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Economics Department

Sustainability gap calculations of the Ministry of Finance - description of methods

1. What does sustainability gap show?

The long-term difference between general government revenue and expenditure is measured with the sustainability gap. The sustainability gap focuses on assessing how the ageing of the population will affect the outlook for general government finances in the coming decades. Besides the ageing of the population, general government finances are also affected by many other pressures stemming from, for instance, climate change and the projected need for public infrastructure repairs and improvements.

The sustainability gap describes how extensively general government finances should be consolidated over the next few years (in the Ministry of Finance's calculations this means over the next four years) in order to ensure long-term balance in general government finances. In other words, after the process of adjustment there would no longer be a need to raise the tax rate, cut spending, introduce structural reforms to strengthen general government finances, or increase indebtedness.

However, no conclusions can be drawn from the sustainability gap calculations about what would be a sensible method or timetable for reducing the sustainability gap. Neither does the calculation take into account the possible economic growth impact of economic adjustment measures or structural reforms.¹ Furthermore, the sustainability gap calculations do not require general government debt to stabilise at any specified level.²

¹ As the S2 indicator does not take into account any adverse effects of direct fiscal consolidation measures on economic growth, it should not be used alone for estimating the required consolidation. There are other methods that can be used to take into account more effectively the unfavourable growth impact of direct consolidation measures. The result given by the S2 indicator corresponds technically to a situation in which the fiscal multiplier would be zero, meaning that adjustment measures do not impede growth in the economy. In reality though, direct consolidation measures are generally believed to depress economic growth. In contrast, many structural reforms do not have such adverse effects but instead can also boost the opportunities for economic growth.

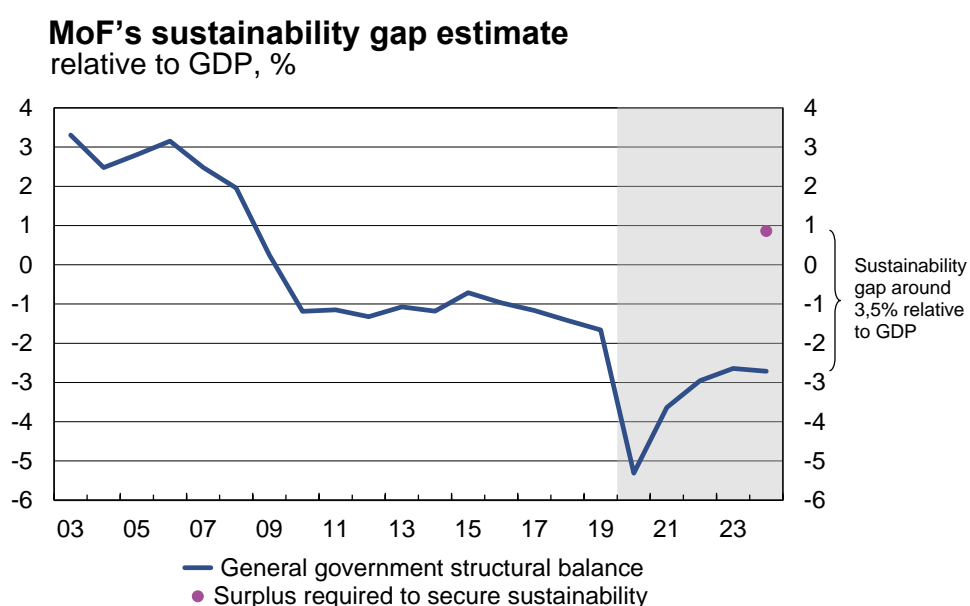
² If the sustainability gap were to be resolved by employing permanent consolidation measures for general government finances in the base year for the calculations, the general government finances debt ratio in the Ministry of Finance's sustainability gap computational framework would stabilise at a point significantly below its current level in the coming decades. The ratio of general government investment assets to GDP would decrease somewhat. In this extreme example, the figure for general government net assets (difference between investment assets and debt) as a ratio of GDP would settle at a point above its present level.

The level at which debt is balanced in the calculations may therefore also be relatively high or low, depending on the level of the debt ratio at the base year of the calculations and how the ageing of the population is estimated to affect public expenditure in the coming decades. It would therefore also be worth examining other ways of looking at the debt sustainability of general government finances.

The sustainability gap is the difference between the surplus ensuring sustainable general government finances and the expected general government structural deficit in the calculation base year (t+4) (see Figure 1). The surplus ensuring sustainable general government finances is the general government financial surplus required for general government actors to manage their expenditure pressures arising from the ageing of the population in the coming decades without additional measures.

