An additional flexible instrument which help to mitigate temporary cash shortfalls at low cost is Treasury bills. As shown in Figure 2.10, the issuance of Treasury bills was re-introduced in 2019 after declining consistently since the European sovereign debt crisis in 2011-2012. Due to COVID-19 the amount of Treasury bill issuances and switch auctions has increased significantly (roughly 80%).

**Figure 2.10. Switch auctions and Treasury bill issuances (as of September 2020)**

Note: This Figure presents the annual switch auctions and Treasury bill issuances since 2011. More information about the strategy to mitigate the refinancing risk is available at the annual and quarterly reports on the Israeli Ministry of Finance website.

[https://www.gov.il/BlobFolder/dynamiccollectorresultitem/annual-debt-reports-2019/en/annual-debt-report\\_YearsRepor\\_2019-en.pdf](https://www.gov.il/BlobFolder/dynamiccollectorresultitem/annual-debt-reports-2019/en/annual-debt-report_YearsRepor_2019-en.pdf)

Source: Israel Government Debt Management unit, Accountant general, Ministry of Finance.

### Box 2.3. 2018-20 review and implementation of the benchmark portfolio strategy – The case of Portugal

In 2018, IGCP pursued the reimplementaion of the benchmark portfolio, aiming at providing a reference for public debt management. The project is aligned with the ultimate goal of minimizing the risk-adjusted cost of debt on a long-term horizon.

The benchmark portfolio rests on issues of Portuguese Government Bonds (PGB) according to a Benchmark Financing Strategy (BFS). In order to get the BFS, an efficient frontier of financing strategies was obtained from long-term simulations of economic (GDP and budget balances) and financial variables (interest rates), subject to specific market constraints and expert judgment. The BFS was selected from the efficient frontier as the strategy consisting of portfolio with the characteristics depicted in table 1. Metrics as ATM or WAM, modified duration and one-year to five-year rollover ratios were key for the selection of the optimal portfolio (as market constraints and expert judgement were incorporated in the modelling and selection stages by calibration of these variables) and later to assess the relative performance of the real portfolio.

In 2019 and 2020, the duration of the State's direct debt increased vis-à-vis the duration of the benchmark portfolio's debt against the backdrop of historically low interest rates and high demand for long-dated securities. As illustrated in Table 2.2, the modified duration of the State's direct debt at the end of 2020 stood 0.5 points above the benchmark's modified duration, whereas its cumulative cost (non-annualized) since the beginning of 2019 was only 0.4 percentage points higher. Not only did ATM and modified duration stand higher in the State Direct Debt portfolio than the benchmark, but the refinancing risk has also improved. Moreover, the risk-adjusted cost of the real portfolio was marginally lower than the one of the benchmark portfolio. Alternative cost indicators were computed, namely Cost at Risk, but the conclusions above were found unchanged.

**Table 2.2. Cost and risk indicators at 31 December, 2020**

	State Direct Debt portfolio	Benchmark portfolio
Average maturity (years)	7.0	6.5
Modified duration <sup>(1)</sup>	5.4	4.9
Percentage of debt refinancing:		
in 1 year	14.9%	17.6%
in 3 years	30.4%	33.1%
in 5 years	44.1%	51.1%
Accumulated cost from 31-12-2018 <sup>(2)</sup>	9.8%	9.4%
Accumulated cost / modified duration	1.8%	1.9%

Note: <sup>(1)</sup> The modified duration is a measure of the market value of debt with respect to changes in market interest rates; <sup>(2)</sup> The cost represents the internal rate of return (not annualized) and is calculated as the percentage change of the market value of debt between 31st December, 2018 and 31st December, 2020 after accounting for cash-flows within the period (dollar-weighted return). A fall in market interest rates will lead to an increase in the cost, all else being equal, and vice-versa.

Source: Portuguese Treasury and Debt Management Agency (Agência de Gestão da Tesouraria e da Dívida Pública - IGCP, E.P.E).

