

CENTRAL GOVERNMENT GUARANTEES AND LENDING

A Risk Analysis



The National Debt Office's mandate for a comprehensive risk analysis

The Swedish state provides guarantees and loans for purposes established by the Riksdag (Swedish Parliament) and the Government. A guarantee entails that the state stands surety for the payment obligations of another party. This involves a credit risk for the state. A credit risk also arises when the state lends money to parties, such as a company or private individual.

At year-end 2018, central government guarantees and lending with credit risk, excluding the deposit insurance scheme, amounted to SEK 595 billion.¹ The portfolio includes student loans, export guarantees, housing guarantees, and guarantees to benefit international financial institutions of which Sweden is a member. These commitments are collectively referred to in this report as the regular portfolio. The deposit guarantee, which amounted to SEK 2,280 billion as at 31 December 2017, is analysed separately in the report.²

The Swedish National Debt Office has submitted the report *Central Government Guarantees and Lending – A Risk Analysis* to the Government every year since 2012. The report is prepared in collaboration with EKN (The Swedish Export Credits Guarantee Board), Boverket (the National Board of Housing, Building and Planning), Sida (the Swedish International Development Cooperation Agency) and CSN (the Swedish Board of Student Finance), as well as other relevant government agencies.³

Increased awareness for better risk management

This risk analysis report is a supplement to the financial reporting of the guarantee and lending operations provided in the central government's annual report. That annual report includes outstanding amounts, provisions for losses, and the fees charged by the state as part of these activities. The purpose of the risk analysis is to provide further information on the credit and liquidity risks involved in the undertakings. This report therefore focuses primarily on:

- the risk of major credit losses in the portfolio, i.e., losses that exceed expectations and also normal deviations (credit risk analysis)
- events or circumstances that could give rise to large credit losses
- the state's ability to handle large unforeseen payments and the risk of payments connected to guarantees and loan commitments leading to higher borrowing costs within the central government's liquidity management (liquidity risk analysis)

These in-depth analyses enable political-decision makers to both communicate that there is good control over operations and determine whether further risk-limiting measures are needed.



¹ Excluding the guarantees and loans exempted from the risk analysis (see Appendix 2).

² The size of the deposit insurance for 2018 was not available at the time of this report.

³ A report containing a comprehensive risk analysis of central government guarantees and lending is to be presented on 15 March in accordance with the Ordinance containing instructions for the National Debt Office (2007:1447).

Contents

Summary	5
Low risk of large losses in the regular portfolio	5
Moderate risk of large losses in the deposit insurance scheme	6
Flexible cash management enables low liquidity risk	6
Analytical framework	7
Scope of the risk analysis	7
Credit risk analysis	7
Liquidity risk analysis	9
Risk factors	9
Credit risks in the regular portfolio	12
The regular portfolio	12
Limited sensitivity to economic downturns	14
Low risk of large losses despite concentrations	18
Name concentrations – good creditworthiness in individual large commitments	19
Limited occurrence of close connections – low risk of problems spreading	23
Sectoral concentrations – exposure to telecom operators	23
Geographic concentrations – large proportion in Sweden	24
Consolidated assessment of risk factors	29
Credit risks in the deposit insurance scheme	30
Commitment to consumer protection and financial stability	30
Different function depending on type of crisis management	31
Different categories of institutions	32
Distinguishing factors for the deposit insurance	34
Moderate risk of direct fulfilments causing large losses	35
Lower recovery with direct fulfilment than in resolution	36
Low risk of large losses for deposit insurance in resolution	38
Relatively good potential for recovery in resolution	45
Liquidity risks linked to central government guarantees and lending	47
Basic assumptions for the liquidity risk analysis	47
Potential payments are not too large to manage	47

Considerable flexibility in the liquidity management operations	49
Potential additional cost is short term and isolated	50
Appendix 1: Central government guarantee and lending operations	52
The central government guarantee and lending model	52
Guarantees and lending regulated separately	54
Appendix 2: Undertakings excluded from the risk analysis	59
Lending funded by appropriations	59
Public enterprise guarantees	59
Capital adequacy guarantees	59
Investor compensation scheme	60
Appendix 3: In-depth presentation of the central government guarantee and lending portfolio	61
Size of the guarantee and lending portfolio	61
Difficulties in determining expected loss	66
Historical flows	67
Appendix 4: Calculation of the risk of large losses	70
Quantitative portfolio model	70

Summary

The Debt Office's assessment is that the risk of large losses in the regular portfolio – containing student loans, export credit guarantees and guarantees to benefit international financial institutions – has remained at the same level as in the previous year's report. The risk of large losses in the deposit insurance scheme is deemed to remain at the same moderate level as in the previous year. In this risk analysis, large losses refer to SEK 20 billion over a five-year time horizon.

Low risk of large losses in the regular portfolio

The Debt Office considers the risk of large losses in the regular portfolio to be low. Significant parts of the portfolio have relatively good creditworthiness, and the share of guarantees and loans with very low creditworthiness is small. The portfolio is deemed to have a limited sensitivity to economic downturns. There are some significant concentrations in the portfolio, but the risk of large losses arising among them is deemed low. Otherwise, the portfolio is well-diversified across many geographic areas and sectors.

The concentrations mainly involve large individual undertakings, a geographic concentration to Sweden (student loans) and a sectoral concentration of telecom operators. The Debt Office considers the risk of these concentrations leading to large losses to be low mainly because the credit risk is low in the undertakings in which the concentrations exist.

Nevertheless, if large losses were to arise, they would most likely be from a deep and lengthy recession that – in addition to generally increasing the overall level of loss in the portfolio – were to particularly affect one or more of its concentrations.

The portfolio's relatively low level of risk is largely attributable to the principles and regulatory frameworks that steer the central government's guarantee and lending operations. Central government's risk-taking is mitigated by the limits placed on guarantees and loans in terms of amount and time, the fact that the expected cost is reported and financed at the time of decision and that risk-limiting conditions are applied. This is described in further detail in Appendix 1.

Table 1. Credit risks in the regular portfolio

Risk factor	Risk of large losses (previous years)
Risk from changes in the general economic environment	Low (Low)
Name concentration (individual large guarantees and loans)	Low (Low)
Close connections between guarantee holders or borrowers	Low (Low)
Sectoral concentration	Low (Low)
Geographic concentration	Low (Low)

The risk level is assessed according to a four-degree scale: low, moderate, significant and high.

Moderate risk of large losses in the deposit insurance scheme

The Debt Office considers there to be a moderate risk of large losses in connection with deposit insurance.

For the major banks and other institutions deemed systemically important, the deposit insurance may need to be utilised in order to provide consumer protection in resolution. However, those institutions would have to suffer significant losses for such a measure to be required. The Debt Office considers this risk to be low.

If a non-systemically important institution were to fail, the deposit insurance commitment would instead be fulfilled by central government paying compensation directly to the depositors and then acquiring a claim on the institution. It would take the failure of two to three non-systemically important institutions in order for large losses to arise. The Debt Office considers the risk of that occurring to be moderate. However, the risk of significantly greater losses than SEK 20 billion arising is deemed low, due to the limited volumes for each institution and because, consequently, an even larger number of them would have to fail.

Table 2. Risk based on type of fulfilment

Type of fulfilment	Risk of large losses (previous years)
Direct fulfilment	Moderate (Moderate)
Fulfilment in resolution	Low (Low)

The risk level is assessed according to a four-degree scale: low, moderate, significant and high.

Flexible cash management enables low liquidity risk

The Debt Office's assessment is that the liquidity risks in the guarantee and lending portfolio remain low. The payments that the individual undertakings could give rise to are not larger than the daily deficits regularly handled by the liquidity management operations. If several large payments were to be made within a number of days, this could entail even larger amounts. However, the Debt Office's assessment is that such amounts can also be borrowed on short notice. The borrowing cost would likely be somewhat higher in certain cases but only in the short term and connected to individual payments. For the first time, the analysis in this year's report also includes deposit insurance payments.

Analytical framework

The Debt Office's risk analysis of central government guarantees and lending with credit risk is based on an analytical framework establishing basic assumptions, definitions and methodology.

Scope of the risk analysis

The risk analysis contains both a credit risk analysis and a liquidity risk analysis. The credit risk analysis comprises the central government portfolio of guarantees and loans with credit risk that, at year-end 2018, had been issued to parties outside central government. In addition to these guarantees and loans, the liquidity risk analysis covers loan commitments in which a party has the right to borrow under certain terms and conditions from the state but has not utilised this right.

The fact that the analysis is based on the guarantees and loans in the portfolio at the most recent turn of the year is admittedly a simplification, as the contents of the portfolio are continually subject to change; for example, certain commitments are settled as others arise. A more dynamic approach, however, would increase both the complexity and uncertainty in the analysis, partly because this would require making assumptions about decisions not yet taken.

Lending financed by appropriations, public enterprise agencies' guarantees, the investor compensation scheme, and capital adequacy guarantees are excluded from the risk analysis. In this context, they constitute either small amounts or negligible risks and are excluded for practical reasons. The exceptions do not affect the Debt Office's conclusions. See Appendix 2 for more information on these exceptions.

Credit risk analysis

The credit risk analysis covers the risk of losses of at least approximately SEK 20 billion in the regular portfolio or for the deposit insurance in the next five years. The credit risk analysis is therefore divided into two parts: the regular portfolio and the deposit insurance portfolio.

The deposit insurance, in terms of reported amount, accounts for more than half of the central government's aggregate portfolio. In light of the large amount and complex regulatory frameworks that directly affect the risk in the deposit insurance, the analysis is presented in a separate section.⁴ However, the analysis is based on the same analytical frameworks as in the regular portfolio.

The risk of large losses is assessed according to a four-degree scale: low, moderate, significant and high. The scale should primarily be viewed in terms of the need for a more in-depth analysis. At a low risk level there is probably no such need, whereas moderate risks call for closer monitoring. A

⁴ If there are large losses in one portfolio, there is an increased likelihood that the losses in the other portfolio are also higher than normal, even if the latter do not necessarily exceed SEK 20 billion. This is explained by the fact that large losses usually occur during a deep recession.

significant or high level of risk increases the need for analysis. At the same time, it may be relevant to analyse whether it is possible to limit the level of risk, which would require a political decision.

Losses

The term losses is used in the credit risk analysis as a collective name for the fulfilment of guarantee commitments and the write-off of loans, in the event of an established loan loss.

Fulfilment of guarantees affects both central government net lending and central government debt. The write-off of loans only affects central government net lending because they are not cash flows. In the analysis, the Debt Office therefore also comments on the effects reductions and cessations of payment of student loans have on the state's cash flow, even though these are not classified as losses in the analysis. The fact box in Appendix 1 describes in more detail how central government finances are affected by the guarantee and lending operations.

Even if the fulfilments involve a loss, in the sense that they have an immediate effect on central government finances, they do not necessarily have to ultimately lead to a loss if the state retroactively recovers, (gets back) the guarantee amount fulfilled. In the credit risk analysis, the Debt Office therefore comments on the opportunities for recovery in the event of a fulfilment. A large part of the recoveries will, however, be made beyond the five-year time frame of the analysis because the recovery process often takes many years to complete. The focus is thus mainly on the risk of fulfilments.

For the deposit insurance, the state also has the right to retroactively raise the fee charged if the losses become large enough to erode the fund used to cover them – that is, a retroactive right to cover losses in the long term.

Focus on large losses over five-year period

In the report, large losses refer to those which amount to at least approximately SEK 20 billion in the regular portfolio or for the deposit insurance over the next five years.⁵

From a risk perspective, the size of losses that should be focused on is not apparent. The size relevant for analysis can vary depending on the situation – specifically the financial position of the central government when the losses occur.

The Debt Office's assessment is that the risk analysis should focus on losses that significantly exceed expected losses and average historical losses. Outcomes that clearly limit the possibility of achieving fiscal and budget policy objectives, compared with an expected or historically "normal" outcome, should receive focus.

Based on this assessment, the Debt Office has chosen to focus on the risk of losses of at least SEK 20 billion over a five-year period. It should be emphasised that this represents a gross loss. The net effect of the losses is lower from the state making recoveries and taking out fees during the same

⁵ If the losses amount to a total of at least SEK 20 billion, the majority of them are assumed to occur in most cases during one, or a few, more critical years, while losses during the remainder of the five-year period are assumed to be at more normal levels.

period. The average annual fee charged has, for example, amounted to SEK 2.4 billion for the regular portfolio and SEK 1.2 billion for the deposit insurance over the last ten years.

A five-year period is intended to reflect a medium-term time horizon, or approximately one economic cycle, in keeping with other economic forecasts and evaluation periods within central government. A limited time period is required for making a sufficiently relevant assessment of the risk of large losses. In the long term, the intention is for fees and recoveries from the guarantee and lending operations to correspond to the losses, with the net effect being that central government finances ultimately balance to zero (see Appendix 1). However, seen in terms of a limited time period, large losses have a negative effect on state finances.

As a consequence of the designated time perspective, the risk analysis is based on the size of the amounts that could be fulfilled under guarantees outstanding over the next five years. This can, in some cases, differ significantly from the amounts in the central government's annual report, for example depending on the fact that many guarantees are not immediately fulfilled in their entirety but rather continually in pace with guarantee repayments falling due. However, when nothing else is presented, the size of the commitments presented in the report is based on the amounts recorded in the central government's annual report. Among other things, this is done to clarify the risk analysis' connection to the portfolio presented in that annual report.

Liquidity risk analysis

Guarantees and loan commitments entail a liquidity risk because it is not known beforehand whether or when payments in connection with the undertakings will need to be made. On the other hand, with direct lending, no such risk arises because the state cannot be affected by further payments after that point.

The section on liquidity risk addresses the central government's ability to handle large unforeseen payments, including the risk that payments connected to guarantees and loan commitments lead to higher lending costs in the liquidity management operations.

The liquidity risk analysis is based on the potential need for large amounts to be paid out as non-recurring payments or as several payments within a few days. In this sense, the analysis has another timescale than the credit risk analysis.

Risk factors

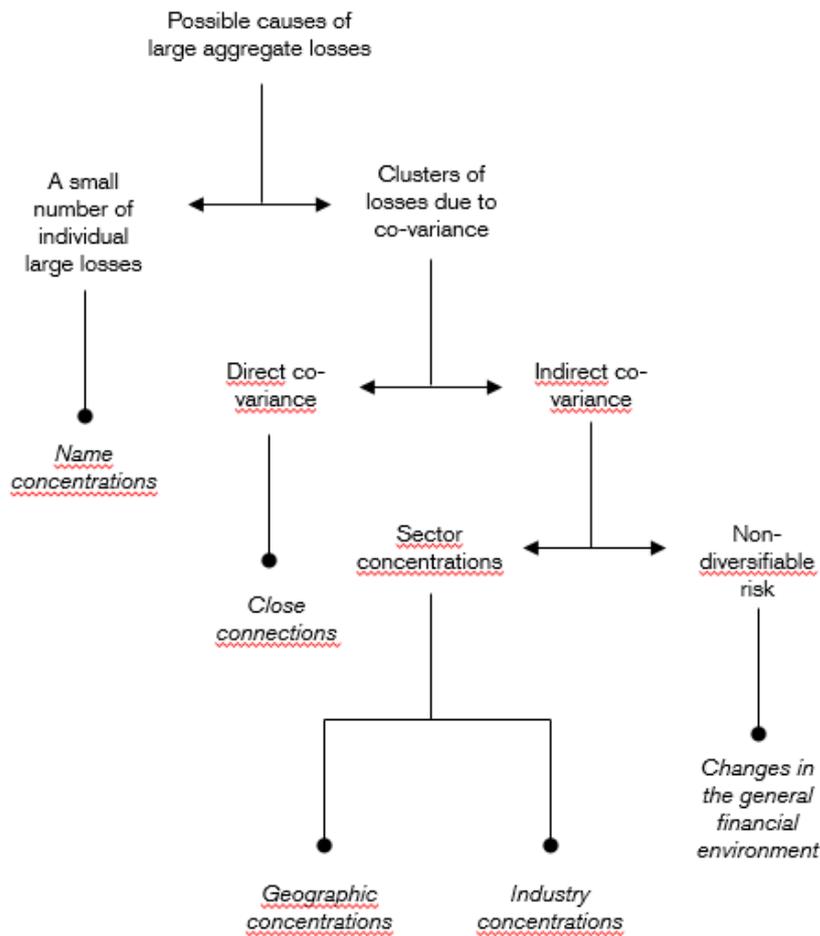
There are essentially two types of events that can result in large losses:

- a small number of losses for individual large guarantees or loans that comprise a significant proportion of the portfolio

- a group (cluster) of losses that collectively comprises a large amount and is, as a rule, attributable to covariance ⁶

The risk analysis identifies and discusses circumstances – risk factors – that can give rise to these two events. The risk factors identified are: changes in the general economic environment, name concentrations, close connections between guarantee holders and borrowers, sectoral concentrations, and geographic concentrations. Figure 1 summarises the interrelationships between the identified risk factors.

Figure 1. Risk factors and their interrelationships



⁶ Depending on, for example, the economic cycle or altered conditions within a particular sector (either in an industry or geographic area), credit losses tend to coincide in time in clusters. This can be interpreted to mean that the possibility for guarantee holders and borrowers to fulfil their undertakings covaries. There are two types of covariance. "Direct covariance" means, in this context, that the credit risk in one guarantee or loan directly affects the credit risk in another. "Indirect covariance" means that one background factor affects the credit risk in several commitments.

Changes in the general economic environment

Other risk factors described below are a consequence of the presence of concentrations in a portfolio. However, even in a perfectly diversified portfolio (without significant concentrations) there is a risk of loss clustering due to indirect covariance. A financial shock such as an economic downturn affecting several sectors and geographic regions can give rise to indirect covariance between different sectors.

Name concentrations (individual large guarantees and loans)

The analysis of name concentrations is related to the size of the proportion of the portfolio that a particular commitment represents. If there are individual guarantees and loans representing a significant share of the portfolio, a small number of defaults can induce large losses. This can occur without the presence of covariance, as a small number of defaults can occur randomly at the same time due to unrelated causes. Accordingly, the analysis of name concentrations differs from the analysis of other risk factors that all depend on covariance.

Close connections

If guarantee holders or borrowers have close financial or legal connections with one another, there is a risk that a default by one guarantee holder or borrower will lead to the other also failing to fulfil its commitment. Examples of such connections are when a number of companies belong to the same corporate group or are part of the same supplier chain. In this way, close connections give rise to direct covariance that can lead to clusters of losses.

Concentrations in a particular sector or geographic region

Indirect covariance can arise in different sectors – for example, industries or geographic regions. This occurs because the creditworthiness of guarantee holders and borrowers in one sector is affected by the same underlying factors, such as demand for a product that is manufactured by another company in the same sector. A negative shock, such as a drop in demand, can give rise to indirect covariance between companies within a sector and lead to clusters of losses.

“Sectoral concentration” refers to low diversification regarding guarantee holders’ and borrowers’ affiliation to a particular industry. This can occur because either the portfolio is exposed to only a few industries or because some individual ones represent a significant share of the portfolio.

Geographic concentrations entail that guarantee holders and borrowers in the same geographic region are affected simultaneously by negative economic changes, such as a downturn or changes in currencies or interest rates. Negative shocks can then lead to indirect covariance that gives rise to clusters of losses.

Credit risks in the regular portfolio

The Debt Office considers the risk of large losses in the regular portfolio to be low. Large parts of the portfolio have relatively good creditworthiness, and the exposure to commitments with very high credit risk is small. There are significant concentrations in the portfolio, but, the risk of large losses arising among them is assessed to be low. Otherwise, the portfolio is well-diversified across many geographic areas and sectors.