The sustainability gap calculation is a pressure projection and not the most probable future scenario. In the calculations, the assumption is made that policy remains unchanged, i.e. the trends under current legislation and practices are projected to the future with the help of population projections, spending breakdowns by age groups, and assessments of long-term economic growth trends. The further in the future we go, the more uncertain the calculations become and for this reason the calculation is sensitive to the underlying assumptions about future trends. Sustainability gap calculations are nevertheless useful because they provide a consistent way of analysing the future challenges facing general government finances and ways of solving them.

Figure 1.



Sources: Statistics Finland, MoF

2. General assumptions concerning sustainability gap calculations

The long-term sustainability estimates of general government finances produced by the Ministry of Finance are largely based on the calculation principles and assumptions jointly agreed in the European Union. The decisions on the assumptions used in the EU calculations are jointly made by the European Commission and the Economic Policy Committee (EPC). The decisions are preceded by an extensive debate between the Commission and the member countries in the Working Group on Ageing Populations and Sustainability (AWG), which comes under the EPC. The assumptions are updated every three years for the EU Ageing Report.³

The assumptions presented in the sustainability gap calculations can be summed up as follows:

Pressure projection for general government expenditure

- Demographic trends have an impact on age-related expenditure.
- The amount of general government debt has an impact on interest expenditure.
- The rest of the general government expenditure will remain constant relative to GDP.

Pressure projection for general government revenue

- There will be a decrease in interest income relative to GDP if no additional interest bearing investments are made.
- Future tax revenue from pensions will depend on how pension expenditure changes relative to GDP. The assumption is that for pensions the tax ratio will remain constant.
- Other revenue (mainly tax revenue and thus also the overall tax rate) will remain constant relative to GDP.

The Ministry of Finance's sustainability gap estimate is normally updated twice a year. It is usually published in the spring and autumn economic surveys. In the same connection, the ministry also reports the reasons for any changes in the

³ The latest ageing report is from the year 2018: European Commission (2018), The 2018 Ageing Report – Economic and Budgetary Projections for the 28 EU Member States (2016-2070), European Economy – Institutional paper 079 | May 2018, https://ec.europa.eu/info/sites/info/files/economy-finance/ip079_en.pdf and the assumptions presented in the latest ageing report is from the year 2017: European Commission (2017), The 2018 Ageing Report – Underlying Assumptions & Projection Methodologies, European Economy – Institutional paper 065 | November 2017, https://ec.europa.eu/info/sites/info/files/economy-finance/ip065_en.pdf

estimate and lists the planned long-term reforms that have been taken into account in the calculations. Long-term reforms can only be taken into account if their impacts can be verified with sufficient certainty.

3. Formula for calculating the sustainability gap

According to generally used definition, general government finances will be on a sustainable foundation in the long term when remaining within their intertemporal budget constraint. This means that the present value of the primary balances must be as great as the current general government debt. This equation is the basis for the sustainability gap S2 indicator used in EU contexts.⁴ The indicator is based on the simplifying assumption that the permanent adjustment measures, which allow the inter-temporal budget constraint for general government finances to be reached, are implemented immediately in the second year of the calculation. This results in the following S2 indicator formula composed of four terms:

$$S2 = rD_{t_0} - PB_{t_0} + r \sum_{i=t_0+1}^{\infty} \frac{\Delta Ageing_i}{(1+r)^{i-t_0}} - r \sum_{i=t_0+1}^{\infty} \frac{\Delta PI_i}{(1+r)^{i-t_0}}$$

The fourth year following the current year (t+4) is used as the base year t_0 in the Ministry of Finance's sustainability gap calculations.⁵ The year t+4 has been selected as the base year because it is the last year in the medium-term projections produced by the Ministry of Finance. With this approach, all adequately detailed measures directed at general government finances in the coming years can be considered.

3.1. Future interest expenditure for base year general government debt

The first term rD_{t_0} in the equation is the margin required to cover future interest expenditure on the general government debt relative to GDP D_{t_0} forecast for the calculation base year. This is because the interest on the current general government debt must naturally also be paid in the future. The variable r is the

⁴ The letter 'S' stands for sustainability and the number '2' means that this is a long-term sustainability indicator, i.e. with an unlimited time horizon. The S1 indicator used in EU contexts refers to how much adjustment is needed in general government finances for the debt ratio to be 60% in about 15 years' time measured from the present. The S0 indicator illustrates the risk of a debt crisis in general government finances during the next year. A detailed description of the S2 indicator's use is given in, for instance, annex A2.4 (pp. 158-161) of: European Commission (2019), Fiscal sustainability report 2018 – Volume 1, European Economy Institutional Paper 094/2019, http://ec.europa.eu/economy_finance/publications/eeip/pdf/ip018_en.pdf