### **2.5.3. Bond switches and buybacks**

Sovereign debt managers can use liability management operations, such as bond switches and buybacks, to attain a desired structure of debt portfolio. Bond switches (i.e. redeeming short-term bonds by issuing medium and long-term bonds) and buyback operations can help in reducing roll-over peaks in line with the desired redemption profile and thus lowering refinancing risk by reducing the outstanding amounts of bonds close to maturity.<sup>7</sup> While the aim is to reduce refinancing risk, cost considerations associated with a buyback premium and the benefit of lower funding costs through enhanced liquidity are generally analysed and factored in the overall cost-risk trade-off framework (Jonasson and Papaioannou, 2018<sub>[3]</sub>).

The use of bond buybacks and switches is a common practice among OECD sovereign debt management offices (DMOs). The 2020 OECD surveys of primary market developments and of liquidity in secondary government bond markets among DMOs revealed that more than 85% of OECD DMOs conduct either buyback or switch operations. There are different approaches to use of these tools in terms of methods (e.g. pricing), frequency and techniques (e.g. reverse auction and outright purchase, and use of sinking funds). For example, Italian DMO consider buyback as extraordinary operations and use a set of criteria to select bonds to be purchased back (Box 2.4). Some DMOs, like in France, Germany, Sweden and United Kingdom, carry out buyback operations on a regular basis via the secondary market (i.e. outright purchase). Some other DMOs like Portugal execute regular bond switches through auctions without a pre-defined calendar, using these operations as an opportunity to re-open off-the-run benchmarks and smooth the redemption profile.

There are several factors to be properly assessed when using buyback and switch facilities. For example, caution should be taken to assess the cost effectiveness of these operations, as buybacks of illiquid lines may crystallize illiquidity costs on the public sector's balance sheet. In addition, accounting effects of large buyback operations needs to be considered (e.g. impact on budget deficit and outstanding debt stock). In the case of switches, DMOs should also take into account investor demand for the issued securities and the efficiency of the yield curve.



#### **Box 2.4. Use of buyback operations: The case of Italy**

Buyback operations in Italy are considered as extraordinary operations, not subject to a fixed annual calendar. Operations are funded by cash surpluses and funds available from the Sinking Fund for Government bonds.

The criteria used by the Italian Treasury to select bonds to be purchased back are as follows. The first criterion is the shape of the redemption profile, whereby bonds that contribute to reimbursement peaks are bought back. The second criterion is liquidity, whereby the Treasury selects off-the-runs with the goal of avoiding a negative impact on secondary market liquidity. Moreover, in some circumstances, specific segments (i.e. inflation linked bonds, floater, etc.) can be chosen in order to re-establish an orderly market condition. The third criterion is the (potential) impact on outstanding debt. In order to smooth the public debt redemption profile, the Italian Treasury traditionally repurchases bonds with a residual maturity up to 18 months (taking into account market conditions). In order to have the maximum impact on the debt reduction, bonds with cash prices below par have major preference.

Buybacks in Italy can be conducted via a competitive (multi-price) auction or Treasury mandate, depending on the quantity to be bought back and market conditions.

#### **2.5.4. Building flexibility in case of market disruption**

As described in the previous section, there are real life challenges to theoretical models. In the event of a significant rise in interest rates and/or liquidity dry up in the financial market, having contingency funding tools, a diversified investor base and efficient communication with investors can be useful. Hence, a key element in managing the refinancing risk is building flexibility in the financing strategy.

The 2008 financial crisis and more recently the COVID-19 crisis have demonstrated that financial markets can become illiquid suddenly and/or for an extended period, even in advanced economies. In the event of financial stress, market participants can be hesitant to lend to the government, especially when they perceive a higher risk with respect to the sovereign's financial position. In such cases, the government may prefer to revise borrowing plans rather than locking in very high interest rates that may result from financial contagion or a temporary spike in risk aversion (Guscina, Malik and Papaioannou, 2017<sup>[5]</sup>). In an extreme scenario, a confluence of global and domestic factors might result in a complete loss of market access, which, in turn, could trigger capital flight and exacerbate exchange rate pressures, even for governments with limited budget deficits (e.g. Iceland before the 2008-09 financial crisis). In view of these considerations, sovereign borrowers often build flexibility through contingency funding plans, such as establishing credit line(s) with commercial banks, cash advances with central banks, maintaining a liquidity buffer (i.e. minimum level of cash balance) and, increasing issuance of short-term debt from money markets (e.g. Treasury Bills, and repos). In addition, keeping continuous communication with the investors and transparency prove to be a valuable tool for increasing financial flexibility, as well as enhancing market confidence.