The regular portfolio

This section analyses the risk of major credit losses in the regular portfolio. In accordance with the analysis' delimitations presented in Appendix 2, the portfolio amounted to SEK 595 billion as at 31 December 2018, compared with SEK 569 billion at the end of the preceding year.⁷ The portfolio is divided into slightly more than 3,000 guarantees and approximately 1.5 million loans. It contains:

- guarantees and loans managed in accordance with the central government guarantee and lending model (see Appendix 1)
- student loans issued under the student aid system
- callable capital subscribed to various international financial institutions of which Sweden is a member

In addition to this risk analysis, the Debt Office has made quantitative calculations for the guarantees in the regular portfolio, using a portfolio model described in detail in Appendix 4. The results, which indicate that the risk is lower than last year, are still considered to be in line with the conclusions presented in the report.

The structure of the section follows the analytical framework. Based on the identified risk factors, an analysis is first made of the portfolio's sensitivity to the general economic environment (systemic risk). Thereafter, the risk of large losses arising from concentrations in the portfolio is analysed.

⁷ An in-depth account of the amounts dealt with in the risk analysis is provided in Appendix 3.

Commitments in the regular portfolio

Tables 3 to 7 show the total size of central government's guarantees and loans in the regular portfolio as at 31 December 2017 and 2018, respectively. At year-end 2018, the regular portfolio amounted to SEK 595 billion, compared with SEK 569 billion the preceding year.

Table 3. Housing guarantees

SEK million	31/12/2017	31/12/2018
Housing credit guarantees	2,786	3,096
Acquisition guarantees	0	0
Total	2,786	3,096

Boverket (the National Board of Housing, Building and Planning) issues, administrates and reports on central government housing guarantees.

Table 4. Export guarantees

SEK million	31/12/2017	31/12/2018
Export credit guarantees	181,485	193,295

EKN (The Swedish Export Credits Guarantee Board), provides government export guarantees to promote Swedish export and the internationalisation of Swedish companies.

Table 5. Development and foreign aid guarantees and credit

SEK million	31/12/2017	31/12/2018
Development credit guarantees	893	803
Independent guarantees	4,011	4,395
Total	4,904	5,198

Within the framework of Swedish foreign aid and development cooperation, there are several guarantees and loans managed by Sida (the Swedish International Development Cooperation Agency).

Table 6. Student loans

SEK million	31/12/2017	31/12/2018
Student loans	215,292	221,243

A large part of the regular portfolio consists of student loans that are granted and managed by CSN (the Swedish Board of Student Finance).

Other

Central government also issues guarantees and loans for, among other things, infrastructure projects, commitments linked to the state's role as owners in various companies, membership in international financial institutions, and research and technological development (RTD) investments (see Table 7).

Table 7. Other commitments managed by the Debt Office and the Government Offices of Sweden included in the regular portfolio

SEK million	31/12/2017	31/12/2018
Credit guarantees within infrastructure	17,309	18,313
International commitments	3,556	3,355 ¹
Base fund commitments	405	405
Callable capital	133,457	140,822
Pension guarantees	8,376	7,969
Other credit guarantees	9	8
Lending to other governments	0	
Lending within infrastructure	957	911
Lending to RTD	117	95
Other lending	17	137
Total	164,201	172,015

¹ The guarantee for the European Investment Bank's lending in regard to the Lomé IV and Cotonou agreements is excluded until it has been incorporated into the analysis. The undertaking amounted to SEK 1,155 million as at 31 December 2018. This does not affect the conclusions in the analysis.

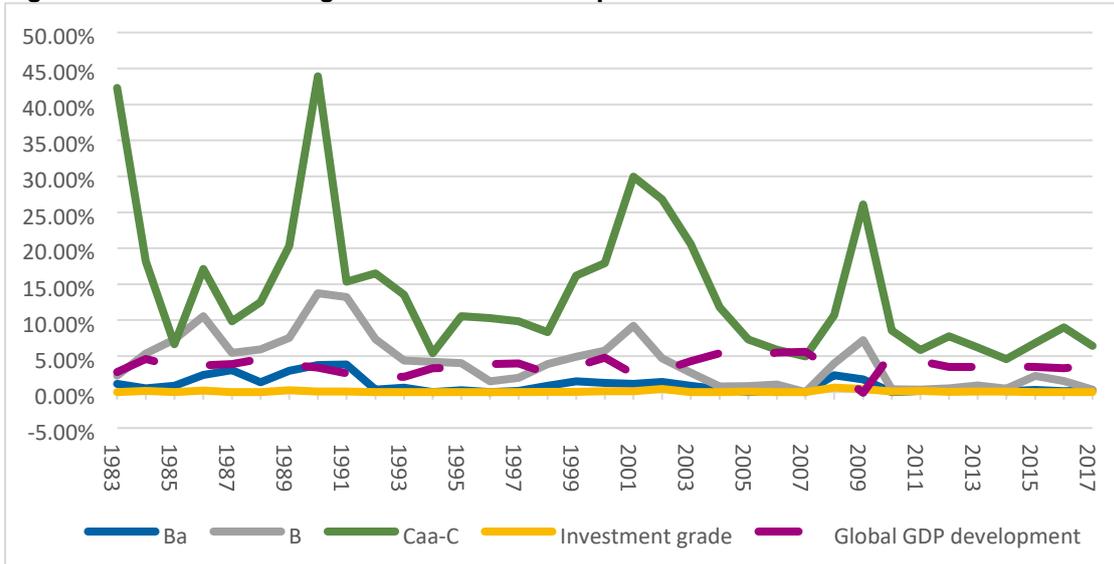
Limited sensitivity to economic downturns

Changes in the general economic environment (state of the economy) constitute a risk factor to which few or no guarantee holders or borrowers are immune. Therefore, diversification cannot remove this risk. The degree to which creditworthiness can be affected by an economic downturn varies for different categories of commitments. Whether the effect is significant enough to lead to a default also largely depends on the commitment's creditworthiness before the economic downturn occurs, beyond the magnitude of that downturn. The following section contains a review of historical relationships between economic downturns and defaults, as well as a description of the creditworthiness of the commitments in the regular portfolio.

Guarantee sensitivity to the general economic environment

Figure 2 shows variations in global GDP development and default rates among issuers who have had a rating from Moody's. The default rate among the two lowest rating categories in the figure (B and Caa-C) is significantly higher during the three economic crises that arose during the period 1983–2017, the recession in the early 1990s, the IT crash around 2001 and the financial crisis of 2007–2010. The default rate is considerably lower in the periods between these crises.

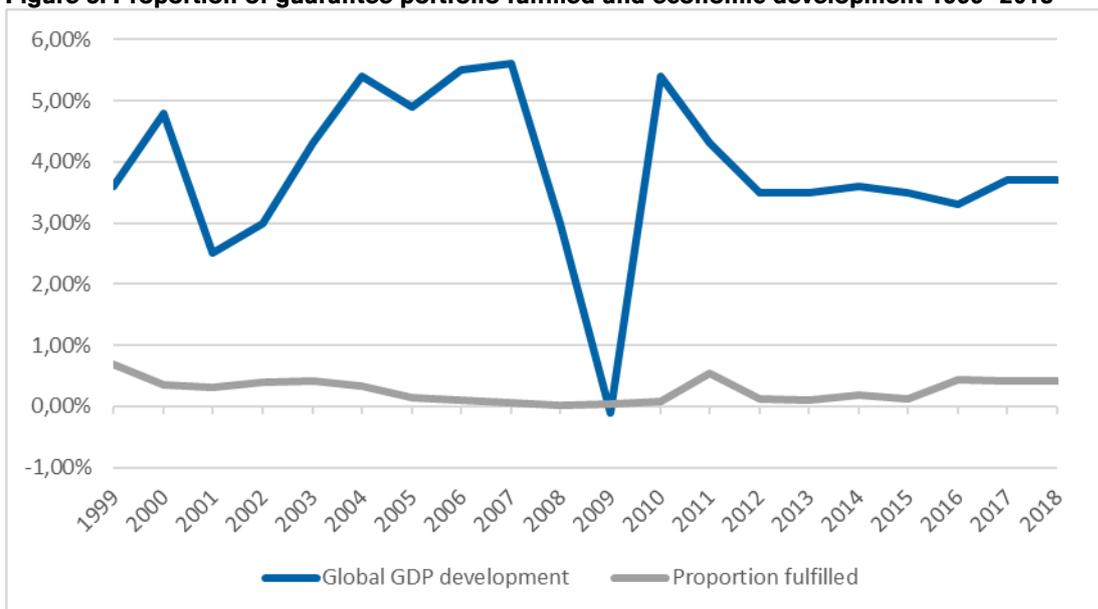
Figure 2. Default rates and global economic development 1983–2017



Moody's Annual Default Study Corporate Default and Recovery Rates 1920–2017, Exhibit 35 – Average Cumulative Issuer-Weighted Global Default Rates by Alphanumeric Rating, 1983–2016, IMF, 2018.

Figure 3 describes the proportion of the state's guarantee commitments in the regular portfolio fulfilled during the period 1999–2018. As shown in Figure 2, the economic downturns have not at all led to the same level of significant increases in the share of guarantee commitments fulfilled per year. Rather, the proportion shows a uniformity over these years. The largest annual fulfilment during the 20-year period consisted mainly of the guarantee for Saab Automobile, which in 2011 amounted to SEK 2.1 billion.

Figure 3. Proportion of guarantee portfolio fulfilled and economic development 1999–2018



Data from EKN, Sida, Boverket and the Debt Office. GDP development from IMF, 2018.

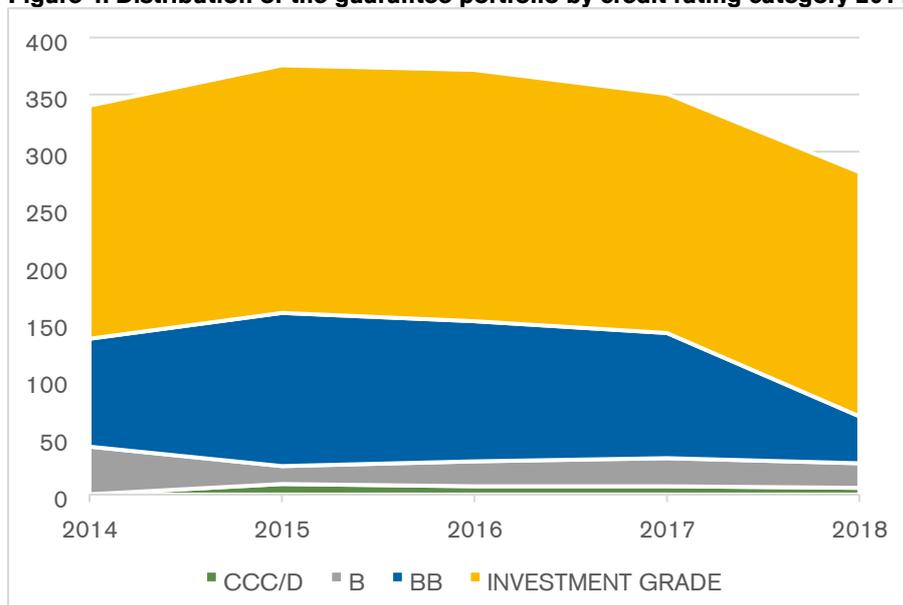
The Debt Office lacks data for aggregate fulfilments during the period before the end of the 1990s. The period before that includes, for example, the financial crisis in the beginning of the 1990s and the oil crisis of the 1970s. In the wake of the oil crisis, mainly countries in Latin America and Africa were affected by the economic consequences, which led to the debt rescheduling that took place in what was known as the Paris Club. For EKN (the Swedish Export Credits Guarantee Board), this entailed a large amount of guarantee commitments being fulfilled in the 1980s, peaking at SEK 1.7 billion in 1987.⁸ The Swedish shipbuilding crisis also resulted in guarantee losses that mostly occurred in the 1980s. This sector experienced a deep recession in Sweden during the 1970s and 1980s, and the state issued a large amount of guarantees in an attempt to promote the sector. The Debt Office's guarantees to the sector amounted to at most SEK 64 billion in 1983 and the amounts fulfilled were over SEK 4.5 billion in the most critical period of 1983–1987.

Recalculated to current monetary value, EKN's and the Debt Office's fulfilments do, in fact, amount to around SEK 20 billion over a number of years in the 1980s. However, these losses are mainly explained by both a geographic and a sectoral concentration rather than a decline in the general economy.

This historical data indicates that there has been limited sensitivity to economic cycles in the guarantee portfolio. A likely partial explanation is that the proportion of guarantees with high credit risk has been relatively small.

Since 2014, the speculative grade (BB+ or lower) exposure has been around 40 per cent. Of this 40 per cent, the exposure to the two lowest credit rating categories has only consisted of a smaller portion, which can be seen in Figure 4.

⁸ Large parts of these amounts paid out from EKN were recovered in the long term. See, for example, the fact box (p. 23) in *Central Government Guarantees and Lending – a Risk Analysis from 2016 (Reg. No. 2016/226)* for more information.

Figure 4. Distribution of the guarantee portfolio by credit rating category 2014–2018, SEK billion

The exposure in 2018 refers to the amount that can be fulfilled during the time horizon of the analysis. Otherwise, the exposure based on the total guarantee amount would have increased to approximately SEK 370 billion. For a smaller portion of the exposure, no assessment of creditworthiness is made.

The creditworthiness of the portfolio's guarantees and loans varies from year to year. If the current guarantee portfolio were to have a larger exposure to guarantee holders with low creditworthiness, compared with previous periods, the value of analysing historical defaults would then be reduced.

There is a lack of detailed information on the development of the exposures' creditworthiness over longer periods, but the Debt Office's assessment is that it has likely deteriorated over time. Rather, the inception of the central government guarantee model at the end of the 1990s is an indication that the issuance of new guarantees, and the risk management of existing ones, has become more restrictive from a risk perspective.⁹ In recent years, this guarantee model has been augmented to also include government lending. The majority of the model's requirements contribute to decision-makers' awareness of risks and to central government subsequently taking these risks into account. Other requirements are intended to ensure that the state avoids taking on certain types of undesirable risks and that the level of risk-taking is, to a reasonable extent, reduced.

Lending sensitivity to the state of the economy

Central government lending with credit risk consists mainly of a large amount of student loans corresponding to SEK 221 billion and a few loans at the Debt Office amounting to around SEK 1 billion.

For student loans, no assessment of individual borrowers' creditworthiness is made because the conditions for lending are governed by study-related criteria as opposed to economic background. The Debt Office is therefore not able to assess the sensitivity of student loans in relation to economic downturns based on the creditworthiness of the various borrowers. At an aggregated

⁹ Appendix 1 includes a description of the central government guarantee and lending model.

level, however, there is reason to presume that student loan holders have a relatively good creditworthiness, mainly in light of the comparatively high level of education, which is discussed further in upcoming sections.

There is, however, much to indicate that the size of annual write-offs of student loans does not, to any significant degree, depend on present economic conditions. The student loans mostly subject to write-offs are those held by borrowers who have reached the age at which this is done as a matter of course. The size of these depends mainly on demographic factors and the financial situation of these borrowers up until the age at which the loans can be written off automatically. In the next five years, this entails a maximum of SEK 2.3 billion in loans written off due to the borrower's age. The write-offs can also be due to the event of death, so-called qualifying studies or other exceptional reasons. However, the Debt Office's assessment is that such write-offs do not vary significantly in relation to prevailing economic conditions.

What could vary more in relation to economic conditions, however, is the proportion paid in of the annual amount CSN charges student loan holders. A reduction in this proportion does not have to lead to increased write-offs, but it has a direct effect on state cash flows and thereby the central government debt. These variations will be addressed in the following sections.

Concentration risks are likely the most relevant to analyse

The Debt Office's assessment is that the regular portfolio has limited sensitivity to the general economic environment. This assessment is primarily due to the portion of guarantees and loans with the lowest creditworthiness (B-CCC/D) being small. The historical outcome regarding losses also indicates a limited sensitivity to economic cycles. The inception of the central government guarantee model in the 1990s has also resulted in a reduced risk of many, and large, commitments being added to the portfolio. From a long-term perspective, this indicates that the portfolio's credit quality has been strengthened.

Due to the above, the Debt Office assesses that there is a low risk of large losses arising solely as a result of systemic risk. This scenario would require a very deep recession or lengthy economic crisis.

It is important to emphasise that the conclusion is not that the general economic environment lacks relevance for the risk analysis. Large losses are likely to arise in connection with a financial crisis. However, the probability that they will derive from one or more of the portfolio's concentration risks is more pertinent. This refers to a financial crisis scenario in which at the same time as the portfolio experiences an overall increase in fulfilments and cessations of payment, its largest guarantee commitments are fulfilled or a sectoral concentration is hit particularly hard. To understand and assess the risk of large losses, these particular concentrations need to be analysed in detail.

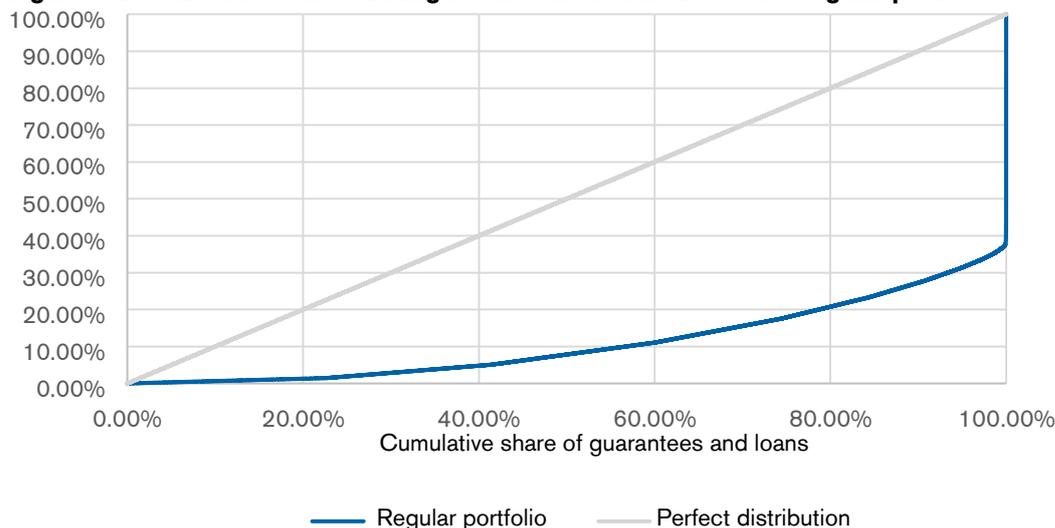
Low risk of large losses despite concentrations

The regular portfolio contains a number of large name concentrations, a sectoral concentration on the telecom sector and a geographic concentration to Sweden mainly consisting of student loans. The Debt Office considers there to be a low risk of large losses arising among the identified concentrations. Other than these concentrations, the portfolio is well-diversified.

Name concentrations – good creditworthiness in individual large commitments

The regular portfolio consists of a large number of guarantees and loans, most of which are student loans. The latter comprises 99.8 per cent of the total number of commitments but only 38 per cent of the total amount. In addition, there are a few guarantees and loans that individually account for a significant proportion of the portfolio in terms of their amount. These are called name concentrations. For a portfolio with a large amount of undertakings, the presence of name concentrations can be shown with a Lorenz curve (see Figure 5).

Figure 5. Lorenz curve demonstrating the amount distribution of the regular portfolio



Data from EKN, Sida, CSN, Boverket, and the Debt Office, as at 31 December 2018.

The share of the portfolio's total amount is shown along a y-axis and the share of the commitments in the portfolio is shown along an x-axis. The straight line in the figure represents a portfolio in which all guarantees and loans are of the same size. The more a portfolio deviates from the straight line, the more uneven the distribution of amounts of the various undertakings is. Figure 5 shows that the distribution of the regular portfolio is considerably uneven.