⁵ The European Commission uses the last year of its economic forecasts as the base year for its sustainability gap calculations (in winter and spring forecasts the year t+2 and in the autumn forecasts the year t+3).

difference between the real interest on general government debt and economic growth (discount rate).⁶

In the EU calculations it has long been assumed that real interest on general government debt will rise in the longer term to 3%, based on the long-term historical average for interest on government bonds. However, this assumption concerning real interest can be considered rather high in view of the trend over the last couple of decades. This is why in December 2018 the Ministry of Finance switched to assuming a real interest of 2% in its sustainability gap calculations. The EU, in its 2021 Ageing Report, has now also decided to move over to using a similar assumption.

A 2% real rate of return is close to the euro period's historical average⁷ and includes a moderate risk premium relative to the assumed 1.5% average productivity growth for the EU, which can be regarded as an anchor for risk-free interest. It should also be noted that the level of interest rates does not change as the debt level rises in the sustainability gap calculations.

For example, let the debt level be 60% relative to GDP in the calculation base year and the discount rate at 0.5% (constant 2% real interest on general government debt from which a constant 1.5% real GDP growth has been deducted). The cost of managing the base year general government debt is therefore 0.3% relative to GDP.

3.2. General government structural primary balance in the base year

The second term of the equation PB_{t_0} is the structural primary balance of the calculation base year relative to GDP. It describes the general government budgetary position from which the cyclical effect, the effect of one-off measures, and interest expenditure have been eliminated. The stronger the structural primary balance is in the base year, the smaller is the need for future adjustments and the smaller is the sustainability gap.⁸

For example, if the base year structural primary balance is -0.5%, this would widen the sustainability gap by the same amount. On the other hand, if the structural primary balance is +1%, it would narrow the sustainability gap by the same amount.

⁶ If the ratio of real interest to economic growth changes in real time, the discount rates of different years must be taken into account.

⁷ The real effective cost of Finland's central government debt in the period 1999–2017 was on average 1.9%.

⁸ Even though the primary balance also includes property income, their impact on the sustainability gap is not equally clear (for more details, see the chapter 5 and in particular footnote 22).

3.3. Long-term trends in structural primary balance

The third term describes the changes in age-related expenditure relative to GDP and the fourth term the changes in property income relative to GDP when the other general government revenue and expenditure are expected to remain constant relative to GDP. The costs arising from changes in age-related expenditure and property income can be obtained by adding together the change in expenditure for each year discounted to current value and multiplying the sum by the negative discount rate.⁹ The calculation of these terms is discussed in more detail in the chapters 4 and 5 below. These two terms can also be put together as follows if the changes in the structural primary balance of general government finances are not fragmented into their constituent factors:

$$-r \sum_{i=t_0+1}^{\infty} \frac{\Delta PB_i}{(1+r)^{i-t_0}}$$

Table 1 illustrates the impact of different factors on the sustainability gap, using the sustainability gap estimate presented in October 2020 as an example.

Table 1. Sustainability gap estimate of the Ministry of Finance, autumn 2020, by contributing factor

	%, relative to GDP
Term 1: Costs of managing base year general government debt	0,5
Term 2: General government structural primary balance in the base year	2,2
Term 3: Costs arising from the changes in age-related expenditure	1,1
Term 4: Impact of changes in property income	-0,2
Sustainability gap (S2 indicator)	3,6

⁹ In the calculation of age-related expenditure, pension expenditure is included in net terms. The assumption is that for pensions the tax rate will remain constant.

4. Expenditure pressures arising from the ageing of the population

4.1. Assumptions concerning long-term economic and demographic trends

In the sustainability gap calculations produced by the Ministry of Finance, GDP growth and long-term trends in age-related expenditure (excluding educational expenditure) are calculated using the social expenditure analysis (SOME) model developed by the Ministry of Social Affairs and Health.¹⁰ The trends in age-related expenditure and GDP up to the year 2070 are estimated on the basis of the SOME model. After this year, the ratio of age-related expenditure to GDP and the GDP growth rate, in the sustainability gap calculations, will remain constant.

After the year t+4, GDP growth in the SOME model will be determined endogenously on the basis of growth in overall productivity and labour input.¹¹ Under the model, growth in real earnings will follow the growth in overall productivity in accordance with the economic theory. Up to the year t+4, the estimates of trends in real earnings (index of wage and salary earnings deflated by consumer prices), consumer price index, GDP, employment rate, and the labour participation rates, based on the latest Ministry of Finance's forecasts are entered into the SOME model.