##### *Liquidity buffer practice:*

The speed of the DMO's ability to react to market developments and to adapt borrowing plans is an important component of prudent debt management. Revisions to borrowing plans such as timing, size and instrument of issuance require a certain timeframe for the decision-making as well as market communication. A sufficiently large liquidity buffer can help a government to meet its immediate financing needs within the span of this reaction time, thereby safeguarding a sovereign's ability to meet obligations in situations where normal access to funding markets may be disrupted or delayed.

Keeping a certain amount of cash helps governments to avoid temporary shortfalls in cash balances and cope with volatile cash flows. A liquidity buffer enables quick access to liquidity and supports government cash managers in their roles by ensuring that a sufficient amount of liquidity is available when it is needed and at the lowest fiscal cost (Hurcan, Koc and Balibek, 2020<sup>[6]</sup>) when compared with prevailing market costs. Depending on how a liquidity buffer is funded, however, there may be a cost of carry for having this precautionary tool.

Several OECD countries — including Denmark, Hungary, Mexico and Poland — adapted their CB policies in the aftermath of the 2008 financial crisis (Cruz and Koc, 2018<sup>[7]</sup>). The objective was to boost market confidence in the government's financial capacity and to provide more flexibility in funding options in the event of stressed market conditions. Country experiences during the European debt crisis highlighted the importance of having a cushion against periods of heightened sovereign stress, as well as against the potential loss of market access. Greece, Iceland, Ireland, and Portugal, have reviewed their CB policies to increase the level of balances to boost market confidence in a government's financial capacity. For example, in Iceland the government's domestic buffer target was set at ISK 120 billion (around 6% of GDP) in 2010, sufficient to meet the largest payments due and to service debt for almost one year (OECD, 2019<sup>[8]</sup>). In the following years, the target level was lowered as the country regained full access to the market.

The 2020 survey of the OECD Working Party on Debt Management (WPDM) on primary market developments reveals that a few DMOs, noting the benefit of keeping a cash buffer during the turmoil in March, have increased the size of cash buffers (e.g. Canada, Portugal and the United States). For example, the US Treasury adopted a cash buffer policy in 2015 to protect against a potential loss of market access for auctions, and decided to increase its cash balance to USD 800 billion in 2020 in view of larger size and greater uncertainty of cash outflows. It was with the same prudent risk management perspective that the Austrian Treasury adopted a cash buffer policy for the first time in March 2020, in the face of the COVID-19 pandemic. In the case of Portugal, a cash buffer policy was adopted in 2012 and from 2014 onwards a target of 30% to 40% of the gross funding needs of the following 12 months has been followed. During the early months of the health crisis, given the interest rates spike and volatility jump, the cash excess was depleted and only replenished in May once market stability was restored. Compared with the year before, cash reserves increased and risked exceeding the top end of the target range in December 2020. In 2020Q4, the budget outturn and the disbursement of EU funds to support COVID-19 employment protection schemes surprised on the upside at a time the issuance programme was already too advanced to accommodate the unanticipated downward revision of the funding needs.

#### *Diversification in source of funding:*

Diversification of funding sources reduces reliance on any one group of investors, which in turn limits potential volatility in markets. Having a diversified funding base (e.g. domestic investors, foreign investors, retail investors and institutional investors) could provide key strategic advantages in dealing with refinancing risk, in particular for countries where borrowing needs have increased substantially and are expected to remain high in medium to long-term. While the investor base of a government debt portfolio is predominantly a result of market forces, a variety of instruments and a range of maturities can be used to build a broad investor base as well as reaching out to new investor groups (OECD, 2019<sup>[8]</sup>). In particular, countries with substantial refinancing needs may benefit from increasing the appeal of government securities to different investor groups.