Individual large commitments

The 15 largest guarantees and loans are shown in Table 8. These exposures comprise 45 per cent of the total portfolio, compared with 43 per cent the previous year. The right-hand column presents the maximum fulfilment over the time horizon of the analysis. For the second-largest guarantee, there is a significant difference between the size of the undertaking and how much can be fulfilled in the next five years. This is because only a small portion of the guaranteed loans have been paid out.

In order to provide a more accurate picture, the amounts for guarantees or loans issued to the same counterparty have been consolidated. This is because a guarantee holder or borrower that is unable to honour its commitments will usually default on several of its commitments simultaneously.

Table 8. Size of the 15 largest commitments in the regular portfolio as at 31 Dec 2018, SEK billion

	Total guarantee undertakings	Number of guarantees	Fulfilment amounts ¹
Callable capital EIB	67.5	1	67.5
Credit guarantee	53.5	1	2.7
Callable capital NIB	20.3	1	20.3
Callable capital IBRD	20.2	1	20.2
Credit guarantee, Öresund Bridge Consortium ²	18.3	1	18.3
Credit guarantee	16.7	2	12.5
Credit guarantee	13.6	1	8.8
Callable capital AfDB	11.9	1	11.9
Credit guarantee	10.1	3	8.7
Other guarantee	8.2	5	2.1
Other guarantee	6.8	1	6.8
Callable capital EBRD	5.6	1	5.6
Credit guarantee	5.6	1	3.5
Callable capital IDB	4.8	1	4.8
Credit guarantee	4.5	2	2.9
Total	267.5		196.6

¹ The far-right column shows the maximum amount that can be fulfilled over the five-year time horizon of the analysis.

² The Swedish government and the Danish government jointly stand surety for all of the Öresund Bridge Consortium's loans. Therefore, the extent to which the Swedish state's undertaking is to be utilised in its entirety, or up to 50 per cent of outstanding amounts, is not given. In the table, a strict formal assessment has been made with the entire amount reported.

Data From EKN, Sida, CSN, Boverket, the Debt Office and the Government Offices.

Low credit risk in individual large commitments

In most cases, the Debt Office obtains assessments of creditworthiness and recovery given default from the agency that has issued the guarantee or loan, or from the three major international credit rating institutions: Standard & Poor's (S&P), Moody's Investors Service (Moody's) and Fitch Ratings (Fitch).

Table 9 shows the creditworthiness for the name concentrations presented in Table 8 with the exception of the callable capital, which is analysed separately in the next subsection. As shown, the credit risk for most of the individual large undertakings is minimal to limited.

Table 9. Creditworthiness assessments for individual large credit guarantees and loans as at 31 Dec 2018, SEK billion

	High expected recovery ($\geq 60\%$)	Normal expected recovery (25–60%)	Low expected recovery ($\leq 25\%$)
Minimal to limited credit risk (AAA/Aaa – BBB-/Baa3) ¹	25.1	8.7	21
Significant to very high credit risk (BB+/Ba1 – C/C) ²	-	-	-

¹ Investment grade rating² Speculative grade rating

The amount that can be fulfilled within the five-year time horizon of the analysis. Data from EKN and the Debt Office.

Most of the exposure is to guarantees and loans with minimal to limited credit risk. This indicates that there is a low risk of large losses arising from one or more larger fulfilments occurring independently of one another.

Credit risk in the callable capital individually represented by large commitments

Sweden is a member of a number of international financial institutions (multilateral development banks), which through their lending activities contribute to the objectives agreed upon by the member countries. Membership can be equated with partnership, since each member country contributes a portion of the institutions' equity. This consists of both paid-in capital and callable capital. The callable capital entitles the institutions to additional capital contributions from the member countries, up to the guaranteed amount. The size of Sweden's callable capital commitments to international financial institutions is shown in Table 10.

Table 10. Sweden's callable capital commitments to international financial institutions as at 31 Dec 2018, SEK billion

	Callable capital
European Investment Bank	67.5
Nordic Investment Bank	20.3
World Bank Group	20.3
African Development Bank	11.9
European Development Bank	5.6
Inter-American Development Bank	4.8
Asian Infrastructure Investment Bank	4.5
Asian Development Bank	4.3
Council of Europe Development Bank	1.3
Eurofima	0.4
Total	140.8

Data as at 31 December 2018 from the Government Offices of Sweden and Trafikverket (the National Transport Administration).

To date, capital has never been called in the formal sense. The international financial institutions' capital has instead been gradually increased as the member countries have paid in small amounts and adjusted the size of the callable capital amounts. The Debt Office's assessment is that the callable capital commitments would only need be fulfilled if an institution were to find itself in an extraordinary situation involving an acute need of capital infusion due to financial difficulties. In such a situation, the member countries could also opt to make capital contributions that don't involve callable capital commitments. No member country, however, has committed to any such capital contributions. Instead, this would be done through new agreements between the member countries and the institutions. The risk analysis only focuses on the capital contribution commitments to which the state has committed explicitly and which could potentially entail fulfilment.

The Debt Office considers there to be a low probability of callable capital commitments being fulfilled. This is mainly because the institutions have a high underlying credit rating, which can be explained in part by their role as preferred creditor.¹⁰ The underlying creditworthiness, as opposed to a rating, ensures the institutions' creditworthiness – provided that they have not had access to extraordinary support from the member countries. Table 11 shows that S&P's assessments of the various institutions' underlying creditworthiness lie within the range of aa to aaa. The high underlying creditworthiness is also based on the fact that the member countries have a history of contributing capital, when required, to expand the institution's lending.¹¹ Therefore, the good creditworthiness of the institutions implies a low probability of their encountering an extraordinary situation in which the member countries would be required to contribute capital, for example by fulfilling callable capital commitments.

Table 11. Creditworthiness of international financial institutions of which Sweden was a member as at 31 Dec 2018

	Underlying creditworthiness	Rating
European Investment Bank	aa+	AAA
Nordic Investment Bank	aaa	AAA
World Bank Group	aaa	AAA
African Development Bank	aa+	AAA
Inter-American Development Bank	aa+	AAA
European Development Bank	aaa	AAA
Council of Europe Development Bank	aa	AA+
Asian Development Bank	aaa	AAA
Eurofima	aa	AA+
Asian Infrastructure Investment Bank	aaa	AAA

¹⁰ The good underlying creditworthiness can also be explained by the fact that dividends are generally not distributed. NIB (Nordic Investment Bank), however, normally distributes an annual dividend of 25 per cent of profit to the member countries. In most of the other institutions, however, distributions have never occurred and they are not expected to occur in the future.

¹¹ The member countries are not obligated to make such capital contributions. Moreover, they involve small amounts that are paid in under normal circumstances.

Limited occurrence of close connections – low risk of problems spreading

The guarantee holders and borrowers in the regular portfolio have a few connections to one another that could give rise to default contagion. However, these legal relationships, which occur through participating interests and group affiliation, are small in terms of amounts. They therefore entail a low risk of large losses.

Sectoral concentrations – exposure to telecom operators

The regular portfolio consists of guarantees and loans in a number of various sectors, presented in Table 12. The most prominent sectoral concentration is on the telecom sector. This amounts to SEK 68.1 billion, or 11.5 per cent of the regular portfolio, and consists mainly of export credit guarantees linked to the sale of telecommunications equipment, for which the state's credit risk lies with the purchasers (telecom operators).

Both exposure to telecom operators in absolute terms and the sectoral concentrations' share of the regular portfolio increased compared with the previous year. This is a result of a couple of new guarantee commitments representing significant amounts that were signed in 2017 and which gave rise to exposure in 2018. These guarantees are of such a size that they also constitute individual large commitments in the regular portfolio.

Table 12 shows that only a small share of the portfolio, 25.1 per cent, can be categorised by sector affiliation. The remainder of the portfolio consists primarily of student loans (SEK 221 billion), callable capital (SEK 141 billion) and guarantees and loans for which the credit risk is directly against another state (SEK 67 billion).

Table 12. Exposure to companies in the regular portfolio by industry as at 31 Dec 2018

	SEK billion ¹	Share in per cent
Telecom	68.1 (54.8)	11.5
Transport	32.8 (31.1)	5.5
Industrial goods and metals	18.8 (12.0)	3.2
Power supply	16.2 (15.2)	2.7
Properties	10.1 (10.1)	1.7
Energy and natural resources	1.6 (1.6)	0.3
Finance	1.1 (1.1)	0.2
Wood and construction products	0.2 (0.2)	0.03
Daily consumer goods and services	0.02 (0.02)	0.004
Total	148.9 (126.1)	25.1

¹ The maximum amount that can be fulfilled within the five-year time horizon of the analysis is shown in parentheses.

Sectoral distribution based on the Global Industry Classification Standard (GICS) developed by Morgan Stanley Capital International (MSCI) och S&P. Data from EKN, Sida, CSN, Boverket, the Debt Office and the Government Offices.

Concentration of telecom operators

The Debt Office considers there to be a low risk of the sectoral concentration of telecom operators giving rise to large losses. The sector is stable, with a low probability of negative shocks that could entail clusters of losses.

The state's exposure to telecom operators consists of export credit guarantees issued for export transactions in predominantly more risk-filled countries. Many of the telecom operators with loans guaranteed by central government have a lower creditworthiness than the industry average, according to EKN's assessment. This implies that they have lower resistance to negative shocks in the sector, such as reduced demand for telecom services. The lower creditworthiness is, however, mainly attributable to the high country risk in the countries where the telecom operators are active. The companies have generally strong positions in their domestic markets, which raises the assessment of their ability to withstand negative shocks.

The creditworthiness in the regular portfolio has also improved compared with preceding years. This is the result of the two new, in monetary terms, guarantee commitments that emerged in 2018, which have shifted the portfolio's geographic distribution toward the OECD's high-income countries that are mature markets with low country risk.

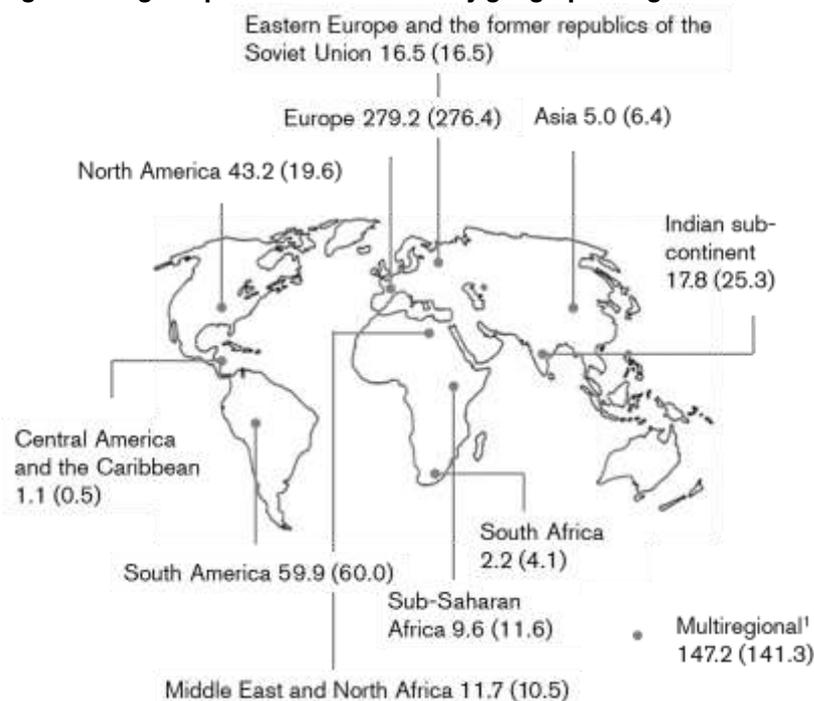
Further, the Debt Office considers there to be a lower likelihood of issued guarantees being fulfilled than what the guarantee holders' creditworthiness indicates. This is mainly due to the conditions of the guarantees, such as risk distribution, providing incentives for the lenders to avoid a fulfilment in the event of a default.

The Debt Office considers the state's opportunities for recovery after fulfilment to be normal in most cases, corresponding to a recovery rate of about 50 per cent of the fulfilled amount. However, EKN expects a lower-than-usual recovery rate for the new larger guarantee commitments.

Geographic concentrations – large proportion in Sweden

The guarantees and loans in the regular portfolio are distributed across a large number of countries, which is mainly attributable to the export credit guarantees issued by EKN and central government's commitments with international financial institutions. To a certain extent, the geographic distribution reduces the risk of large losses. Figure 6 shows the portfolio's composition in terms of geographic regions, with 2017 figures in parentheses.

Figure 6. Regular portfolio distribution by geographic region as at 31 Dec 2018, SEK billion



¹The multi-regional category includes callable capital commitments to international financial institutions. The common denominator of the commitments in this category is that they contribute to the geographic distribution of the portfolio.

The categories correspond to those used by Moody's to analyse geographic concentrations in the structured products. Moody's (2015) – Moody's Approach to Rating Corporate Synthetic Collateralised Debt Obligations, Exhibit 9: Classification of Countries by Contagion Region. Figures in parentheses refer to 2017. Data From EKN, Sida, CSN, Boverket, the Debt Office and the Government Offices.

High geographic concentration to Sweden

The geographic distribution of the portfolio in Figure 6 is supplemented in Table 13 with data on the ten largest exposures to individual countries. The latter also describes how external assessors view the country risk in these countries. The country risk takes the degree of economic and political stability into account and can be considered an indicator of the risk of negative financial shocks.¹²

Table 13 shows that there is a clear geographic concentration to Sweden, where guarantees and lending represent over 40 per cent of the portfolio.

¹² The country risk of a particular country is not be confused with a government's creditworthiness. These two measures of risk focus mainly on the same risk factors, but there are also key differences between them.

Table 13. The ten largest country exposures in the regular portfolio as at 31 Dec 2018, SEK billion

	Country risk ¹	Country risk rating ²	Amount	Share
Sweden	0	Aaa/Aaa	236.6	39.8
Brasil	4	A3/Ba1	55.8	9.4
USA	0	Aaa/Aaa	41.0	6.9
Spain	0	Aa1/Aa1	11.9	2.0
Denmark	0	Aaa/Aaa	10.2	1.7
India	3	A1/Baa1	9.3	1.6
Russia	4	Baa1/Baa2	8.5	1.4
Pakistan	7	Ba3/B2	7.5	1.3
Turkey	5	Ba1/Ba2	5.1	0.9
Italy	0	Aa3/Aa3	5.1	0.8
Total			391.1	65.8

¹ Refers to EKN's country risk classification, in which category 0 represents the lowest risk and category 7 the highest risk.

² Refers to Moody's "country ceiling" for debt instruments in local and foreign currencies, respectively. Moody's (2019), Sovereign and Supranational Rating List.

Low risk of large losses for Swedish student loans

The Debt Office considers there to be a low risk of large losses for student loans resulting from the concentration to Sweden. The largest part of the concentration, 87 per cent, corresponding to SEK 206 billion, consists of student loans to borrowers residing in Sweden.

The student loans have been issued under two distinct systems – student loans and annuity loans. Both types of loans have similar characteristics, such as long maturities (on average 25 years or more) and “soft” conditions involving the option to reduce the borrower’s annual payments during periods of lower income. The student loans can therefore be compared with conditional loans, for which the extent and rate of repayment to the state depends on the borrower’s future income growth.

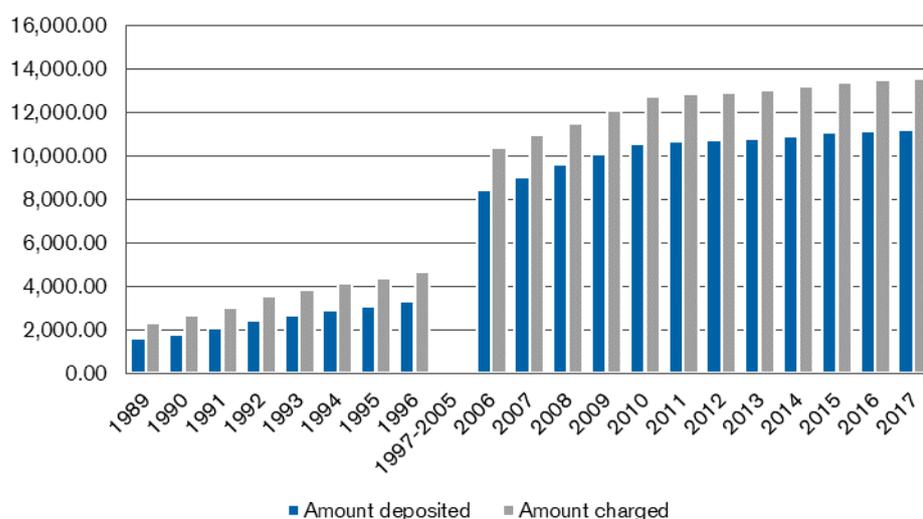
The Debt Office's assessment is that the risk of large write-offs is low. Write-offs due to age shall not exceed SEK 2.3 billion during the time horizon of the analysis, given the state of the stock of loans. Other significant reasons for write-offs, such as deaths and qualifying studies, are not deemed to have a significant effect on the economic development in the country. Therefore, there is a low likelihood of these reaching significant amounts.

Low likelihood of significant deterioration in cash flow from student loans

The analysis of large write-offs is mainly relevant because they have a negative effect on central government net lending. However, only analysing the risk of write-offs provides a limited picture of how student loans can affect government finances. Doing so does not address the effect that reduced payments on loans during certain periods has on central government cash flows. Given the size of the annual deposits, a drastic reduction of payments on student loans would have distinctly negative effects on the state's cash flow. Therefore, although reduced payments are not classified

as losses, the risk is relevant to analyse. Figure 7 shows both the size of the amounts deposited and charged for student loans annually.

Figure 7. Amounts deposited and charged annually, SEK million



Source: CSN. No data is available for 1997-2005

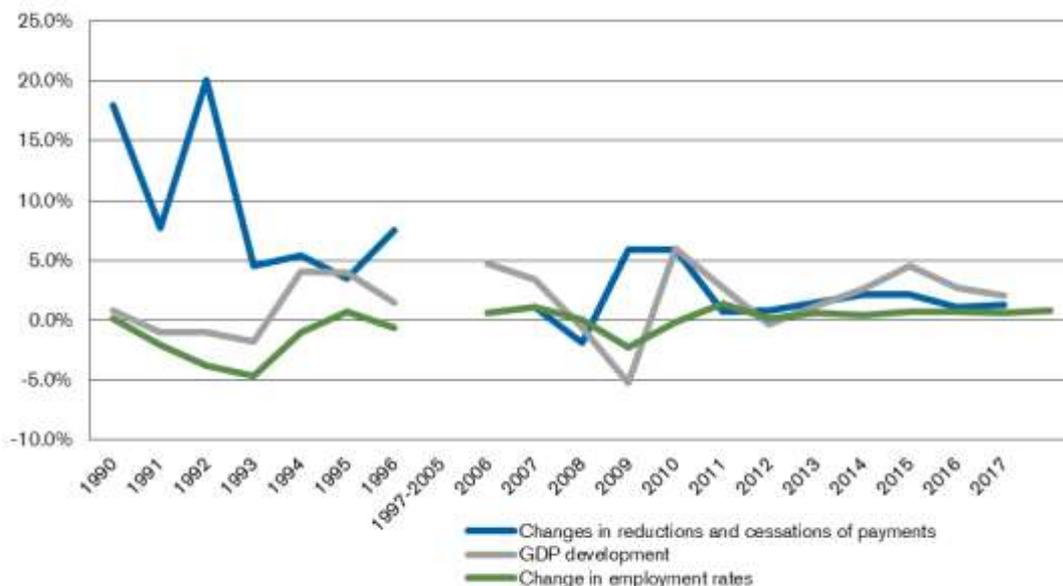
The amount charged has increased on average by SEK 560 million per year between 1989 and 2017. The amount deposited has increased each year by SEK 480 million per year. The increase over time is due to growth in the portfolio of student loans. The fact that the amount charged increased by more than the amount paid in has resulted in the difference between them increasing by around SEK 80 million per year on average, even if the difference measured in per cent declined from around 30 per cent in 1989–1996 to almost 20 per cent in 2006–2017.