The assumptions of trends in overall productivity growth, employment rate, labour participation rate and inflation in the long-term are based on the assumptions used in the EU ageing report.¹² Long-term estimates of the labour participation rate and the employment rate are based on the cohort simulation model (CSM)¹³ developed by the European Commission. The method is based on the average probabilities, over the past ten years, of entering and exiting the labour force by age group. Entry and exit probabilities, based on these ten-year averages, will reduce the cyclical impact in calculations concerning the longer term.¹⁴ Unlike the

¹⁰ Further information: Social expenditure scenarios – effects of health promotion and a presentation of the analysis model. Reports of the Ministry of Social Affairs and Health 2009:7 <http://urn.fi/URN:ISBN:978-952-00-2775-9> (in Finnish, with English abstract)

¹¹ Labour input is determined on the basis of the employment rate and population projections.

¹² See footnote 3.

¹³ For more about the assumptions of the cohort simulation model, see: Carone, G. (2005), Long-term labour force projections for the 25 EU Member States: A set of data for assessing the economic impact of ageing, European Commission Economic Papers 235,

https://ec.europa.eu/economy_finance/publications/pages/publication576_en.pdf and European Commission (2017), The 2018 Ageing Report – Underlying Assumptions & Projection Methodologies, European Economy – Institutional paper 065 | November 2017, https://ec.europa.eu/info/sites/info/files/economy-finance/ip065_en.pdf.

¹⁴ The probabilities of entering and exiting the labour force are expected to remain essentially unchanged throughout the projection period, and they will determine the future course of the participation rates by age group. Among older age groups (aged 51–74), the probabilities of exiting the labour force are affected not only by the historical trend but also by the joint assessments of the European Commission and the EU Working Group on Ageing Populations and Sustainability (AWG) of the effects of the legislated pension reforms. The participation rates for younger age groups (aged 15–29) also take into account the lengthening periods of education over recent decades. The model assumes that the participation rate of people aged 15–19 will remain unchanged for the entire forecast period. Furthermore, no decrease is permitted in the participation rates of those aged 20–29. Any change

EU (which relies on Eurostat population forecasts), the Ministry of Finance uses the Statistics Finland population projections in the assessment of future demographic trends. At the same time, the unemployment rate is expected to converge to its long-term structural level during the first years covered by the calculations and remain constant after that.

The European Commission updates its cohort simulation model every three years in connection with preparation of the Ageing Report. The Ministry of Finance's cohort simulation model is updated annually on the basis of Statistics Finland's most recent population projection and the labour force survey statistics. The other assumptions of the model are updated every three years in connection with the update from the Commission.

Yearly growth in overall productivity is estimated to reach 1.5%. However, according to the calculations, there will be an adjustment period from the current low level before this level is achieved. As a result of the 2017 pension reform, the structural levels of the employment and labour participation rates are expected to increase gradually in the long term. Inflation assumption is two per cent.

4.2. Assessment of age-related expenditure trends

In the sustainability gap calculations, the impacts of the population ageing are assessed by reviewing trends in age-related expenditure. In the EU calculations, pension, health care, long-term care and education expenditure are strictly age-related expenditure. In addition, unemployment expenditure is also included in the calculations of age-related expenditure in order to ensure consistency.¹⁵

The basic principle in the calculation of age-related expenditure is that benefit and service expenditure is divided between different age groups in accordance with the use statistics.¹⁶ These age-group-specific expenditure items are expected to change as the size of the age groups changes in accordance with population projections and as unit costs increase. The manner in which improvements in public health, indexing of unit costs, and other factors are considered in the calculations is presented in more detail below by expenditure item.

on the basis of labour force entry and exit probabilities is incorporated only if the model forecasts a rise in the participate rate. The overall participation rate is influenced by the participation rates of different age groups and also by demographic trends, which determine the weights given to the participation rates for the age groups.

¹⁵ Not all social welfare expenditure included in the SOME model is considered as age-related expenditure in EU calculations, which means that they are also similarly treated by the Ministry of Finance. Like other general government expenditure, it is, however, expected to remain constant relative to the GDP.

¹⁶ The expenditure and user data in the SOME model is normally updated every second year. This is because of the substantial workload required by the update process. The model's base data is currently the statistical data for 2017, and the aim is to update the model with 2019 statistical data at the start of 2021.