Designing and using longer-term instruments to lengthen the nominal yield curve that would match investor preferences is an important strategic consideration. Introducing new securities with long-term maturities would not only help mitigate refinancing risks in the medium and long-term, but also generate additional demand from available domestic and international savings pools (OECD, 2020<sup>[9]</sup>). For example, in the United Kingdom, long-dated conventional and indexed-linked bond programmes (e.g. 40-year maturities),

supported by structural demand from the United Kingdom pension and insurance sectors have helped to increase average duration of issuance and to mitigate refinancing risk since 1980s. The weighted average term-to-maturity has been increased from 14 years in 2007 to almost 18 years in 2019.

During 2020, several sovereign borrowers introduced new securities, as funding needs of governments have increased substantially. The US Treasury introduced 20-year maturity bond in early 2020, which received strong demand from long-term investors such as pension funds. New securities such as green bonds might also help reaching out climate sensitive investors and institutional investors with long-term investment horizon. Maturity of sovereign green bonds issued so far have varied from 5 to 30 years, with a weighted average maturity of 18-years.

#### *Establishing credit lines:*

Establishing credit lines with commercial banks, or a short-term cash advance facility from central banks can also help to build flexibility. For example, following the COVID-19 shock, the Bank of England has temporarily extended the use of the government's 'Ways and Means (W&M) facility' to manage liquidity and the short-term volatility of cash forecasts. Thus far, the United Kingdom debt management office has not used this facility.

Similarly, establishing swap lines with central banks can help ease currency pressures, and mitigate refinancing risk of foreign debt. Following the pandemic, several countries signed or enhanced existing bilateral swap arrangements with major central banks (e.g. Australia, Brazil, Japan, Malaysia, Mexico, Korea, Singapore and Thailand).

#### *Access to liquid money markets:*

Money markets are often, but not necessarily, the most liquid segment of financial markets, and money market instruments (e.g. Treasury bills and commercial papers) can offer flexible and relatively cheap financing conditions for a short time. Normally, issuance of short-dated securities lowers average maturity of debt issuance and elevates refinancing risk. However, when facing significant uncertainty concerning funding conditions, or funding needs, sovereigns, –particularly those with high credit ratings– can potentially benefit from issuing in money markets to generate flexibility in funding operations, and meet emergency funding and any temporary cash shortfalls at low costs. Given that this strategy also entails high refinancing risk, sovereign issuers should balance the use of money market instruments over time, and when they better understand how permanent the increase in funding needs is, they replace them with long-term debt.

Sovereign debt managers assess T-bills as 'shock absorbers'. It is because T-Bill markets, often the most liquid segment of the yield curve, enables sovereign issuers to manage uncertainties regarding financing requirement in the most cost-effective way (For further information, see Chapter 1, Box 1.1. Issuance of T-Bills to navigate shocks). During the 2008 financial crisis, the share of short-term debt issuance of OECD governments in gross issuance climbed to over 55%. In the years following the crisis, T-bill issuance moderated and the share of short-term debt issuance declined to below 40% of gross issuance in 2019. Sovereign issuers followed a similar strategy to address large unexpected financing needs due to the COVID-19 shock. In 2020, majority of pandemic-related debt was issued in the form of T-Bills in the US, France, Germany and Japan with almost no cost (e.g. 6 month Treasury bill yields negative in the euro area, Japan and 0.1% in the United States).

#### *Role of transparency and communication in times of stress:*

A sovereign debt management office's ability to finance governments can be adversely affected by exogenous changes in economic and market conditions. Anticipating and mitigating potential impacts of changes in these conditions requires continuous monitoring and communication. Sovereign DMOs should

maintain regular contact with primary dealers as well as end-investors. This is not to supervise the market, but to help gather market intelligence and develop an understanding of the investor base and its prevailing concerns, as well as potential demand for various borrowing instruments. In particular, with refinancing needs of most sovereigns having increased substantially, it is prudent to consider demand from various buy-side and sell-side participants of government securities markets when reviewing the volume of instruments and auction sizes.

Furthermore, at times when market sentiment deteriorates to the point that sustaining market access is at stake, a concentrated focus on investor engagement plays a critical role in managing refinancing risk. Experiences of the 2008 financial crisis and the subsequent European sovereign debt crisis suggest that having an investor relations programme is an effective tool for developing long-term relationships with investors, broadening the investor base, and providing transparency on the macroeconomic situation and funding plans (OECD, 2019<sup>[8]</sup>).