The difference between charged and deposited annual amounts is mainly due to reductions of the annual amount and the amounts that the borrowers were obligated to pay but still failed to pay (cessation of payments). A reduction means that borrowers will postpone repayment, even as it is understood that they are to pay back the loan in full. If a reduction is made for annuity loans, corresponding amounts are thereby added to future payments. Decisions on reduction can be made several years in a row. If a debt remains due to a reduction, it is written off when the borrower becomes eligible for a write-off based on age. The write-off does not necessarily have to correspond to the sum of all reductions and cessations of payments. A reduction of the “same lent krona” can be made several years in a row but can only be written off once. An increase in reductions and cessations of payment, however, entails a corresponding increase in the central government debt and budget balance, all else being equal.

The fact that reductions and cessations of payments increase over time in terms of volume is, as described, a result of increased lending by CSN. However, if the increases are particularly high during certain periods, the possibility of payment is lower than usual during these periods. All else being equal, this leads to poorer cash flows for the state. Figure 8 shows that reductions and cessations of payments increased substantially around 2009 in connection with the financial crisis,

compared with subsequent years. The changes in the reductions and cessations of payments varied more during 1990–1996 than during 2007–2017, but the variations do not appear to be the result of variations in GDP development or changes in the rate of employment.

Figure 8. Changes in reductions and cessations of payments 1990–2017



Student loan information from CSN. Basis for 1997-2005 data is missing. GDP development information from IMF. Basis for calculating the rate of employment from SCB (population and employment, ages 16-64).

As a proportion of the total amount paid in, even the most significant increases during the years in focus were relatively limited. The increases were at most approximately SEK 200 million annually, compared with the total amounts deposited, which were approximately SEK 2–3 billion per year during 1990–1996 and around SEK 10 billion per year during 2006–2017. A likely explanation for the fact that the reductions and cessations of payments did not increase more during the financial crises in Sweden between 1989 and 2017 is that, overall, student borrowers had good creditworthiness and thereby the capacity to pay despite the crises. The borrowers' relatively high level of education reduces the risk of unemployment, and the existence of unemployment insurance and other insurance systems mitigates the effect of unemployment on borrowers' incomes. Student loans are well-diversified because the borrowers are employed across a variety of sectors. This reduces the risk of payments on student loans sharply decreasing if only individual sectors are affected by financial shocks.

In a scenario in which many student borrowers lose their jobs, the recent years' declining rate of people affiliated to unemployment insurance would entail a sharper increase in reductions and cessations of payments than in 1989–2017.¹³ Another factor that can entail sharper increases,

¹³[13] Statistics Sweden (2016) <http://www.scb.se/> 14 February 2018. Inspektionen för arbetslöshetsförsäkringen (2016) <http://www.iaf.se/Statistik/Statistikdatabasen/> 14 February 2018.

primarily in cessations of payments, than previously in an economic crisis, is whether many borrowers are at a significantly higher level of indebtedness.

Currently, annual reductions and cessations of payments correspond to almost SEK 2.4 billion. This means that if the rate of increase in the reductions and cessations of payment would be at the same high level as in 1992, i.e. 20 per cent, they would increase by an average of over SEK 700 million per year in the next five years. This corresponds to a total of SEK 3.5 billion over the five-year period. Thus, even in such a negative scenario, the overall effect of these increases on central government cash flow would thereby be relatively limited compared with the losses that the risk analysis otherwise focuses on – i.e. losses of at least SEK 20 billion.

Consolidated assessment of risk factors

Based on the analysis of identified risk factors, the Debt Office estimates that, overall, the risk of large losses occurring in the regular portfolio is low.

The portfolio's sensitivity to economic downturns is judged to be limited, although a very deep and lengthy recession could cause large losses. This is especially true if such a recession were to strike one or more of the concentrations in the portfolio particularly hard at the same time as the losses in the rest of the portfolio were higher than normal. Significant parts of the portfolio have relatively good creditworthiness, and the share of guarantees and loans with low creditworthiness is low. Existing portfolio concentrations are currently only considered to give rise to a low level of risk.

What would primarily lead to a higher risk of large losses, however, is a significant increase in commitments with very high credit risk (B to C). This is especially true if such commitments were to be particularly sensitive to economic fluctuations and/or active in a sector or geographic area undergoing significant transition.¹⁴

¹⁴ *Examples of losses arising in the wake of major transitional periods include guarantees to the Swedish shipbuilding industry in the 1980s, export credit guarantees to, among others, Latin America during the same period and the guarantee to Saab Automobile after the most recent financial crisis.*

Credit risks in the deposit insurance scheme

The Debt Office considers the risk of large losses in connection with deposit insurance to be moderate. For the major banks and other institutions deemed systemically important, the deposit insurance scheme may need to be utilised to provide consumer protection in resolution. These institutions often have a debt structure with an extensive amount of liabilities with lower priority rights than those of guaranteed deposits, which means that very significant losses would have to arise before for the deposit insurance would need to be activated. In addition, the systemically important institutions have high creditworthiness and the risk is therefore deemed low. If a non-systemically important institution were to default, the deposit insurance commitment would be fulfilled by the state paying compensation directly to the depositors and receiving a claim on the institution. Due to their smaller size, more non-systemically important institutions would have to default before such fulfilments would lead to large losses. The Debt Office considers the risk of that occurring to be moderate.

Commitment to consumer protection and financial stability

Deposit insurance is a form of consumer protection for money in accounts at banks, credit market companies and securities companies (“institutions”).¹⁵ The maximum compensation amount provided under the deposit guarantee is SEK 950,000 per person and institution. Protecting account balances allows depositors to feel secure. This reduces the risk of many depositors withdrawing their funds at the same time, leading to bank runs, which could threaten financial stability.

The deposit guarantee is the single largest state guarantee in terms of reported amount. As at 31 December 2017, the total guaranteed deposits amounted to SEK 2,280 billion distributed among 107 institutions.¹⁶

¹⁵ Most institutions authorised to accept deposits from the public are covered by the deposit guarantee, in accordance with the Deposit Insurance Act (1995:1571). There are exceptions, however, such as so-called deposit-taking companies.

¹⁶ Guaranteed deposits are reported once a year, and the volumes as at 31 December 2018 had not yet been received at the time of this report. The amount is therefore not adjusted for changes in 2018.

Different function depending on type of crisis management

The purpose of the deposit insurance scheme is the same in all situations, but it functions differently depending on whether a failing institution is placed into bankruptcy or resolution.

If an institution with guaranteed deposits encounters problems that lead to bankruptcy or if Finansinspektionen (the Swedish Financial Supervisory Authority) decides that the guarantee should be applied, there is a “direct fulfilment” of the deposit insurance commitment.¹⁷ This means that the state pays out compensation to the institutions’ depositors and acquires the depositors’ claims on the institutions placed into bankruptcy.

If a failing institution is deemed systemically important¹⁸ and thereby to be managed through resolution, the state takes over control (not ownership) of the institution in order to restructure it or wind it up in an orderly manner.¹⁹ The main principle of resolution is that the shareholders and lenders have their claims written down and/or converted to share capital from a previously determined order of priority. This process is called a bail-in.

Guaranteed deposits, however, are exempt from bail-in. Any losses or recapitalisation requirements for which the depositors would have been responsible, had they not been exempted, are covered instead by the deposit insurance fund. The fund can contribute a maximum of SEK 36 billion (see the fact box Payments from the deposit insurance fund). This is done through an injection on the asset side of the institution’s balance sheet.

Based on these different modes of functioning, the risk analysis is divided into two parts:

- Direct fulfilment
- Deposit insurance contributions to resolution

In accordance with this division, the institutions have been divided into different categories.

¹⁷ Section 8 of the Deposit Insurance Act (1995:1571) states that decisions by FI are based on the circumstance that a deposit fallen due for payment has not been repaid by the institution and that the inability to pay is due to the institution’s financial situation and not merely temporary.

¹⁸ “Systemically important” refers in this report to the Debt Office’s classification of an institution as having operations that, were they to cease, would likely lead to a serious disturbance to the financial system.

¹⁹ Resolution is a restructuring procedure for institutions that cannot be wound up through bankruptcy, as this would create serious disturbances to the financial system. The purpose of resolution is to give the state an opportunity to maintain the institution’s critical functions (accounts, payment processing, access to capital, etc.) without taxpayers having to bear the costs. As with bankruptcy, the intention is for shareholders and lenders to bear the costs of an institution’s failure. The Debt Office is a resolution authority responsible for both the preparatory work and management of institutions in crisis. Resolution is regulated under the Resolution Act (2015:1016) and the Resolution Ordinance (2015:1034). These are based on EU Directive 2014/59 and the Commission Delegated Regulation (EU) 2016/778.

Different categories of institutions

The institutions affected by the analysis of the deposit insurance scheme have been divided into four categories, given that the different modes of functioning for the deposit insurance best determine the structure of the analysis (see Table 14). The institutions expected to be subject to resolution are placed in categories 1 and 2. The risk analysis is based on the assumption that institutions have fully complied with the requirements stipulated by the Debt Office in its resolution planning. This includes the principle that liabilities must be subordinated in order to meet MREL.²⁰ Institutions that are instead considered subject to direct fulfilment in the event of default are included in Categories 3 and 4. The division is based on the Debt Office's resolution planning decision from December 2018, entailing that eight deposit-taking institutions conduct activities deemed critical to the financial system.²¹ These decisions are based on an assessment of whether the individual institutions can be managed through bankruptcy/winding up or if resolution measures would be necessary. If the conditions change, however, the decision may be reconsidered. For example, at default, an institution in categories 1 or 2 could be deemed non-systemically important and thus subject to direct fulfilment instead of resolution. Conversely, it could be judged necessary to employ resolution for institutions in categories 3 and 4 – for example, in a situation involving a more widespread and general threat to financial stability. This circumstance does not appreciably affect the conclusions of the analysis.

²⁰ For further explanation of MREL, see the fact box on page 41.

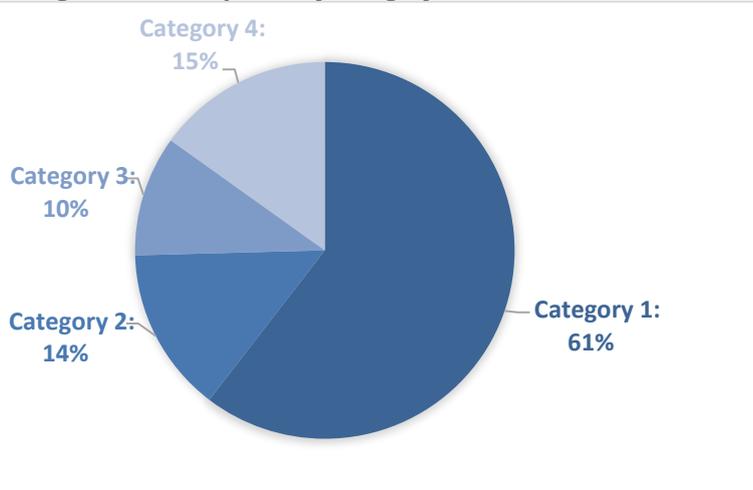
²¹ SEK (Swedish Export Credit Corporation) is also subject to the same decision by the Debt Office; however, this institution has no guaranteed deposits.

Table 14. Categories of institutions according to the analysis in this report

Institution categories	Resolution	Bankruptcy/liquidation (direct fulfilment)
Category 1: Major banks that, in the event of a crisis, cannot be managed by means of bankruptcy proceedings.	- Skandinaviska Enskilda Banken - Svenska Handelsbanken - Swedbank	
Category 2: Other institutions that, like the major banks, are not deemed suitable for bankruptcy.	- Landshypotek Bank - Länsförsäkringar Bank - SBAB - Skandiabanken - Sparbanken Skåne	
Category 3: Institutions considered potentially subject to direct fulfilment of the deposit insurance scheme and that have guaranteed deposits of more than SEK 10 billion.		11 institutions.
Category 4: Institutions considered potentially subject to direct fulfilment of the deposit insurance scheme and that have guaranteed deposits amounting to less than SEK 10 billion.		Approx. 90 institutions.

As indicated by Figure 9, the guaranteed deposits are unevenly distributed among the various institutions. The four major banks (category 1) account for 61 per cent while the smallest institutions, in category 4 – approximately 90 institutions – account for only 15 per cent combined.

Figure 9. Total guaranteed deposits by category as at 31 Dec 2017



Due to Nordea's change of domicile to Finland in 2018, the bank's deposits have been excluded from the figure.

Distinguishing factors for the deposit insurance

The initial analytical framework describes different risk factors and that there are essentially two types of events that could cause large losses.

The first such event is if individual, or a small number of, sufficiently large institutions (name concentrations), were to fail independently of one another and thus, by their size alone, generate large losses. There are significant name concentrations within the first two categories of institutions. There are also smaller name concentrations in category 3 that include the ten institutions deemed potentially subject to direct fulfilment and that have guaranteed deposits in excess of SEK 10 billion.

The other such event is if the majority of the institutions were to fail, together causing large losses. A high degree of default could almost exclusively be attributed to them having been in some way dependent on one other – that is, that they covaried. Covariance can be direct or indirect (see Figure 1).

The fact that different groups of institutions have similar business models can also generate default covariance. If institutions have similar lending portfolios, there is an increased probability of large credit losses within a specific area of lending affecting several institutions. An example of a business model shared by several institutions is the issuance of credit to parties with lower creditworthiness. In the event of a persistent recession, for example, this customer group is more likely to have payment problems. When this group is unable to pay interest and amortisation payments, several institutions thereby suffer higher credit losses. In the worst case, this could lead to default.

Another risk factor for the financial system is that the institutions are, to varying degrees, interconnected. One such connection is the occurrence of financial connections between certain institutions. The institutions have varying degrees of credit exposures to one another in the form of both secured and unsecured lending. (Just before Nordea's change of domicile, for example, the four major banks' exposures to one another, including securities, derivatives and interbank loans, amounted to 40 per cent of their Common Equity Tier 1 capital.)^{22 23} This means that if an institution suffers from financial problems, these will spread to other institutions through their ownership of securities in, and lending to, the first institution. If the institutions affected by these spillover effects fail to manage the losses that occur, there may be additional spillover effects.

The fact that these institutions are so interconnected also entails the risk that one institution's credibility problems will spread to another. The spread of credibility problems would most likely affect institutions with a similar risk profile or that are active in the same markets. An example of this was when money laundering accusations in 2018 and 2019 towards a couple of banks operating in the Baltic market also led to suspicions of other institutions with activities in the same market. The fact that credibility issues can spread in this way could exacerbate problems for an institution that is already in a difficult situation for other reasons.

²² Tier 1 capital is equity excluding proposed dividend, deferred tax assets and intangible assets (for example goodwill). Tier 1 capital may also include certain types of subordinated loans. Common Equity Tier 1 capital is, in turn, Tier 1 capital less capital contributions and reserves that may be included in own funds in accordance with Chapter 3, Section 4 of the Capital Adequacy and Large Exposures Act (2006:1371).

²³ Riksbank (2018). *Financial Stability 2018:2*. p.13.

As with mainly student loans in the regular portfolio, the deposit insurance also involves a geographic concentration to Sweden, even if many major institutions have significant operations in other countries. An overall deterioration of the state of the Swedish economy would thereby increase the risk of direct fulfilments of the deposit insurance commitment.

Moderate risk of direct fulfilments causing large losses

As previously explained, direct fulfilment only applies to institutions in categories 3 and 4, because institutions in categories 1 and 2 are expected to be managed through resolution. The risk that arises as the result of direct fulfilments of the deposit insurance commitment would most likely be due to covariance leading to the failure of several institutions. It is more likely that large losses would arise as a result of independent defaults of individual large institutions.

Low risk of large losses resulting from name concentrations alone

The risk that the name concentrations in category 3 would lead to large losses depends mainly on the likelihood of default among these individual large institutions and the size of their guaranteed deposits. As the institutions in category 4 each have a smaller amount of guaranteed deposits, the risk of name concentrations in this category leading to large losses is considerably lower. Therefore, this section focuses on category 3.

Altogether, the eleven institutions in category 3 have around SEK 159 billion in guaranteed deposits, and the distribution among them is relatively even. Consequently, several institutions would have to fail for large losses to arise in the deposit insurance. The likelihood of several mutually independent defaults arising over a limited period of time is significantly lower than the likelihood of an individual default.

It should be noted that the likelihood of a direct fulfilment of the deposit insurance commitment is lower than the likelihood of an institution failing. This is mainly because some of the problems that could lead to a default would not necessarily result in a direct fulfilment. An example of this is if Finansinspektionen were to revoke an institution's authorisation (which would be classified as a default) and the institution were subsequently wound up through a private-sector solution in which another actor acquired all or parts of the institution (including its stock of deposits).²⁴

The likelihood of default can be estimated by assessing an institution's creditworthiness, for example, by means of a credit rating. This has been used in the analysis of those institutions with a public rating. For some of the institutions that lack such a rating, the Debt Office has made its own rating assessment based on the methodology of the international credit rating institutions.²⁵

Some of the institutions in category 3 have relatively weak creditworthiness. The probability of such institutions failing is not insignificant. The Debt Office's assessment is that there is a low risk of large losses arising as a result of a number of mutually independent defaults among these institutions. Even if the institutions generally have a lower rating than the institutions in categories 1 and 2, there is a limited number with relatively weak creditworthiness.

²⁴ An example of such a case is when HQ Bank lost its authorisation in 2010 and was acquired by Carnegie Investment Bank.

²⁵ Moody's (2018). *Rating Methodology: Banks*. S&P (2011). *Banks. Rating Methodology and Assumptions*.

Moderate risk of large losses due to covariance of defaults

The analysis of covariance of defaults includes both categories 3 and 4. Category 4 consists of approximately 90 smaller institutions that together have guaranteed deposits totalling approximately SEK 230 billion. Altogether, both categories amount to about a hundred institutions with a total volume of almost SEK 390 billion.

As previously mentioned, the financial sector is characterised by a number of risk factors that can contribute to covariance of defaults, which also applies to the institutions in categories 3 and 4. The vast majority have either all or parts of their operations in Sweden, i.e., a geographic concentration. Many are savings banks with similar business models in the form of deposits and lending at the local level, even if these have a large geographic distribution across the county.

In the Debt Office's estimate, the most distinctive risk factor is a number of institutions with a significant part of their lending to the customer segment with relatively low creditworthiness. This business model entails an enhanced risk of credit losses in the institutions because the creditworthiness of borrowers in similar sectors also tends to be affected by the same background factors, such as the general economic environment. In total, this group includes around 15–20 institutions with guaranteed deposits, which amounts to over SEK 110 billion.

A shock to the economy, for example a downturn that leads to a sharp increase in credit losses in the financial sector, could cause large losses for this group. This mainly applies to those institutions in the group that have low creditworthiness (a speculative grade rating), which the Debt Office deems to be the majority. However, in regard to the aggregate limited volumes involved, fulfilments would need to be made for at least two to three of these institutions in order for large losses to occur. The Debt Office judges this risk to be moderate. The risk of significantly greater losses than SEK 20 billion arising is deemed to be low. This is due to the limited volumes for each institution and the fact that an even larger number would thereby have to fail.