4.2.1. Pensions

In the model, the pension system has been divided into national pensions and earnings-related pensions, which in turn are divided into types of pension. The accruals and indexation of the earnings-related pensions are in accordance with the current legislation. In fact, future pensions depend on the incidence of retirement as well as trends in employment rates and pay. The trends in pension expenditure are fairly close to the long-term calculations produced by the Finnish Centre for Pensions.¹⁷

In the long-term, national pension expenditure is 50% linked to inflation and 50% to growth in earnings. This is because, even though under the Finnish law, these benefits should only be linked to inflation, there have been occasional increases in the level of the benefits so that they would not fall too much behind overall increases in earnings.

4.2.2. Health care and long-term care

In addition to the size of the age groups, growth trends in health care and long-term care are also impacted by the assumption that the increase in life expectancy for people aged over 50 will delay the need for services by half compared with the increase in the life expectancy. Thus, a two-year increase in life expectancy will mean that the service needs of people aged 61 is estimated to correspond to the service needs of people aged 60 in the past.

In the EU calculations, the health care costs are expected to grow at the same rate as the income (GDP per capita). It is also assumed that, at first, income elasticity will be at 1.1 and that it will gradually converge to one by the year 2070. In the SOME model, it has been necessary to standardise this assumption into income elasticity of 1.048 because it is not possible to vary the size of the elasticity in real time. The assumption is therefore that, in addition to the wages and salaries of care personnel, which increase in line with overall earnings, there are also other factors increasing health care expenditure. These include the introduction of new treatments, service improvements and the growth in the demand for services as income levels increase. The productivity of the health care services is also expected to remain at the level of the base year, which means that no changes are expected in the labour intensity of these services.

Expenditure trends in long term care are linked to overall increase in earnings because personnel expenditure accounts for most of the care costs. The productivity in care services is also assumed to remain at base year level, which means that no changes are expected in the labour intensity of these services.

¹⁷ Slightly differing assumptions concerning long-term economic growth are the main reason for the gaps. If the same underlying assumptions were used in the calculations, the differences would be almost non-existent.

4.2.3. Education

Education expenditure is not included in the SOME model, which means that the estimates are based on the computational framework used by the Ageing Working Group of the EU. In the EU computational framework, education expenditure is examined by education level. The only factors affecting expenditure on primary education are the size of the age groups and trends in unit costs. Participation in secondary and higher education depends on the size of the age groups and, inversely, the labour participation rate of young people. The trends in education unit costs are linked to overall growth in earnings, and the trends in personnel expenses, capital expenditure and income transfers concerning education are in line with overall earnings growth. The productivity in education is assumed to remain at base year level, which means that no changes are expected in the labour intensity of these services.

4.2.4. Unemployment security

In the model, growth trends in unemployment expenditure depend on the number of the unemployed and the level of the unemployment benefits, which is expected to rise at the same rate as wages and salaries.¹⁸ The unemployment rate after year $t+4$ will, in accordance with EU assumptions, converge to its structural level in about ten years. After this, unemployment expenditure will remain more or less constant relative to GDP.

5. Property income

General government property income must also be taken into account in the sustainability gap calculations. The level of property income, and changes in that level, affect the sustainability gap in several ways, and these impacts can, in places, be divergent.

If no additional investments in bonds are made, their nominal value will remain unchanged. This means that interest income relative to GDP will gradually decrease as the value of the GDP increases. In that case, property income relative to GDP will decrease, which will increase the sustainability gap.¹⁹ In other words, as the economy expands, interest income will gradually account for a smaller proportion of the GDP if none of the income is reinvested in the capital markets.

¹⁸ In the SOME model, unemployment trends are based on the employment and labour participation trends entered into the model.

¹⁹ Numerically, this impact can be calculated by adding together the changes in property income for each year discounted to current value and multiplying the sum by the negative discount rate (see chapter 3 for more details)..

If, on the other hand, new investments are made in bonds, these investments will directly increase the gross general government debt. This means that both general government debt and general government assets will increase equally. This will have no impact on the sustainability gap if the interest rate on the debt corresponds to the percentage return on fixed income investments, in which case interest income and interest expenditure will increase equally. If, on the other hand, the interest income from investments exceeds the debt interest, the sustainability gap will be slightly reduced.

It should also be noted that as the property income is included in the general government primary balance at the start, it helps to improve the balance. Without property income, the starting situation for general government finances would be significantly weaker and the sustainability gap wider, compared with the situation where general government finances include property income.