Improving the transparency of refinancing risk is likely to reduce investor uncertainty, leading to more credible debt management and lower borrowing costs (OECD, 2016). Disclosure of key indicators as well as liquidity buffer policies help to improve confidence between investors and sovereigns. Therefore, DMOs should try to include this information as part of their communication tools (e.g. annual reports, monthly bulletins and investor presentations).

Enhanced transparency of strategies, operations and policies for public debt management reduces investor uncertainty, thereby increasing the appeal of government bond markets. This in turn broadens the investor base, lowers risk premiums and eases borrowing costs (OECD, 2016<sup>[10]</sup>). The role of transparency and communication becomes even more important in stressed periods. The 2020 survey of the OECD Working Party on Debt Management (WPDM) on secondary market developments indicates that DMOs have regularly updated investors through email distribution lists, press releases, publishing market notices on their websites regarding changes in funding needs and plans in response to the COVID-19 crisis. While the pandemic restrained travel and face-to-face meetings, communication with investors has been to a large extent carried out via conference calls (including videoconferencing). In addition, in some countries, senior government officials have played a larger role in communicating changes in funding needs and information on programs and operations (e.g. Australia, Canada, the United Kingdom, and the United States). In addition, Primary Dealers have been directly and more frequently contacted in order to reinforce their significant role in helping to manage the huge increase in debt issuance, and efficiency of government securities markets.

The level of uncertainty associated with expenditure on COVID-19 and its impact on the economy has hindered most countries' ability to estimate financing requirements for the whole financial year of 2020. Several DMOs have taken a cautious approach in communicating the uncertainty around the new funding needs as well as the revisions to refinancing strategies, in particular at the initial stage of the crisis during March and April 2020. For example, German debt agency, "Finanzagentur" announced an update of its quarterly issuance plan in April 2020 following its first press release in March 2020 (German Finanzagentur, 2020<sup>[11]</sup>) (German Finanzagentur, 2020<sup>[12]</sup>). A cautious approach was taken in terms of highlighting potential changes associated with financing requirements and auction calendar linked to fiscal measures and market conditions. At the same time, providing timely information with comprehensive explanations has helped to manage investor expectations and ease uncertainty.

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## Notes

<sup>1</sup> IMF defines public debt sustainability as follows: “In general terms, public debt can be regarded as sustainable when the primary balance needed to at least stabilize debt under both the baseline and realistic shock scenarios is economically and politically feasible, such that the level of debt is consistent with an acceptably low rollover risk and with preserving potential growth at a satisfactory level” (International Monetary Fund. Strategy, Policy, & Review Department, 2021<sup>[14]</sup>).

<sup>2</sup> Countries that can issue domestic currency debt generally face much lower refinancing risk, particularly for very short-term (t-bills) that are accepted as collateral by the domestic central bank. In the OECD area, governments predominantly finance their budget deficits through local currency denominated debt. For example, local currency share of total central government marketable debt in the OECD area is about 95 percent as of 2020.

<sup>3</sup> Credit rating agencies also consider the share of non-resident as an assessment criterion. For example, Standard&Poors sees a risk factor if non-residents hold consistently more than 60% of government marketable debt.

<sup>4</sup> Life and non-life insurance companies hold 19.5% of outstanding Japanese Government bonds as of December 2020; the insurance companies and pension funds hold around 28% of outstanding Gilt issuance in the United Kingdom as of as of September 2020.

<sup>5</sup> For instance, the central bank holds around 45% of outstanding national central government bonds in Japan and Sweden, above 20% in Germany, the United Kingdom and the United States (as of December 2020).

<sup>6</sup> Average Time to Re-fixing (ATR) is a measure of weighted average time until the principal payments in a debt portfolio become subject to a new interest rate. A low (high) ratio indicates that the interest rates of the debt portfolio re-set in a short (long) period and therefore increases (decreases) the risk. Further discussion on this indicator is available in the [2016 edition of the Sovereign Borrowing Outlook](#).

<sup>7</sup> Bond switches and buybacks are also used to increase the issuance of on-the-run securities above and beyond what would otherwise have been possible. The resulting more rapid build-up of new bonds enhances market liquidity of these securities. (Blommestein, Elmadag and Ejsing, 2012<sup>[13]</sup>)



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