Lower recovery with direct fulfilment than in resolution

The Debt Office's assessment is that recovery of paid-out funds in most cases is lower with direct fulfilment of the deposit insurance commitment than when deposit insurance is utilised in resolution. The degree of recovery can, however, vary widely between compensation cases.

The degree of recovery is based on these institutions largely being funded by deposits, which leads to a capital structure usually involving a limited volume of liabilities that are written down before guaranteed deposits. The positive effect of the higher right of priority for guaranteed deposits is thus limited for the institutions deemed potentially subject to direct fulfilment.

At the same time, it should be pointed out that larger fulfilments, which erode available funds in the deposit insurance fund, lead to an increase in future fees paid by the institutions that are affiliated to the deposit insurance scheme (see the box Payments from the deposit insurance fund). This retroactive fee differs from how fees are charged for the regular portfolio and contributes to the entire loss being borne by the institutions in the long term. However, depending on the situation that arises, this long-term cost coverage may be beyond the time perspective in this risk analysis.

Large share of deposits affect recovery rate

In conjunction with the crisis management directive being transposed into Swedish law in 2016, guaranteed deposits were assigned a general right of priority.²⁶ This entails a preferential claim on any distributions from a bankruptcy in relation to claims having no priority right (so-called non-preferential claims). The preferential order must also be respected in a resolution.

The prioritised position of guaranteed deposits entails a lower risk of losses for the deposit insurance scheme both in the case of direct fulfilment and resolution. However, this positive effect is judged to be limited for institutions that finance their operations extensively via deposits from the general public (with the majority of those deposits protected by deposit insurance). This is because these institutions lack a large quantity of claims with lower priority rights than those of guaranteed deposits in bankruptcy.

While the capital structure of the institutions presumed to be the subject of direct fulfilments (categories 3 and 4) shows some differences, the share of deposits is significantly higher overall than in the institutions in categories 1 and 2. Some institutions fund their activities almost exclusively with deposits; others employ more diversified financing that also includes non-preferential capital market borrowing. The share of deposits covered by the deposit insurance is, on average, 81 per cent for institutions in category 3²⁷. For several institutions, however, that share is over 90 per cent.²⁸

²⁶ Section 13 a of the Rights of Priority Act (1970:979). The change went into effect 1 February 2016.

²⁷ As a result of the large number of institutions in category 4, only an average has been calculated for category 3.

²⁸ Certain types of debt have the same priority rights. These include non-preferential debt such as short-term capital market borrowing, interbank borrowing, bond loans and derivatives.

Figure 10. The balance sheet for two types of institutions considered potentially subject to direct fulfilment as at 31 Dec 2017

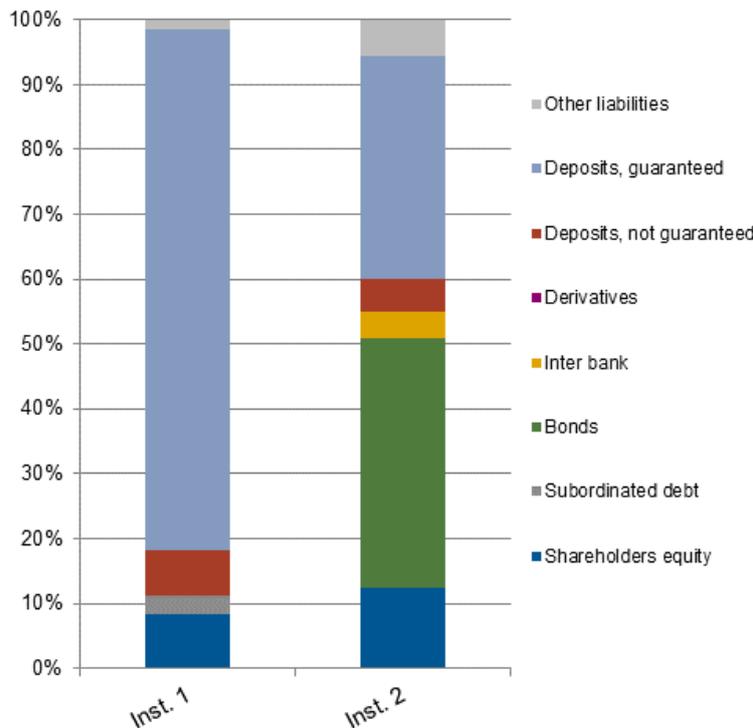


Figure 10 illustrates the two institutions in category 3 that are the extremes in regard to capital structure. Institution 1 is the one that finances its activities to the largest extent through deposits, and institution 2 is the one with the largest share of non-preferential capital market borrowing. The capital structure is shown on the basis of the order of priority rights that applies in bankruptcy.

An institution’s capital structure could change if financial problems arise, which would lead to an increased risk of losses under the deposit insurance scheme. Such dynamic capital structure changes are explained in more detail in the next section on the deposit insurance scheme’s contribution in resolution.

Low risk of large losses for deposit insurance in resolution

The Debt Office’s assessment is that there is a low risk of large losses resulting from potential deposit insurance contributions to resolution. The institutions with the largest deposits have good creditworthiness, entailing a low likelihood of default and consequent resolution intervention. If resolution intervention were nevertheless required, there would have to be significant losses in the institutions to merit activating the deposit insurance scheme. In most cases, there would be good potential for recovering funds paid out under the scheme.

The analysis covers the institutions that would presumably be subject to resolution if they were to fail. These include the four major banks (category 1) and five other deposit-taking institutions (category 2).

Probability of resolution intervention

The probability of resolution intervention depends on the likelihood of an institution failing, which is in turn based on the institution's underlying creditworthiness.²⁹

The creditworthiness of the institutions in categories 1 and 2 is good. All institutions have a rating that is A3 or higher according to the Moody's scale so all institutions have an investment grade rating, as shown in Table 15. This implies a low probability of default and resolution intervention.

Table 15.

	No. of institutions	Probability of default for individual institutions ¹ per cent
Minimal to limited credit risk (AAA/Aaa – BBB-/Baa3) ²	8	0.1-2.1
Significant to high credit risk (BB+/Ba ¹ – C/C) ³	-	-

¹ For a five-year time horizon.

² Investment grade rating.

³ Speculative grade rating.

Moody's Annual Default Study Corporate Default and Recovery Rates 1920–2017, Exhibit 35 – Average Cumulative Issuer-Weighted Global Default Rates by Alphanumeric Rating, 1983–2016.

Likelihood of deposit insurance being utilised in resolution

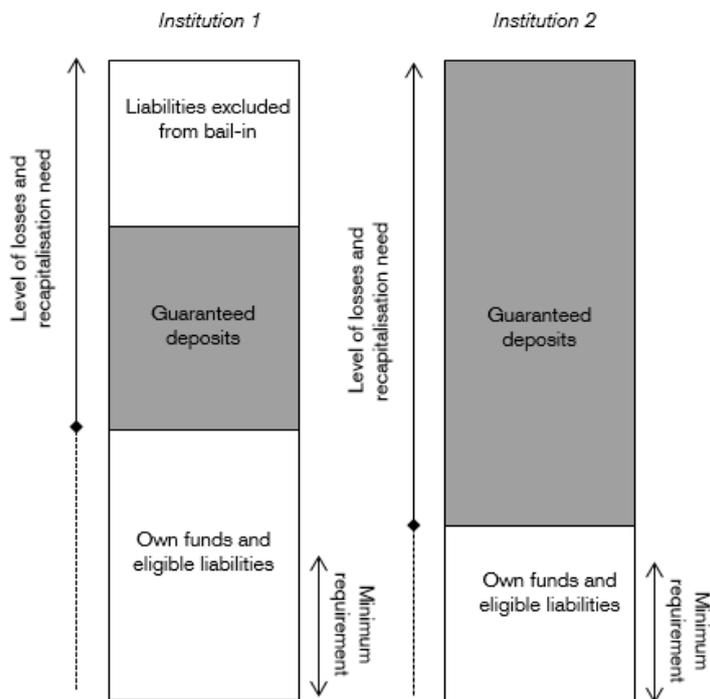
It is the Debt Office's assessment that the institutions would have to experience significant losses in order for it to become necessary to activate the deposit insurance scheme in resolution. This is because guaranteed deposits have a high rank in the capital structure given the general priority right.

There are two primary factors that affect the risk of the deposit insurance being utilised in resolution. The first is the size of the losses in an institution and thus the need for loss absorption and recapitalisation. The other is the institution's capital structure, i.e. the amount of own funds and eligible liabilities with lower priority rights than those of guaranteed deposits.

Figure 11 describes the schematic level of the losses that would have to occur before the deposit insurance scheme would need to contribute in resolution. This depends on the capital structure of an institution. The likelihood of such a contribution is particularly low for institutions with own funds and eligible liabilities that exceed the minimum requirements (MREL). If we compare the institutions in Figure 11 below, the level of losses required to activate the deposit guarantee in resolution is lower in institution 2 than in institution 1.

²⁹ "Underlying creditworthiness" refers here to the credit rating called the Baseline Credit Assessment from Moody's and the Stand-alone Credit Profile from S&P, respectively.

Figure 11. Illustration of loss level required to activate deposit insurance



Minimum Requirement for Own Funds and Eligible Liabilities (MREL)

To ensure that resolution can be implemented without requiring the use of state funds, each year the Debt Office imposes specific demands on the capital structure of financial institutions. This is called the Minimum Requirement for Own Funds and Eligible Liabilities (MREL). The requirement ensures that institutions always have a certain amount of capital and liabilities with lower priority rights than those of guaranteed deposits.

The minimum requirements shall reflect the loss-absorbing and recapitalisation requirement set for each institution if it were to fail. Therefore, the requirement consists of two components: a loss-absorbing amount that roughly corresponds to the company's capital

adequacy requirement, and a recapitalisation amount corresponding to what is needed to restore capital to applicable requirement levels following resolution.³⁰

In December 2018, the Debt Office decided on the MREL requirements that would apply for the institutions. The Debt Office's method of establishing MREL entails that the minimum requirement must be met exclusively with subordinated instruments (capital and subordinated liabilities) and must consist of a certain proportion of liabilities.³¹

Analysis of the capital structure of the major banks

Figure 12 shows the average capital structure of the major banks at year-end 2017. For major banks, the share of liabilities with lower priority rights than those of guaranteed deposits amounts to an average of almost 53 per cent of total liabilities and own funds.³²

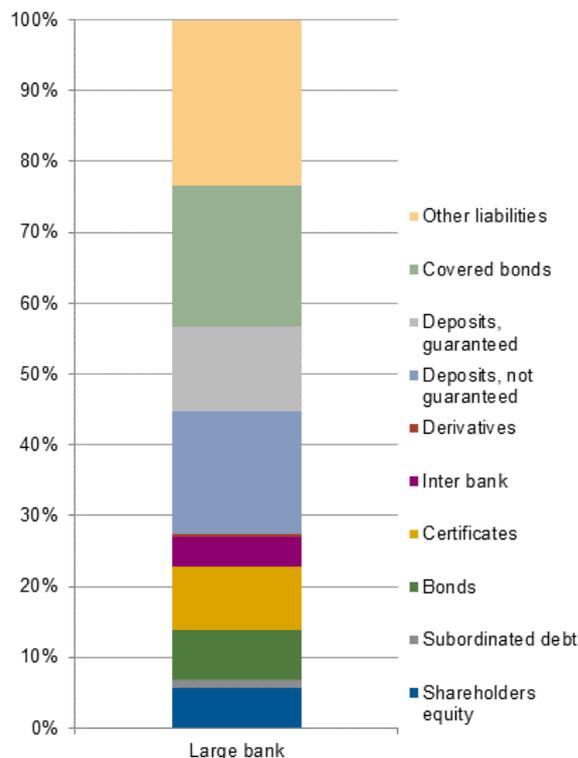
Excluding certificates, interbank borrowing and derivatives (see the section Dynamic capital structure changes), the proportion of liabilities with lower priority rights than those of guaranteed deposits was just over 39 per cent. Even taking into consideration the risk that the proportion of non-preferential deposits may decrease, the proportion of liabilities with priority rights lower than those of guaranteed deposits is therefore significant and exceeds MREL by an average of approximately 30 percentage points.

³⁰ For certain institutions deemed subject to resolution, there is a recapitalisation requirement only for parts of the operations assessed to contain critical functions, whereas it is judged that the remaining parts can be isolated and wound up through normal bankruptcy proceedings.

³¹ See the Debt Office report (in Swedish), *Tillämpning av minimikravet på nedskrivningsbara skulder* ("Application of the minimum requirement for own funds and eligible liabilities"), Ref. No. 2016/425.

³² There is currently no data on the proportion of major banks' deposits that consist of non-preferential deposits from large companies and institutions.

Figure 12. Average capital structure of the major banks (Category 1) as at 31 Dec 2017



The figure has been adjusted to reflect Nordea's change of domicile to Finland in October 2018.

Due to MREL, the major banks' capital structure will be gradually adapted. A significant proportion of their existing loan financing will need to be replaced with subordinated debt instruments.³³

Capital structure of other systemically important institutions

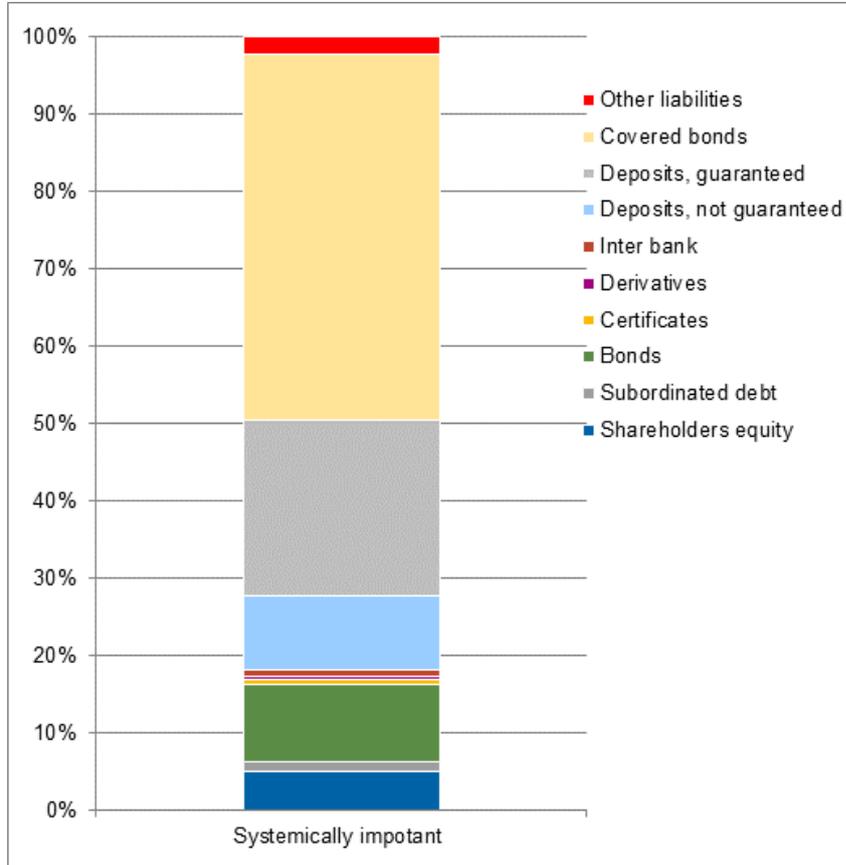
The average capital structure for institutions in category 2 is illustrated in Figure 13.³⁴ For this category, the proportion of liabilities with lower priority rights than those of guaranteed deposits amounts to 28 per cent on average.³⁵ Excluding certificates, interbank borrowing and derivatives, the proportion is 26 per cent.

³³ According to the Debt Office's calculations, the major banks must issue subordinated bond loans totalling approximately SEK 300 billion up until 2022. The calculation is based on data as at 30 September 2018.

³⁴ There are other systemically important institutions included in category 2 that do not conduct deposit-taking operations and are therefore excluded here.

³⁵ None of the institutions in category 2 have deposit-taking operations in markets other than Sweden, so the proportion of guaranteed deposits is known.

Figure 13. Average capital structure of other systemically important institutions (category 2) as at 31 Dec 2017



One conclusion is that the capital structure of these medium-sized institutions does not differ significantly from that of the major banks in terms of own funds and liabilities with lower priority rights than those of guaranteed deposits. This applies particularly if short-term borrowing and interbank borrowing are excluded, as these account for a comparatively larger proportion of the major banks' capital structure.³⁶

However, the categories differ regarding their proportions of deposits versus secured financing. The proportion of deposits covered by the deposit insurance also varies: the average for the major banks was 32 per cent guaranteed deposits, whereas the average proportion for category 2 was 69 per cent. Both of these proportions are lower than the average of 81 per cent for the institutions deemed potentially subject to direct fulfilment. For institutions in category 2, the likelihood that the deposit insurance will be need to be utilised in resolution is therefore deemed low.

³⁶ The medium-sized institutions obtain a significantly smaller proportion of their funding from short-term borrowing. The medium-sized institution with the highest proportion is SBAB, at 1.3 per cent of its financing from certificates compared with Handelsbanken at 15.0 per cent.

Dynamic capital structure changes

It is also necessary to clarify potential changes in the volume of liabilities that must bear losses before guaranteed deposits in resolution. Types of debt with lower priority rights than those of guaranteed deposits can, for example, decline in scope when the creditworthiness of an institution deteriorates.³⁷ The risk of this happening increases the shorter the maturity of the debt is and the lower its priority rights are.³⁸

There is a risk that maturing short-term borrowing in the form of borrowing in certificates and unsecured interbank borrowing will not be renewed or replaced with secured borrowing – and thus receive a higher priority than that of guaranteed deposits. There is also a risk that the part of the wholesale deposits not covered by deposit insurance will decrease because it constitutes a non-preferential claim that is largely immediately callable. Derivatives risk being secured before an institution fails.^{39 40}

Altogether, this increases the likelihood that resolution will require contribution from deposit insurance. In this context, it is worth noting that MREL is, however, a cap on the size of the capital structure changes that can occur.

Discretionary exceptions

Under certain circumstances, a need can arise in resolution to exempt liabilities from being written down (called discretionary exceptions).⁴⁰ Since a departure from the regular priority right is permitted in such cases, these exceptions may entail an increased risk of the need for contribution from deposit insurance. However, due to the Debt Office's requirement that MREL must be met entirely with subordinated liabilities, the need for such exceptions is considered to be small.

Historical losses in banks

The overall likelihood of the deposit insurance scheme being activated in resolution is deemed low, given the significant losses required and the special requirements placed on the institutions. This level of losses can be compared with historical loss levels in bank defaults.

A review of a number of studies of the size of losses in defaults indicates that a loss-absorbing and recapitalisation capacity corresponding to MREL had, in the majority of cases, been sufficient for covering losses that arose.⁴¹ Supposing that, in a resolution intervention, the institutions studied

³⁷ *Adjustments of priority rights that pose a disadvantage to a certain type of debt at the expense of other types of debt can also lead to such changes, without an institution's creditworthiness having declined.*

³⁸ *Experience from the US, among others, suggests that such changes occur before an institution fails. See Marino, James A. and Bennett, Rosalind L. (1999): The Consequences of National Depositor Preference. FDIC Banking Review, Volume 12, No. 2. pp. 19–38.*

³⁹ *To create room for this dynamic, the international rating institution Moody's makes assumptions about the extent of the changes in types of debt that occur prior to a resolution intervention (see Moody's Investors' Service, 2016). Rating Methodology: Banks.*

⁴⁰ *Chapter 21, Section 27 of the Resolution Act (2015:1016).*

⁴¹ *See, for example, the Financial Stability Board, 2015: Historical losses and recapitalisation needs, and BCBS, 2010a: Calibrating regulatory minimum capital adequacy requirements and capital buffers: a top-down approach.*

would have had own funds and eligible liabilities exceeding MREL, as in the capital structure analysis above, the studies show no loss levels that would lead to a deposit insurance contribution in resolution.