The assumption in the joint EU sustainability gap calculations is that the dividend income generated by shares relative to GDP will remain constant in the long term, which means that of the property income categories, dividend income will not affect the sustainability gap. In other words, the nominal value of shares and dividends will grow at the same rate as the nominal GDP, in which case their GDP ratio will not decrease. At the same time, interest income is calculated on the basis of the start value of the bonds and the interest rate assumption. For bonds, the assumed rate of return corresponds to the real interest rate assumption for general government debt, which was examined in more detail in section 3.1. Moreover, as described above, the assumption is that no further investments are made in bonds. This means that the implicit rate of return on shares is higher than that of bonds.

In the Ministry of Finance's sustainability gap calculation, these EU assumptions are used in the case of central and local government assets, as applicable. Deviating from the EU assumptions, the return on shares has been expressed in terms of parameters so as to make it possible to perform sensitivity analysis. The return on shares has also been tied to the growth in productivity rather than to Finland's GDP growth, as a significant proportion of the return on shares is dependent on GDP growth abroad rather than in Finland. The end result of parameterization is that the overall return on shares in real terms is 4%, of which 2.5% is dividend income and 1.5% the real increase in value.

In the joint EU calculations, all general government subsectors are treated in the same manner, which means that the surplus generated by earnings-related pension schemes is used to reduce general government debt and the pension assets relative to GDP will gradually shrink. In fact, the surplus of the earnings-related pension schemes will be reinvested in the capital markets²⁰, in which case

²⁰ The calculations use the EDP debt, i.e. general government sub-sector items are consolidated out of general government debt. Following the same logic, general government sub-sector items have been consolidated out of

the gross general government debt will increase more rapidly than would be concluded on the basis of the general government deficit as a whole. At the same time, the financial assets of central and local government and the interest income generated by them will contract relative to GDP. This is because the assumption is that these sectors will not acquire additional assets and will instead channel the income to debt repayments. This means that for central and local government the assets-to-GDP ratio (and thus also the return-to-GDP ratio) will decrease over time.

The above is a unique feature of Finland's general government finances and the Ministry of Finance has decided to take it into account in its sustainability gap calculations by applying to earnings-related pension schemes a sustainability calculation that is separate from the rest of general government. In long-term calculations, the 3.5% real rate of return assumption for pension assets used by the Finnish Centre for Pensions for 2029 and beyond is applied to all assets of earnings-related pension schemes, in contrast to the assets of central and local government.²¹ This is also used in the discount rate calculation for earnings-related pension schemes, as the surpluses of these schemes begin to accumulate implicitly as negative debt, the rate of return of which corresponds to the real interest rate assumption used in the discount rate calculation.

It is natural to assume that the rate of return for all the assets of earnings-related pension schemes will remain stable after reaching its longer term level and that the schemes' distribution of investments among different asset classes will not change in the long-term. In addition, the opportunity cost of the changes in the employment pension contribution is a return on assets for as long as the net assets of the earnings-related pension schemes is positive. These considerations validate the higher discount rate of the earnings-related pension schemes in comparison with central and local government.

In addition to the rates of return, details of the base year financial assets and property income are also required for making estimates of the property income. Estimates of the financial assets held by earning-related pension schemes in the base year will be obtained from the fiscal forecast produced by the Ministry of Finance. No separate forecasts are prepared for central and local government. Instead, the details of financial assets relative to GDP contained in the financial

general government assets and interest expenditure and interest income. Thus, for example, earnings-related pension scheme investments in government bonds are removed from general government debt and from general government assets. As a result of this procedure, it is also natural, for reasons of simplicity, to assume that new investments by earnings-related pension schemes will not concern Finland's general government debt.

²¹ The real rate of return on shares and investments in mutual funds is assumed to be 3.5% after the base year of the calculation, but the return on bonds is assumed to rise only gradually to 3.5% from its present low level. It is assumed that 2.5% of the real rate of return generated by shares will be in the form of dividends and the remaining one per cent will be generated as increase in value. Even though some of the investments in mutual funds also resemble investments in bonds, their nature is not clear from the financial accounts. This division is, however, not important because in the long-term, the same rate of return is applied to all assets.

accounts at the end of the latest statistical year are used for the purpose. The forecast for the property income in the base year is taken unchanged from the fiscal forecast produced by the Ministry of Finance.²²

Thus, in the property income calculations the contraction of each year's interest income and additional investments are converted to current value by means of each year's discount factor and the sum of these then multiplied by the negative discount rate.

6. Sensitivity of sustainability gap calculations to underlying assumptions

The aim is to establish a sustainability gap estimate that is based on assumptions that are as realistic as possible. As with any indicator, the estimate oscillates somewhat over time as the relevant data and forecasts are updated. Table 2 presents the main assumptions made in calculating the sustainability gap and the sensitivity of the sustainability gap calculation to changes in these assumptions. The sustainability gap calculation and the sensitivity analysis provide a useful and consistent basis for assessing the extent of the challenge posed by the ageing of the population, and for considering which tools can be used to respond to the challenge.

Although the changes in assumptions illustrated in the table are for one direction (up or down), the impacts of changes in the other direction will be of the opposite kind but of the same magnitude. In addition, the impacts are linear, which means that a change in assumption that is twice as large, for example, will also lead to a sustainability gap impact that is twice as large. However, the larger the change that is made, the less certain is the outcome of the sensitivity analysis, as the world is not necessarily linear in reality despite this simplifying assumption being made in the sustainability gap calculation model.

In the sustainability gap calculations, overall productivity is estimated to grow in the longer term by an average of 1.5% annually. Based on the analysis, a permanent acceleration of 0.5 percentage points in the overall productivity growth, which would be a substantial increase, would only narrow the sustainability gap by 0.3 percentage points.²³ This is because in the long term, growth in overall productivity would increase real earnings in all sectors by an equal amount, which would also result in higher labour costs in the public sector.

²² The base year interest rate (and interest income) forecast does not have any impact on the size of the sustainability gap estimate (assuming that the calculation will otherwise remain unchanged). For example, a lower interest rate forecast for the calculation base year would reduce interest income, which would also weaken the structural primary balance. An opposite impact that is of equal significance for the sustainability gap estimate will, however arise when the interest income will decrease less in the long term. This is because, the unchanged long-term interest income development is compared to the lower base year interest income.

²³ In this analysis it is assumed that the improved productivity trend will also be reflected in the interest rate level and the return on shares.

Table 2. Main assumptions and sensitivities of the sustainability gap calculation

	Baseline scenario (autumn 2020)	Change	Impact on sustainability gap, pp.¹
Growth in general productivity (and real earnings) in 2025-2070	on average 1.5%	+0.5 pp.	-0,3
Employment rate (15-64 yrs) in 2025-2070	71.9% in 2024 and 75.9% in 2070	+1.0 pp.	-0,3
Annual productivity growth of public health and social services in 2025-2070	0%	+0.5 pp.	-1,9
General government structural primary balance ² / GDP in 2024	-2.2%	+1.0 pp.	-1,0
Total fertility rate	1.35	+0.35 (= 1.70)	-0,2
Annual net immigration (impact if employment rate remains unchanged)	15,000	+7,500 (= 22,500)	-0,4
Life expectancy at the age of 50 (33.6 years in 2019)	Will be increased by 7 years by 2070	-1.4 years (= 5.6 years)	-0,5
Postponement of the need for health and social services as life expectancy increases	Will be postponed by half of the life expectancy increase (people aged over 50)	Will be postponed at the rate of life expectancy increase	-1,1
		No postponement as life expectancy increases	1,1
Inflation (change in GDP deflator and consumer prices) in 2025-2070	2%	-0.5 pp.	approx. 0.0
Real interest rate on central and local government debt (+ impact on the discount rates of the two sectors)	Real interest rate on central and local government debt and interest income 2%, real rate of return on central and local government's investments in shares 4% and real rate of return on employment pension schemes' investments 3.5% (from 2040s onwards)	-0.5 pp.	-0,2
Real interest rate on central and local government debt and impact on the real rate of return on central and local government and employment pension schemes' investments in bonds (+ impact on all sectors' discount rates)		-0.5 pp.	approx. 0.0
Real interest rate on central and local government debt and real rate of return on all general government investments (+ impact on all sectors' discount rates)		-0.5 pp.	0,6

¹ The calculations are based on summer 2020 MoF sustainability gap calculations (impact of assumption changes are stable over different calculation rounds)

² Deficit excl. interest payments

In the calculations, the employment rate is estimated to increase in the longer run as a result of the 2017 pension reform, rising to almost 76% by 2070. The future employment rate will have a major impact on the size of the sustainability gap, because a permanent increase of one percentage point in the employment rate would narrow the sustainability gap by more than 0.3 percentage points.²⁴ A higher employment rate would strengthen the sustainability of public finances in two ways: Firstly, it would increase GDP and thus also general government tax revenue (in the sustainability gap calculations this would be seen as lower spending-to-GDP ratios of all age-related expenditure). Secondly, lower unemployment would decrease public spending related to unemployment.