Relatively good potential for recovery in resolution

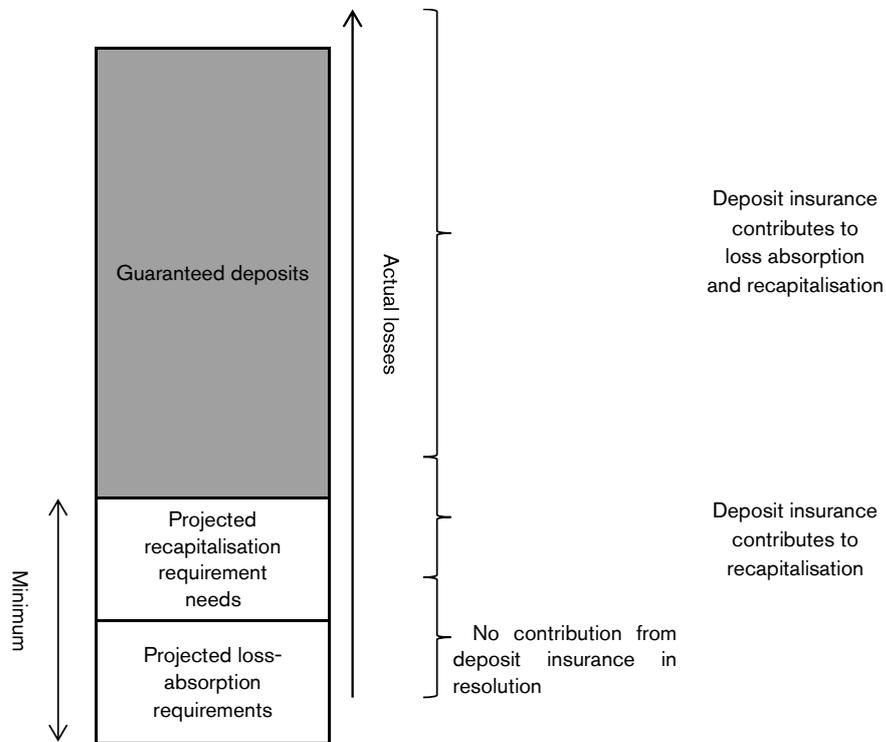
The contribution from the deposit insurance scheme to resolution corresponds to the amount the scheme would be required to inject into every individual institution to cover outstanding losses or to recapitalise an institution.⁴² To the extent deposit insurance is used to recapitalise an institution, the deposit insurance fund receives an asset in the form of shares in the reconstructed institution. This constitutes compensation for the deposit insurance contribution and entails a good potential for recovery for central government.

If, instead, the deposit insurance contribution is used to absorb losses, there is no chance for recovery. This is because, in the case of loss absorption, there is no claim that could generate a recovery, which is equivalent to what happens to a lender's claim in a bail-in.

However, it is more likely that activating the deposit insurance scheme for an institution undergoing resolution would entail recapitalisation rather than loss absorption. This is because the level of losses required to activate the scheme in order to absorb losses would be higher than that required for recapitalisation (see Figure 14). This aspect works in favour of central government's long-term potential for recovery.

⁴² As previously described in regard to direct fulfilments, the state shall take out retroactive fees if losses arise that are large in relation to the funds in the deposit insurance fund. This is also described in further detail in a fact box in the next section on liquidity risks.

Figure 14. Illustration of loss levels required for a deposit insurance contribution to recapitalisation and loss absorption in resolution



Liquidity risks linked to central government guarantees and lending

The Debt Office's assessment is that the liquidity risks in the guarantee and lending portfolio remain low. The payments that the individual undertakings in the portfolio could give rise to are not larger than the daily deficits regularly handled as part of the central government liquidity management operations. The amounts could be higher if several large payments had to be made within the span of a few days. However, the Debt Office's assessment is that such small amounts can also be borrowed on short notice. The borrowing cost would likely be higher in certain cases, but only in the short term and connected to individual payments. For the first time, this year's report also analyses payments under the deposit insurance scheme.

Basic assumptions for the liquidity risk analysis

Guarantees and loan commitments entail a liquidity risk because it is not known beforehand whether or when payments connected to the undertakings will need to occur. If a government guarantee commitment is fulfilled, or a loan commitment utilised, funds are paid out and central government's debt increases. The borrowing requirement is managed in the short term as part of the daily liquidity management and in the long-term through planned issuance of government securities.

The central government's long-term borrowing is planned on the basis of forecasts of the total borrowing requirement over two years. An important strategy for minimising long-term borrowing costs is to keep the supply of government securities in the regular issuance stable and predictable. Short-term fluctuations in the borrowing requirement are therefore handled within liquidity management. This applies to both anticipated fluctuations and unforeseen payments such as when a guarantee commitment is fulfilled or a loan commitment utilised. If the payment entails a permanent increase in the borrowing requirement, it is then gradually phased into the long-term borrowing.

The liquidity risk analysis begins by comparing the size of the payments state guarantees and loans can give rise to and the flexibility in the central government liquidity management operations. The purpose of the comparison is to address the issue of whether potential payments can be managed within these operations. The analysis then describes the risk of the payments leading to higher liquidity management costs. This risk is determined in part by the size of the payments as well as how quickly and in which currency they are made.

Potential payments are not too large to manage

The larger the guarantees and loan commitments, the larger the payments can be. Table 16 shows the largest undertakings in the regular portfolio together with the deposit insurance scheme's

largest undertakings within each category of institution.⁴³ The amounts may seem large. However, this should be viewed in the context of the fact that deficits (borrowing requirements) of up to SEK 100 billion are financed within liquidity management on a daily basis.

Granted, if several sizeable guarantees or loan commitments had to be fulfilled in the same short period of time, even larger deficits could arise. However, these flows are also deemed manageable within the framework of the continual liquidity management. At the same, the likelihood of such an outcome is very low and the need for quick disbursement is, in practice, lower than the amounts shown in the table below. This is because the entire amount is rarely to be paid out at the same time.

Table 16. Commitments over SEK 10 billion as at 31 Dec 2018

	SEK billion
Lending framework For SEK (Swedish Export Credit Corporation)	125.0
Callable capital to EIB	67.5
Credit guarantee ¹	53.5
Deposit insurance – categories 1 & 2 ²	36.0
Callable capital to NIB	20.3
Callable capital to IBRD	20.2
Deposit insurance – category 3 ³	20.0
Credit guarantee for the Öresund Bridge Consortium ⁴	18.3
Credit guarantee	16.7
Credit guarantee	13.6
Callable capital to AfDB	11.9
Credit guarantee	10.1
Deposit insurance – category 4 ⁵	10.0

¹ The fulfilments are not to exceed SEK 2.7 billion over the next five years, due to the maturity structure of the guaranteed loans.

² The deposit insurance scheme's contribution in resolution may never exceed 200 per cent of the target level of the deposit guarantee (see the box Payments from deposit insurance fund). If additional funds are required in resolution, they are primarily contributed by the resolution reserve.

³ A direct fulfilment of the deposit insurance commitment for an institution in category 3 can amount to a maximum of approximately SEK 20 billion.

⁴ The Swedish government and the Danish government jointly stand surety for all of the Öresund Bridge Consortium's loans. Therefore, the extent to which the Swedish state's undertaking is to be utilised in its entirety, or up to 50 per cent of outstanding amounts, is not given. In the table, a strict formal assessment has been made with the entire amount reported.

⁵ A direct fulfilment of the deposit insurance for an institution in category 4 can amount to a maximum or almost SEK 10 billion.

Data from EKN, Sida, CSN, Boverket and the Debt Office.

Usually a time frame between fulfilment and payment

A review of the contractual terms that apply to the undertakings presented in the table shows that the potential liquidity strain is often significantly lower than what the amounts imply. Either

⁴³ The financial institutions that have guaranteed deposits are divided into four categories in the section Credit risks in the deposit insurance scheme, Different categories of institutions.

circumstances dictate that central government not need to fulfil the entire commitment at one time, or there is in practice a time frame enabling systematic planning of the payments. In certain cases, it may be necessary to rapidly fulfil the commitment in its entirety. This mainly applies to subscribed callable capital and deposit insurance.

There is no contractual payment period for the callable capital. In a few cases, however, it has been communicated that, if necessary, central government must pay out a capital contribution within one week but that the time allowed will be adapted according to the size of the payment. A larger amount provides an opportunity for a longer period and vice versa.

For the deposit insurance scheme, the law states that compensation to affected depositors must be available within seven working days. Deposit insurance shall also be able to contribute funds in resolution. There are no stated time frames for payments from the scheme made to an institution in conjunction with resolution, but the Debt Office's assessment is that such a payment may be required on short notice. The time depends on how long it takes to carry out the resolution transaction. Payments connected to the deposit insurance scheme shall primarily be made from the deposit insurance fund. If the fund amounts are insufficient, the state can borrow what is required (see the box in the last chapter for further information).

Considerable flexibility in the liquidity management operations

The liquidity management operations are designed to ensure that government payments are always carried out on time. All payments to and from central government agencies are collected in a central account, meaning that only the net of these payments is handled by the liquidity management operations. On days when outgoing payments exceed incoming payments, the Debt Office borrows to finance the deficit in the account. Conversely, when incoming payments exceed outgoing payments, the surplus is invested.

In order to ensure effective liquidity management, the Debt Office plans according to daily borrowing and investment needs. At the same time, the management must be flexible in order to expediently handle unexpected payment flows. For example, the Debt Office is able to choose instruments, maturities and counterparties (within the framework of applicable regulations and guiding principles).

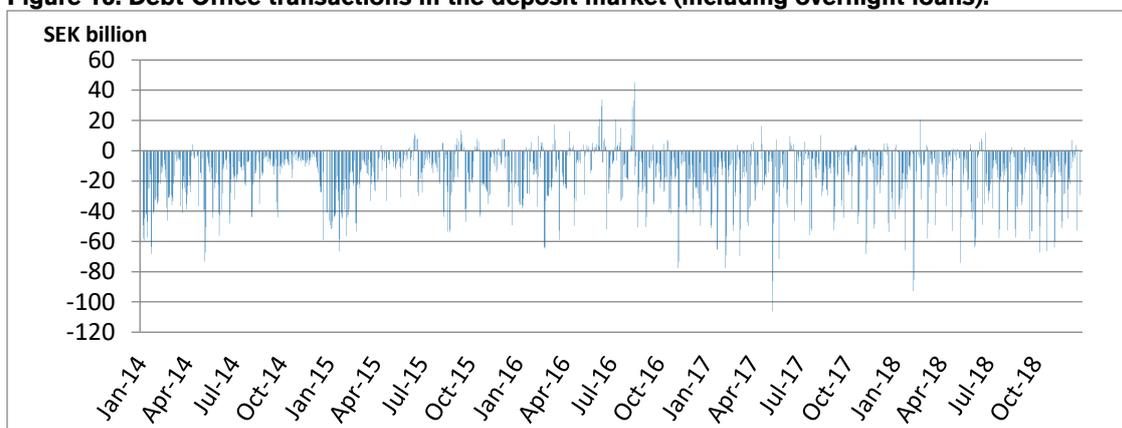
Access to several different instruments

The Debt Office can employ several instruments in its liquidity management operations. If large unexpected payments arise with a few days' notice, borrowing can begin in advance in the money market. This is mainly done through deposits, that is, standardised agreements on depositing and lending between market participants. If the unforeseen payment must be made on the same day, the deficit is funded with an overnight loan – the most short-term type of deposit.

In the overnight market (federal funds market), the liquidity requirement in kronor is balanced to zero each day between the market participants and the Swedish payment system. If central government has a deficit to finance overnight, there is always one or several market participants with a corresponding surplus to invest. This is because the money paid out by the Debt Office has gone elsewhere in the payment system. The system is thus set up so that it is always possible to fund

deficits (and invest surpluses) in kronor overnight. Figure 15 illustrates the variation in the daily flows that the Debt Office handles with deposits.

Figure 15. Debt Office transactions in the deposit market (including overnight loans).



The minus signs refers to loans, the plus sign to investments.

If the increased borrowing requirement from the payment is expected to persist for some time, the Debt Office can instead issue commercial paper in foreign currency. This borrowing instrument works much like a bond but with a shorter maturity. Commercial paper provides access to the international money market, which is considerably larger than the Swedish market. Combining this borrowing with currency derivatives makes the procedure comparable to borrowing in Swedish kronor.

Potential additional cost is short term and isolated

When a large payment is funded short term with commercial paper instead of by utilising deposits, the borrowing cost can be slightly higher (or lower) depending on the price of the included currency derivative. An additional cost would, however, be isolated to the specific payment and disappear within a short time as the initial short-term borrowing is phased into the continual issuance.

In the event of payment connected to a guarantee or loan in foreign currency, the Debt Office borrows in the same way as for a payment in kronor and makes an exchange simultaneously. If there is a need to exchange large amounts on small foreign exchange markets, where liquidity is limited, there is a risk that the transaction will be more costly than usual. Currently, however, there is no exposure to smaller currencies among the portfolio's major undertakings.

Payments from the deposit insurance fund

Disbursements under the deposit insurance scheme are financed by the deposit insurance fund. As opposed to the regular portfolio's guarantee reserves, which are accounts at the Debt Office, this fund consists of securities in the form of Swedish government bonds. This means that the fund must sell government bonds when the compensation is to be paid out. If there are not sufficient assets in the fund, the Debt Office has unlimited credit in order to

raise new debt to cover the amounts required (see Deposit Insurance Act (1995:1571) for more detailed information).

Deposit insurance is financed with fees

The deposit insurance fund is built up by a statutory and risk-differentiated fee that the institutions covered by the deposit insurance scheme pay. The fees shall amount annually to a sum corresponding to 0.1 per cent of the institutions' aggregate guaranteed deposits at the end of each year. The fund, which is administered by Kammarkollegiet (the Swedish Legal, Financial and Administrative Services Agency) by commission of the Debt Office, amounted as at year-end 2018 to SEK 41.7 billion. This corresponds to approximately 1.83 per cent of the guaranteed deposits.⁴⁴

By law, the fund must amount to at least 0.8 per cent of the guaranteed deposits. If the fund falls below two-thirds of this level, the amount must be restored within six years. Therefore, when necessary, the fees can become higher than the 0.1 per cent normally charged.

Limited contribution from deposit insurance in resolution

According to regulations, the deposit insurance fund may also be utilised to protect depositors in resolution. The contribution for a single institution, however, may never exceed 200 per cent of the minimum level of the fund. The fund can thus contribute a maximum of 1.6 per cent of guaranteed deposits, which corresponds to SEK 36 billion based on guaranteed deposits as at year-end 2017.

However, the fact that the deposit insurance contribution in resolution is limited in its amount does not mean, however, that the protection for depositors is limited. Any additional funds (over and above SEK 36 billion per institution) required for resolution will first be taken from the resolution reserve.⁴⁵

Sales of government bonds may entail additional costs

From a liquidity risk perspective, it is worth noting that assets in the deposit insurance fund must be realised at the time of disbursement. A large volume of government bonds may then need to be sold in a short time, which may adversely affect the sales price. Although this has no direct effect on central government borrowing costs, it entails additional costs for the deposit insurance scheme.

Such additional costs do not arise when the funds for the payments are instead borrowed directly by the Debt Office, for example in fulfilment of other types of guarantee commitments or when the amount in the deposit insurance fund is insufficient.

⁴⁴ When calculating this percentage, Nordea's guaranteed deposits were still not included in the total guaranteed deposits.

⁴⁵ The resolution reserve is a special financing arrangement, separate from the deposit insurance fund, established to finance resolution measures taken by the Debt Office that are permitted under the Resolution Act (2015:1016). A payment from the reserve, which is an account at the Debt Office, affects the central government's borrowing requirement and the central government debt.

Appendix 1: Central government guarantee and lending operations

The management of central government guarantees and lending is based on distinct principles and rules designed to clarify the associated financial risks and costs (the guarantee and lending model). This ensures that central government avoids undesirable risks. These principles and rules are described below because they have an inherently favourable effect on the risk level of the central government guarantee and lending portfolio. There are also commitments regulated separately from the collective model – for example, student loans and the deposit insurance scheme.

The central government guarantee and lending model

In the mid-1990s, a model for managing central government guarantees was adopted by the Riksdag for the first time, in the Central Government Budget Act (1996:1059). In the period up to and including 2001, risk assessments of previously issued guarantees were conducted in accordance with the new model. As of 2002, the principles of the guarantee model have thereby also been applied to guarantees issued before the model was introduced.

The revised Budget Act (2011:203) further clarified the principles for issuing central government guarantees. At the same time, it was decided that corresponding principles should also be applied to central government lending with credit risk. The Ordinance on Lending and Guarantees (2011:211) supplements the Budget Act with more detailed regulations. The result is uniform and distinct rules for both guarantees and lending with credit risk.

Overall, the central government guarantee and lending model is based on a number of rules intended to foster both responsible and cost-effective management of financial risks. Most of the rules help ensure that decision-makers are aware of the risks and that central government makes provisions for those risks. Others are intended to ensure that central government avoids undesirable risks and minimises risk-taking in general.

The primary rule is to ensure the following: that guarantees and loans are to be limited in amounts and maturity; that the expected cost is booked and financed in conjunction with the issuance decision; that the financial position of the guarantee and loan recipients is analysed; and that the contracts include adequate conditions for limiting risk.

In addition, the authorities that issue guarantees and loans will regularly analyse, limit and report the credit risk of guarantees and loans issued. This approach serves to reduce the likelihood that the portfolio will become too large or contain risks that are inappropriately high or difficult to assess. Altogether, the principles and regulations on which this lending model is based are significant in forming the assessment that there is a low overall risk of large losses in the regular portfolio.

Long-term cost recovery principle

One of the fundamental principles for central government is to charge a fee that corresponds to the expected cost of the guarantee or loan. The expected cost consists both of the expected credit loss (usually shortened to expected loss) and the administrative costs associated with the commitment.

The expected loss arises from the probability that the recipient of a guarantee or loan will not be able to fulfil its commitment, which usually results in a credit loss for the state. For loans, the central government's interest expense for financing the loan is added to this.

$$\text{Expected loss} = \text{Exposure at Default} \times \text{Probability of Default} \times (1 - \text{Expected Recovery given Default})$$

Central government charges a fee to cover this expected cost. The expected cost for the state is thus matched by a predetermined income. Accordingly, the state's financial position is, in theory, unaffected at the time of decision to issue a central government guarantee or loan.

If the guarantee or loan recipient is allowed to pay a fee lower than the expected cost, a state subsidy arises. To create transparency around this subsidy, the Budget Act requires that it be financed, unless the Riksdag makes a decision to the contrary. This often entails that a sum corresponding to the subsidy is charged to an appropriation. This, in turn, means that the expenditure for the subsidy must be weighed against other expenditure in the state budget and therefore competes for inclusion under the expenditure ceiling. Consequently, any subsidy of a government guarantee or loan is treated in the same way as any other central government expenditure.

A model in which fees – including any subsidy financed via appropriations – are allocated equal to the state's expected costs involves an actuarial cost-reimbursement principle. In the long term, the accumulated fees are expected to correspond to the costs of credit losses and administration. In practice, however, the outcome in the operations will vary over time and deviate from the expected outcome – in both a positive and a negative direction. Accordingly, in many ways the model has parallels to conventional insurance operations, in which fees from a large number of claim-free commitments are expected to cover the costs related to a small number of claims (credit losses).

Central government is risk-neutral at the margin

In accordance with the fundamental principle in the Budget Act, central government does not charge a risk premium – unlike the situation in insurance operations. In theoretical terms, this can be seen as central government being risk-neutral at the margin and therefore not requiring a return to cover the risk that follows from guarantees and lending, i.e. deviations from the long-term expected outcome. One significant reason for this is that the state has an extensive and strong balance sheet underpinned by its right of taxation. As a result, central government does not maintain an earmarked risk buffer and does not tie up any capital that requires a return. It should be stressed that central government is only risk neutral at the margin, that is, for risks that are not excessive in relation to the entire central government balance sheet.

Outcomes are recorded in notional reserve accounts

The design of the guarantee and lending model entails that fees and costs are handled outside the income headings and appropriations in the central government budget. Fee income – including appropriation funding to cover any subsidies – is not entered under an income heading but instead recorded in notional reserve accounts. Accordingly, credit losses and any recoveries are recorded in these reserve accounts as well.

An unlimited mandate to raise new debt is linked to each reserve account. This addresses the budget-technical issue of how to finance and report credit losses that exceed the accumulated funds in the reserves, allowing for a negative balance from time to time.

It is important to note that the reserves at the Debt Office are only notional accounts. There are exceptions, however, in the form of actual funds, for example the deposit insurance fund.

One reason for mainly having notional reserve accounts instead of special asset and liquidity portfolios is that such portfolios could add risks rather than reduce them. Therefore, it is normally not a question of either earmarking or accumulating money in an actual fund. Instead, fee income recorded in the notional reserve accounts is included in the cash flow of central government. A paid-in fee thus improves the budget balance and reduces central government debt.

The total assets in the guarantee and lending activities do not consist solely of the balance in the notional reserve accounts that the responsible agencies have at the Debt Office. Other significant assets are the recourse claim that arises when a guarantee commitment is fulfilled as well as the remaining value of outstanding claims following realised defaults on loans issued. The present value of agreed but not paid fees is also an asset. The total value of all these assets should be compared with the expected losses when assessing the actuarial deficit or surplus in the central government guarantee and lending activities.

Guarantees and lending regulated separately

Some guarantees and loans are regulated separately, in separate acts or through individual decisions by the Riksdag or the Government.

The student aid system

The Student Aid Act (1999:1395) regulates the management of student loans. The Act contains stipulations regarding who can receive student loans and grants, interest, repayment, and recovery demands. These differ in several respects from how lending is handled under the guarantee and lending model. However, new student loans granted after 2013 are managed in accordance with the guarantee and lending model in the sense that appropriated funds corresponding to expected losses are transferred to a notional reserve account. For the remainder of the loans, realised credit losses are financed as they arise by appropriations.

Deposit insurance scheme and investor compensation scheme

The deposit insurance scheme is intended to provide consumer protection for deposits by private individuals and to promote the stability of the financial system. Deposit insurance is regulated under the Deposit Insurance Act (1995:1571).

The investor compensation scheme provides loss protection for investors' financial instruments and funds held with a securities company, fund manager, or an asset management company. Any costs for central government following activation of the scheme are paid retroactively by the remaining institutions covered.

Lending funded by appropriations

According to Chapter 7, Section 3 of the Budget Act, lending with high expected loss must be funded by appropriations. Since such lending is already fully financed by appropriations, there is no reserve account to manage losses on these loans. Amortisation and interest payments are reported under an income heading.

Callable capital to international financial institutions

The state has issued guarantees to provide, when required, additional capital – known as callable capital – for a number of international financial institutions of which Sweden is a member.

Callable capital has been exempted by the Riksdag from the central government guarantee and lending model. However, to make clear that these guarantees and the risks associated with them exist, a specialised notional account with credit has been set up at the Debt Office. Any charge to this account has to be cleared from appropriated funds from the central government budget.

Public enterprise undertakings

Following decisions by the Riksdag and the Government, public enterprise agencies can also issue guarantees and provide loans linked to their activities. At present, Luftfartsverket (the Swedish Civil Aviation Administration) has commitments of this kind.

How guarantees and loans affect central government finances

The following two simplified examples illustrate the effects of guarantees and loans on central government finances.

The state issues a guarantee for SEK 100

When the guarantee is issued, the state charges a fee corresponding to its estimate of the expected loss on the guarantee. Suppose the fee is set at SEK 5. The balance in the state's guarantee reserve increases by SEK 5 while its reserve requirement increases by the same amount. The state's net wealth is thus unaffected. Its cash flow increases by SEK 5, decreasing central government debt by the same amount. Central government net lending is also strengthened by the corresponding amount.

A change in the expected loss

If the expected loss of the guarantee increases/decreases, central government must increase/decrease provisioning for the guarantee by the corresponding amount. As a result, central government's net wealth decreases/increases. A change in the expected loss, however, has no effect on central government net lending or central government debt.

The state fulfils the guarantee commitment

The state makes a payment corresponding to all or part of the guarantee. This is funded, like all other cash flows, within the framework for the Debt Office's debt management. Suppose the commitment to the whole amount under the guarantee, SEK 100, is fulfilled. Central government debt increases by SEK 100 and the balance in the guarantee reserve decreases by the same amount. Central government net lending is also reduced by the corresponding amount.

When a guarantee commitment is fulfilled, the state also receives a recourse claim (an asset). Suppose the claim is initially expected to be worth 50 per cent of the fulfilment amount. In this situation, central government net wealth has decreased by SEK 45.

The state recovers 60 per cent of the fulfilment amount

The balance in the guarantee reserve increases by SEK 60. At the same time, the state receives a deposit that improves cash flow, as well as strengthening central government net lending, by SEK 60 and reduces central government debt by the same amount.

In terms of all events, the total change in central government net wealth ended up at SEK 35. The net charge to the guarantee reserve is also SEK 35, as is the increase in central government debt and the decrease in central government net lending.

Central government issues a loan for SEK 100 with credit risk

To finance the loan, the state must borrow, increasing the central government debt by SEK 100. At the same time, the state receives an asset in the form of a loan receivable. Central government net lending is unchanged, as lending corresponds to a financial asset in the form of this claim. However, because of the credit risk in the loan, this asset is worth less than SEK 100. The expected loss is estimated at SEK 5. Thus, the carrying amount of the state's loan receivable is written down by SEK 5 to SEK 95. The expected loss, however, has no effect on central government net lending. Central government charges an interest margin on the loan corresponding to the expected loss. The balance in the state's credit reserve increases by SEK 5. At the same time, central government debt decreases accordingly and central government net lending improves by the corresponding amount. The value of the state's loan receivable of SEK 95 is equivalent to an increase in the debt by SEK 95. Central government's net wealth is thus unaffected.

A change in the expected loss

The value of the state's loan receivable decreases/increases. As a result, central government's net wealth decreases/increases. A change in the expected loss, however, has no effect on central government net lending or central government debt.

A default occurs

Central government's cash flow is reduced by the amount of contracted payments not received from lenders. For the sake of simplicity, it is presumed that none of the loan amount is repaid. After confirmed default, the expected recovery is 50 per cent of the loan receivable. The value of the loan receivable is therefore written down to SEK 50. Central government's net wealth has decreased by SEK 45.

Central government recovers 60 per cent of the amount lent

The state's cash flow is improved by SEK 60, reducing central government debt by the same amount. In total, central government's net wealth is reduced by SEK 35, central government debt increases and central government net lending decreases. The point in time when this effect on central government net lending arises may vary depending on when the credit loss is finally reported and established.

Similarities and differences between credit guarantees and lending

Credit guarantees and lending are regulated in a similar way because the credit risk, and thus the expected cost, is the same for the two types of undertakings. Both guarantees and lending require approval by the Riksdag and are treated similarly in the central government budget process. However, the state must consider the differences when it decides whether to issue a guarantee or loan for funding purposes.

Lending is more transparent than guarantees

When the state grants a loan, it is financed by central government. In the case of a credit guarantee, the financing of the underlying loan is done by a private party. Consequently, unlike guarantee issuance, lending affects both the central government borrowing requirement and debt at the time the loan is granted. In the case of a guarantee, the borrowing requirement increases only if a guarantee commitment is fulfilled. Guarantees can thus be seen as contingent government debt.

This difference is also reflected in the financial reporting. Increased borrowing affects gross debt, and the loan receivable is recorded as an asset in the balance sheet.

Losses can have different effects on central government net lending

Normally, a fulfilled guarantee commitment entails a corresponding immediate effect on central government net lending. The effect of a corresponding default on a loan will normally have no immediate effect on central government net lending. In the case of loans, the effect on central government net lending normally arises when the loss is realised.

Lending is normally less expensive than guarantees

The state's cost for expected loss and administration is normally about as high when funding is provided through direct loans from central government as it is when provided through a state guaranteed loan from a private actor. The total cost of funding through direct lending includes the central government borrowing cost. The cost of funding through a central government guarantee, on the other hand, includes the private lender's cost for borrowing and administration.

As, under normal circumstances, the private actor's borrowing costs are higher than those of central government, the cost for the borrower via direct lending by the state is lower than that of a guarantee. This applies despite the risk to the state being the same in both cases.

Loans involve more restrictive management

A difference in the regulation of guarantees in relation to loans is that only loans with low expected losses can be funded with borrowing at the Debt Office. In practice, this means that loans with high expected losses are funded through appropriations. There is no corresponding regulation for guarantees. Consequently, the Budget Act stipulates a more prudential treatment of lending with high credit risk.

Lending sometimes involves less complicated management

A credit guarantee often involves a tri-party relationship between the central government, the lender and the borrower. Loan issuance entails only a relationship between two parties. This tri-party arrangement may give rise to more complex management in order to avoid risks that arise from, for example, moral hazard.

Advantages of guarantees may outweigh disadvantages

Although in most cases lending is preferred over issuing guarantees, there are several examples of situations in which the advantages of a guarantee outweigh the disadvantages. One argument in favour of guarantees is that they can simplify risk distribution, which is usually preferred, by the state guarantee covering less than the whole amount of the underlying loan. In addition, guarantees can be more effective than loans. In situations in which there are a large number of potential beneficiaries, the banks' existing networks, systems and administrative routines might, for example, lead to greater efficiency than if the state were to engage in direct lending. Guarantees can also entail a lower degree of intervention on the retail market compared with loans, as government lending in some cases risks crowding out private lenders.

Appendix 2: Undertakings excluded from the risk analysis

The Debt Office has chosen to exclude the following from the risk analysis: lending financed by appropriations, guarantees and loans issued by public enterprise agencies, capital adequacy guarantees and the investor compensation scheme. This is primarily for practical reasons, but also because they involve either small amounts or negligible risks. These exclusions only marginally limit transparency and do not affect the Debt Office's conclusions in the risk analysis.

Lending funded by appropriations

Unlike lending financed by central government borrowing, lending funded by appropriations is included under the expenditure ceiling. Such funding thus falls outside the guarantee and lending model (not pursuant to Chapter 6, Section 3 of the Budget Act). Lending funded by appropriations can be viewed as a transfer with repayment conditions. Potential credit losses can therefore be assumed to have been subject to the customary political discussion of expenditure prioritisation in the central government budget, which is why this lending is excluded from the risk analysis.

Lending funded by appropriations amounted to SEK 4.1 billion as at 31 December 2018. Most of the amount consists of older student loans and home improvement loans.

Public enterprise guarantees

The few guarantees issued by public enterprise agencies are excluded from the risk analysis. Any losses related to such guarantees are borne, primarily, by the assets in the respective agencies' operations. Should these assets prove insufficient, losses will be borne by appropriations, as the public enterprise agencies and the central government are one and the same legal entity.

As at 31 December 2018, public enterprise agencies' loans issued totalled SEK 110 million.

Capital adequacy guarantees

Trafikverket has issued one capital adequacy guarantee to Arlandabanan Infrastructure AB (Arlandabanan) and one to Svensk-Danska Broförbindelsen AB (Svedab). The scope of the capital adequacy guarantees is not explicitly limited, making it difficult to assess the credit risk.

Trafikverket's capital adequacy guarantee to Arlandabanan is also designed in such a way that the risk of fulfilment is not linked to credit risk. The capital adequacy guarantees are therefore excluded from the analysis.

Capital adequacy guarantees from Trafikverket to Arlandabanan and to Svedab amounted to SEK 1,211 million and SEK 3,149 million, respectively, at year-end 2018.

Investor compensation scheme

The investor compensation scheme protects securities holders whose securities are held on deposit by a securities firm. The guarantee is activated if such a firm goes bankrupt and has not held customers' assets separate from its own assets, for example as a result of gross negligence or criminal activity. The probability of the investor compensation scheme being utilised is therefore significantly lower than the probability of an institution going bankrupt.

The size of the central government's undertaking under the investor compensation scheme is not known. As fees are only charged retroactively to recover compensation paid out under the scheme, the scope of the assets protected has only been established on one occasion, in connection with one case of compensation. At that time, the securities firms's aggregate assets protected by the scheme were estimated at around SEK 93 billion. However, this figure referred to 31 December 2004, the year of the bankruptcy that led to the compensation case.

There are many indications that central government's cost for the investor compensation scheme is small. Since the scheme was introduced, there has only been one small case in which it was utilised. In addition, as central government retroactively charges fees to the remaining institutions – recovering the full cost of any compensation paid out – central government, in principle, does not bear any credit risk for the investor compensation scheme. This presumes that the amount paid out will be restored within a short amount of time by the fees paid in from the other institutions, which the Debt Office deems likely. Therefore, the investor compensation scheme is excluded from the risk analysis.

For the deposit insurance scheme, central government is also entitled to charge fees retroactively to cover losses if retained fees prove insufficient. The potential amounts are, however, larger for the deposit insurance scheme, and the retroactive fees would likely come in at a slower pace than they would for the investor compensation scheme.⁴⁶

⁴⁶ This applies as long as the losses exceed the extra fee of 0.5 per cent of the institutions' total deposits that the guarantee authority is entitled to take out. Section 13 a of the Deposit Insurance Act (1995:1571).

Appendix 3: In-depth presentation of the central government guarantee and lending portfolio

The in-depth disclosure in this appendix is intended to further increase transparency in regard to central government guarantees and loans with credit risk. The appendix is a supplement to both the risk analysis in the report and to the central government's annual report. The amounts presented in the appendix pertain to the commitments included in the risk analysis.

Size of the guarantee and lending portfolio

Table 17 presents the size of the central government portfolio of guarantees and lending at year-end 2018, in both absolute and relative terms. Figure 16 shows the development over the past 20 years.

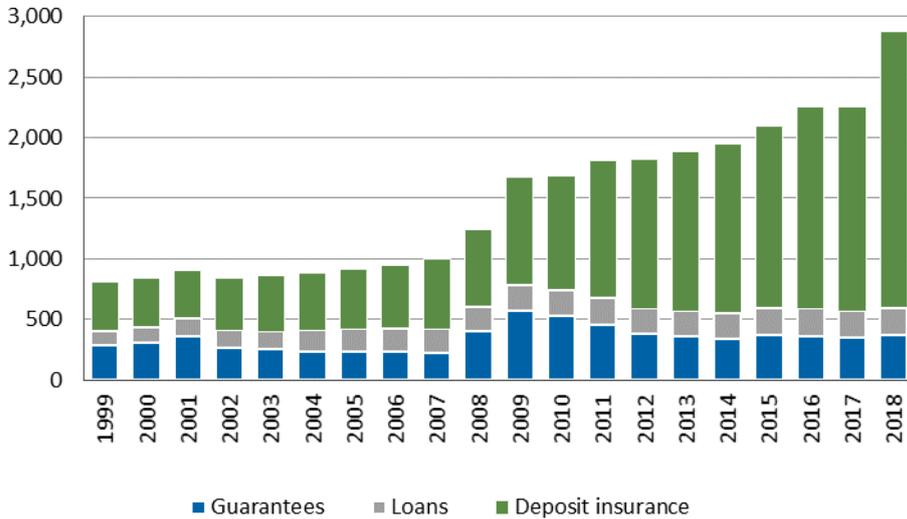
Table 17. Size of the guarantee and lending portfolio as at 31 Dec 2018

	SEK billion ¹
Guarantees and loans to companies and private individuals	595 (569)
Deposit insurance ²	2,280 (1,689)
Total	2,875 (2,258)
Share of GDP	60% (49%)

¹ Last year's amount in parentheses

² The amount referring to the deposit insurance is from year-end 2017, as the 2018 figure was not available when the report was written. Data From EKN, Sida, CSN, Boverket, the Debt Office, the Government Offices, the ESV (Swedish National Financial Management Authority) and own computations.

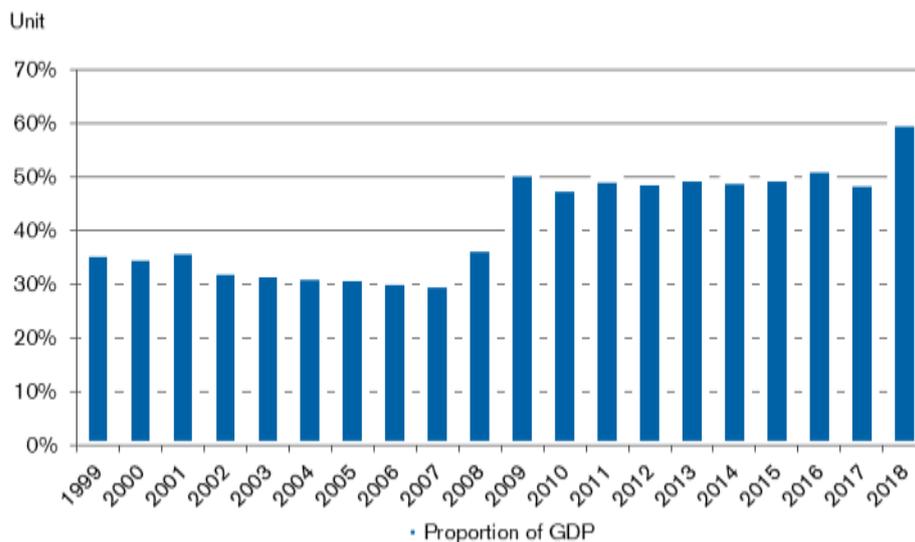
Figure 16. Historical data on the size of the portfolio 1999–2018, SEK billion



The central government's annual report, information for that annual report compiled by the Debt Office, and own computations. Note that the 2017 deposit insurance figure is used as an approximation of the 2018 figure, as the 2018 information was not available when the report was written.

Figure 17 shows the corresponding historical information in relation to certain fiscal quantities and GDP for Sweden.

Figure 17. Historical data on the relative size of the guarantee and lending portfolio 1999–2018

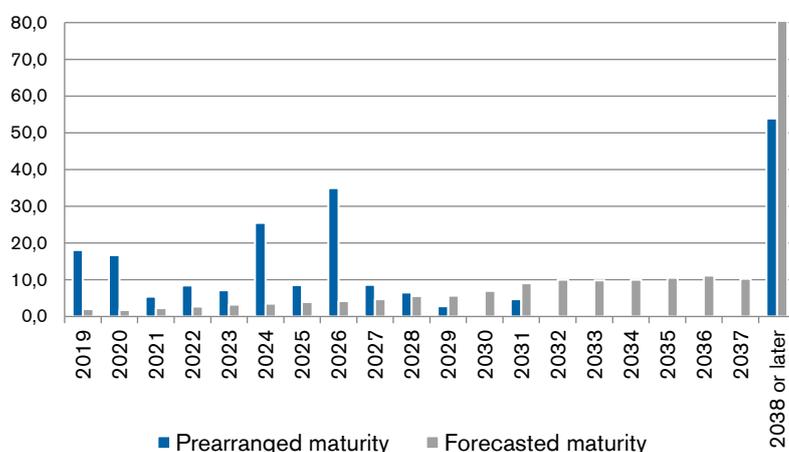


The central government's annual report, information for that annual report compiled by the Debt Office, data from the Statistics Sweden and own computations.