Higher productivity in public social welfare and health services also has a major impact on the size of the sustainability gap. In the baseline scenario, it is assumed that the productivity of these services remains at the level of the base year, which means that no changes are expected in the labour intensity of these services. If the productivity growth in public social welfare and health services could be permanently improved by, for example, 0.5 percentage points each year, this would significantly slow down the long-term increase in public expenditure and would thus also narrow the sustainability gap by about 1.9 percentage points.

As was stated in chapter 3, the structural primary balance of general government finances has a direct effect on the sustainability gap. However, as with other sustainability gap factors, there is uncertainty associated with forecasting and assessing the structural primary balance. This uncertainty is evident, for example, in the fact that changes in forecasts cause oscillations in sustainability gap assessments from one round of calculations to the next. The structural primary balance is affected by new and rapid-impact discretionary measures aimed at general government income and expenditure.

In Statistics Finland's 2019 population projection, the total fertility rate is 1.35. A permanent increase in the total fertility rate by 0.35 units to 1.7 children per woman would reduce the sustainability gap by about 0.2 percentage points. The effect is modest because changes in the birth rate are reflected in the employment figures only after an interval of more than 20 years. In addition, a higher birth rate will permanently increase education expenditure.

In Statistics Finland's 2019 population projection, the assumption made for net immigration is 15,000 people a year. A permanent increase in net immigration of 7,500 people, to an annual total of 22,500 people, would reduce the sustainability gap by around 0.4 percentage points, because the ratio of employed people to dependents would improve, and labour input and thus GDP would rise. In the calculations, it is assumed for simplicity that with increased net immigration there

²⁴ The assumption is that about 30% of all new employed persons would come from outside the work-force and about 70% from among the unemployed.

will be no change in the average income of the population or in the use of public services or benefits, or in the employment rate.

Based on life expectancy in Finland, someone 50 years old in 2019 would live another 33.6 years. In Statistics Finland's 2019 population projection, it is anticipated that by 2070 a 50-year-old's life expectancy will have lengthened by 7 years. If a 50-year-old's life expectancy were, by 2070, to increase by 1.4 years less than in the baseline scenario, i.e. by 5.6 years instead of 7 years, the sustainability gap would decrease by about 0.5 percentage points. A slower than expected rise in life expectancy would mean a smaller number of people in the higher age groups and therefore a reduced demand for health and social services and lower pension expenditure. The impact on pension expenditure is reduced by having retirement age linked to the life expectancy, and the life expectancy coefficient reduces the level of new pensions as life expectancy rises.

The basic assumption in the sustainability gap calculations is that the increase in life expectancy for people aged over 50 will delay the need for health and social services by half compared with the increase in the life expectancy. This assumption is half way between two extremes. The first extreme is that the need for health and social services would be postponed at the same rate as the increase in life expectancy. This would mean the sustainability gap decreases by about 1.1 percentage points. The other extreme is that the need for health and social services would not be postponed at all as life expectancy increases. The sustainability gap would increase by about 1.1 percentage points.

The sustainability gap calculations assume that the rise in the general price level (GDP deflator and consumer price index) will average 2% annually in the long term. In the calculation, a rise in prices increases both general government expenditure and revenue to the same degree. This means that if a lower average annual inflation rate is assumed, for example 1.5% instead of 2%, this would not, in practice, change the sustainability gap estimate at all.

In the sustainability gap calculations, it is assumed that the real interest rate on central and local government debt and the return on public sector fixed income investments will rise to 2% by the 2040s. Decreasing the real interest rate on central and local government debt by 0.5 percentage points to 1.5% would reduce the sustainability gap by about 0.2 percentage points. The effect is small, as the fall in interest rates also affects the discount rate for age-related expenditure, meaning that an increase in age-related expenditure will produce a greater impact in terms of current value.

If the above-mentioned decrease in interest rates were to be reflected not only in the interest rate on debt but also in all public sector fixed income investments, the sustainability gap would in practice not change at all in relation to the baseline scenario. This is because public sector fixed income investments and particularly those of the earnings-related pension schemes are substantial. This scenario can

also be considered more likely, as it is probable that the fall in interest rates will also be reflected in the returns on fixed income investments.

In the sustainability gap calculations it is assumed that the annual real return on the equity investments of central and local government will be 4%, and that the average real return on the investments of the earnings-related pension schemes will rise to 3.5%. If both the real rate of return on all investments and the real interest on general government debt were to remain 0.5 percentage points lower than in the baseline scenario, the sustainability gap would widen by about 0.6 percentage points. Here the impact of the lower investment income would be dominant because in the baseline scenario, the general government investment assets are about twice as high as the general government debt. This is mainly the result of partial advance funding of pensions.