Maturities

A significant part of the central government portfolio (86 per cent) consists of guarantees with unlimited maturity. This includes the deposit insurance and callable capital subscribed to international financial institutions. In the remaining cases, the maturity of the guarantee or loan is predetermined by contract. Alternatively, the maturity may be a function of some underlying factor such as income development in the case of loans with conditional repayment. The latter involves a maturity forecast. The maturity structure of guarantees and loans with a contractually stipulated or forecast maturity is shown in Figure 18.

Figure 18. Maturity structure of the guarantee and lending portfolio as at 31 Dec 2018, SEK billion



Excluding guarantees that are without time limit (SEK 1,845 billion) and student-loan holders who have not yet become liable for repayment (SEK 27 billion). Data From EKN, Sida, CSN, Boverket, and the Debt Office

Currencies

The loans granted and the commitments guaranteed are in different currencies. Table 18 shows the corresponding value in kronor for the ten largest currency exposures in the central government's guarantee and lending portfolio.

Table 18. The ten largest currency exposures in the guarantee and lending portfolio as at 31 Dec 2018, SEK billion

Currency SEK billion	Amount
SEK	2,595.3
USD	188.9
EUR	125.6
GBP	2.7
EGP	0.9
ZAR	0.9
RUB	0.6
DKK	0.6
JPY	0.5
Special drawing rights ¹	16.2

¹ Special drawing rights correspond to a group of currencies used in international trade and finance (EUR, GBP, JPY and USD).

Guarantees and loans that can be paid out in several currencies are included under all these currencies. Data From EKN, Sida, CSN, Boverket, the Debt Office, and the Government Offices.

Approaches to financing the credit risk of guarantees and loans

The guarantees and loans in the portfolio are managed differently in terms of cost recovery. Table 19 illustrates these differences.

Many of the guarantees and loans are managed on the basis of the central government guarantee and lending model. A central part of this model is that the expected loss of the guarantee or loan is financed at the time of issuance, generally with fees charged to guarantee holders and borrowers and in exceptional cases by appropriations. The fees are booked against a notional reserve account, for which there is an unlimited mandate to raise new debt in order to deal with losses that temporarily exceed the size of the reserve.

The management of student loans is regulated separately. For loans issued as of 2014, the expected loss is funded by appropriations when the loan is granted, which is in line with the guarantee and lending model. For student loans issued prior to that date, actual losses are funded when they occur by appropriations.

The management of the deposit insurance scheme is also regulated separately. All institutions covered by the scheme pay an annual statutory fee to the central government, which is risk-differentiated for individual institutions. The level of the aggregate annual fees charged, however, is regulated by law. The fees are placed in a fund with its own assets. Deposit insurance payouts are financed primarily with money from this fund. If the fund's assets are insufficient, there is an unlimited mandate to raise new debt linked to the fund.

In addition, there are outstanding guarantees and loans with credit risk that are managed separately on the basis of individual decisions. Among these are central government's callable capital commitments to international financial institutions of which Sweden is a member. Payments under these guarantees are financed when they arise by appropriations.

There are also a small number of loans financed by borrowing that were issued before the central government lending model was introduced. In some cases, fees covering at least the expected loss were set at the time the loans were granted. In other cases, no fee has been charged at all. However, the common denominator of these loans is that the method of financing realised credit losses has not been established in advance.

Table 19. The portfolio divided by approach to financing credit risk of guarantees and loans, as at 31 Dec 2018, SEK billion

Order	Expected loss	Actual loss	Amount	Share
Guarantee and lending model	Fees/appropriations	Reserve	232.3	8.1
Deposit insurance scheme	Fees ¹	Reserve	2,280.0	79.3
Student aid system:				
New student loans	Appropriations	Reserve	82.1	2.9
Old student loans ²	-	Appropriations	139.2	4.8
Callable capital	-	Appropriations	140.4	4.9
Individual loans	Fees/-	Unknown	1.0	0.0
Total			2,875	100

¹ Fees for the deposit insurance are not set on the basis of expected loss. The statutory fee is taken out at 0.1 per cent of the institution's aggregate guaranteed deposits as at the prior year-end.

² Student loans granted prior to 2014

Data from EKN, Sida, CSN, Boverket, the Debt Office and the Government Offices

Problem guarantees and loans

For problem guarantees and loans, a credit loss is deemed likely. These are guarantees and loans for which a negative credit event – such as delayed payment or non-payment of interest or amortisation – has already occurred. Alternatively, there are other good reasons to doubt whether a loan issued or guaranteed will be repaid in time.⁴⁷

Table 20. Problem guarantees and loans as at 31 Dec 2018, SEK billion

	Amount	Share
Problem guarantees and loans	7.8	0.3
Performing guarantees and loans	2875.0	99.7

Data From EKN, Sida, CSN, Boverket and the Debt Office.

⁴⁷ Problem guarantees and loans do not include the following two of CSN's criteria for loan losses: reservation based on security rules in respect of repayment, and reservation with respect to future losses due to death.

Difficulties in determining expected loss

Disclosing and financing the expected loss that relates to the credit risk in a guarantee or loan is an important part of the central government's guarantee and lending model. There are, however, circumstances that make it more challenging to reliably estimate the expected loss for a guarantee or loan. That being said, it is important to stress that such guarantees and loans are not necessarily unjustified or ill-advised. In essence, the issuance of central government guarantees and loans is a political decision. The objectives that form the basis for the decisions often contain other positive effects that outweigh the difficulties in managing the guarantees and loans. Transparency regarding these undertakings may nevertheless result in greater awareness of the problems they bring.

The data in Table 21 shows that there are guarantees and loans with characteristics that make estimating the expected loss more challenging (for parts of the portfolio where estimation of expected loss is required according to regulations). This mainly relates to guarantees and loans with very long maturities or for which the maturity is not regulated at all.

Unlimited guarantees or loans

A typical example of challenging characteristics for determining expected loss is guarantees or loan commitments without time and/or amount restrictions. Such guarantees and loans involve a certain arbitrariness in the risk assessment, which often applies primarily where there is no limit on the amount involved. In those cases, it is not possible to unequivocally determine the scope of the central government undertaking.

Guarantees or loans with long maturities

For guarantees or loans with a very long maturities – more than 20 years – it is also difficult to estimate the expected loss for the whole of the term in a non-arbitrary way.

Guarantees or loans to parties that are not economically viable

Another challenging characteristic concerns the issuance of guarantees or loans to counterparties that are not economically viable. One such example is companies that have financial difficulties due to a prolonged decline in sales or a weak capital structure.

Issuing a guarantee or loan in these circumstances increases the asymmetry between risk and reward that already exists between a company's owners and its creditors. In turn, this makes it difficult for the state as the issuer of guarantees or loans to assess and limit its credit risk. Determining the expected loss in a reliable way becomes difficult as well.

Guarantees for which the role of central government is unclear

A final example of challenging characteristics is when guarantees are issued to companies in which central government is also a major shareholder. Such dual roles make it challenging to assess the probability of the guarantee commitment being fulfilled because, in practice, this partly depends on an assessment of how central government in its role as an owner is expected to proceed if the company encounters difficulties. This problem arises mainly with guarantees that entail a pledge to inject new capital.

Table 21. Guarantees and loans with challenging characteristics, as at 31 Dec 2018, SEK billion

Challenging characteristic	Amount
Guarantees or loans with unlimited maturity ¹	8.4
Guarantees or loans with unlimited maturity and amount ²	21.1
Guarantees or loans with an original maturity exceeding 20 years	54
Guarantees or loans granted to counterparties not economically viable	-
Guarantees for which the role of central government is unclear	0.4
Total	83.9

Excluding the deposit insurance scheme (SEK 2,280 billion), callable capital (SEK 140 billion), student loans granted prior to 2014 (SEK 139 billion) and royalty- and conditional loans (SEK 1 billion) for which expected loss is not calculated.

¹ Outstanding amounts for guarantees with unlimited maturities. This mostly refers to guarantees managed by the Debt Office as well as Boverket.

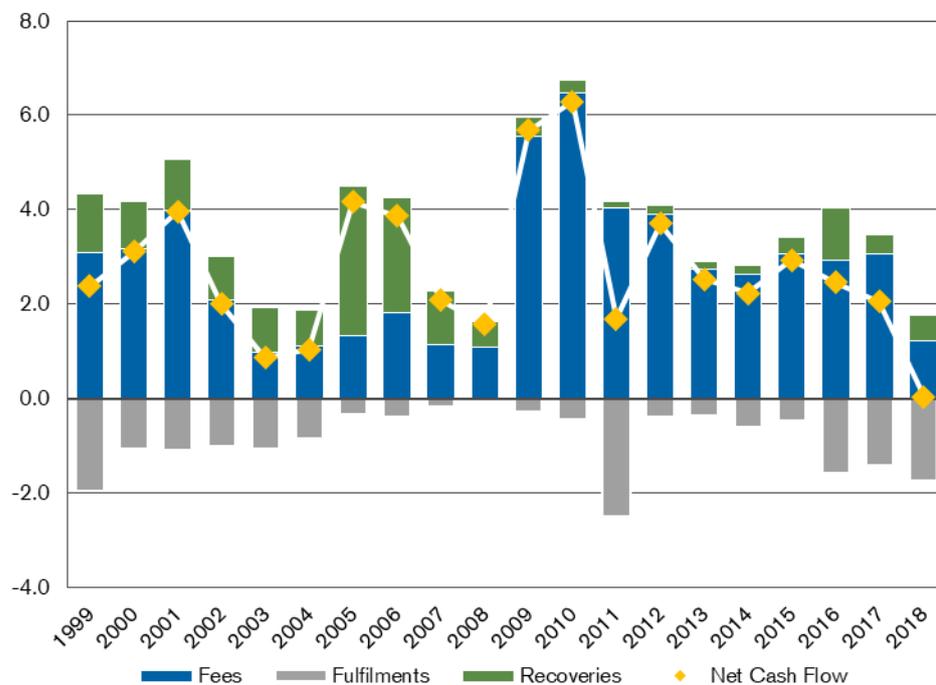
² Outstanding amounts for guarantees with unlimited maturities and amount. Refers to guarantees managed by the Debt Office.

Historical flows

Guarantees

For guarantees, there are mainly three types of flows: incoming payments of fees, outgoing payments due to guarantee commitments being fulfilled, and recoveries from previous fulfilments. These inflows and outflows vary over time, for example because the fulfilments tend to be higher in recessions. Several years can elapse between fulfilment and recovery. Consequently, it is natural for the size of inflows and outflows to differ during individual years.

Figure 19. Historical inflows and outflows in the guarantee portfolio 1999–2018, SEK billion



The central government's annual report, information for the 2016 annual report compiled by the Debt Office, and own computations.

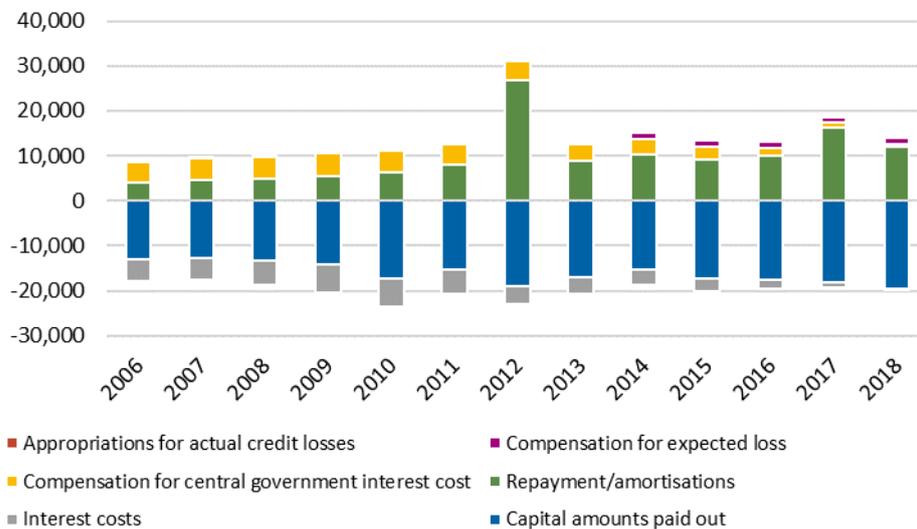
Lending with credit risk

Central government lending with credit risk is dominated by the Swedish Board of Student Finance's (CSN) student loans but also includes lending by the Debt Office. The large amortisation for 2012 refers to a loan to the Bothnia Line issued by the Debt Office.

The compilation of historical flows concerning central government lending in Figure 20 consists of capital amounts paid out, interest costs, repayment/amortisation, compensation for central government interest cost, compensation for expected loss, and appropriations for actual credit losses for the 2006–2018 period.

Flows relating to royalty loans are excluded from the figure.

Figure 20. Historical flows in the central government lending portfolio 2006–2018, SEK billion



Data from CSN and the Debt Office.

Appendix 4: Calculation of the risk of large losses

In a calculation example, expected and unexpected losses occurring over a three-year time horizon with less than 1 per cent probability have been estimated at 10 per cent of the portfolio's size, without taking into account any recoveries. When the calculations are stressed, the corresponding result is one percentage point higher. Note that there are several important limitations regarding the calculations, which is why the figures must be interpreted more as an indication of the risk level in the portfolio.

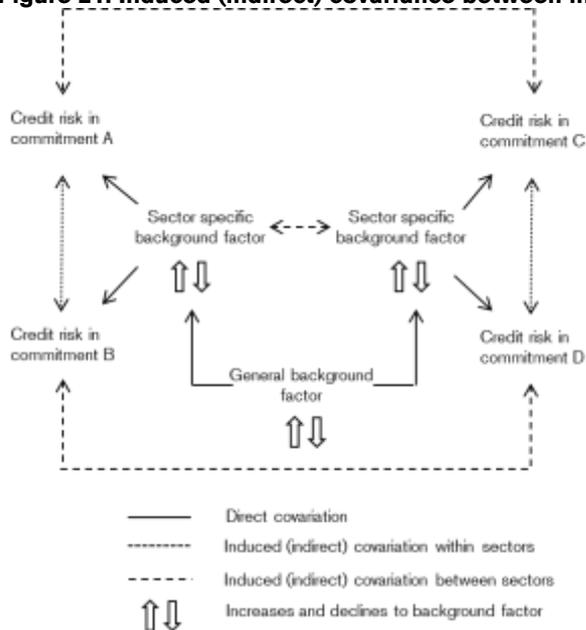
Quantitative portfolio model

Using a portfolio model, the qualitative risk analysis of the state's guarantee and lending portfolio can be supplemented with a quantitative analysis. The model developed by the Debt Office has been developed on the basis of established methodology – from the perspective of both academic studies and experience from professional practitioners. It has also been important that the model is rigorous, easy to use and can be explained in an understandable way.

The chosen model is, in simplified terms, based on variation of default rate for the commitments in the portfolio. The modelling is done with reference to individual guarantee holders' and borrowers' joint dependence on various background factors. This includes both specific background factors in regard to sectoral concentrations that occur as well as a general background factor that reflects general economic development (see Figure 21).

Thus, other levels are modelled than is normally the case. For example, if the modelled default frequencies are higher than normal, this reflects an increased likelihood of credit losses that coincide in clusters, i.e. an expression of (indirect) covariance that can lead to large losses.

Figure 21. Induced (indirect) covariance between individual guarantee and loan commitments



The box Modelling of covariance with a factor model provides an overview of the model. A technical and more detailed description is available on the Debt Office's website in the focus report calculations of the risk of large losses in the central government's guarantee and lending portfolio from 15 March 2017.

Usability and limitations of the model

No calculation model is better than the preconditions used in its design and implementation. Without knowledge and understanding of this, exact figures from a model can be interpreted as providing more information than they actually do. In the worst case, this can lead to the calculations being misinterpreted.

The model developed by the Debt Office provides a strict description of the factors and relationships that constitute important explanations for large losses in the portfolio. This means that there is a good chance of distinguishing a high-risk portfolio from a low-risk portfolio. The calculations thus contribute to increasing the transparency of the portfolio's risk profile further (not least by comparing the calculations over time). It is also the Debt Office's assessment that the results from the model provide an indication of the size of less probable losses.

At the same time, it should be noted that calculations with a portfolio model entail a reduced format for credit risk analysis. This is in part because, for a comprehensive portfolio, a large number of combinations of possible outcomes are to be explained using the model. Also, for credit losses in

general – and clusters of credit losses in particular – there is limited access to data.⁴⁸ Altogether, this means that minor changes in assumptions and/or data can have a significant impact on the calculation results. In addition, there is no opportunity to reliably evaluate the estimates generated by the portfolio model.⁴⁹ A number from a model that cannot be evaluated in a statistical test implies, in actuality, a qualified guess.

Thus, it can be concluded that there is analytical added value in implementing the calculations, but that they should be interpreted with caution.

Unexpected loss

Unexpected loss is illustrated by the spread around the expected loss in the portfolio for a given time horizon. However, there is no unambiguous definition of unexpected loss. The Debt Office has chosen to express the spread as the difference between the mean of the losses exceeding Value-at-Risk (VaR) for a specific confidence level, called conditional value-at-risk (CVaR) or expected shortfall, and expected loss. VaR, in simplified terms, refers to an amount that is not lost more than with a certain probability.

Unexpected loss = Expected shortfall – Expected loss

Expected shortfall (CVaR)

Unlike VaR, expected shortfall takes into account all losses above a specified level, instead of a single outcome. Expected shortfall is determined by calculating the expected loss *given that* the actual loss is greater than VaR for a chosen confidence level.

$$CVaR_{\vartheta} = E[L \mid L > VaR_{\vartheta}(L)]$$

Delimitations

The portfolio for which the calculations are made constitutes a subset of the regular portfolio, in which student loans and Boverket's guarantees are not included. In previous years, delimitations have also been made for all guarantees and loans that are less than SEK 5 million – but after optimisation of the calculation model, which reduces the time spent per simulation, these have been included in the calculations. Finally, the calculations are delimited as to maximum amount of fulfilments within the upcoming five-year period.

Student loans are not included

At present, it is not possible to include student loans (which account for just over 37 per cent of the regular portfolio) in the model in a way that is conceptually and methodologically consistent with the

⁴⁸ Credit losses rarely occur and only once for the same commitment. Thus, a fundamentally different situation applies to many other types of financial models – such as changes in market prices or macroeconomic variables that can be observed more or less continuously.

⁴⁹ In practice, the evaluation of the portfolio model is limited to validation of the logic and degree of reasonability in the model's design.

remaining parts of the portfolio. This is because concepts such as probability of default and recovery rate given default are not applied in CSN's operations and the necessary data is therefore missing.

Boverket's guarantees are not included

Boverket's fee model is developed solely for the purposes of determining expected loss in the guarantees it has issued. Therefore, Boverket does not have a method for estimating the probability of default and the expected recovery rate separately. The portfolio calculations require that these two components be distinguished from each other. However, there is no need for Boverket to produce these two components in any other context than for the portfolio calculations. Boverket's guarantees are therefore not included in the calculations. These comprise only a very small part of the regular portfolio and their exclusion has no significant effect on the calculation results.

Simplifications

A static portfolio

Amounts and credit rating assessments are based on the information compiled by the agencies in their annual accounts. The portfolio for which the calculations are made is kept unaltered for the respective period of time to which the calculations pertain (irrespective of the actual remaining maturities of the guarantees and the loans).

The risk of default contagion is handled outside the model

Modelling direct covariance due to business or legal obligations between different guarantee holders and borrowers is a complicated process. A simple, though conservative, solution is to merge the guarantees or loans in cases where such connections are deemed to exist.

Focus on name and sectoral concentrations

The analysis of concentrations in the calculations is limited to name and sectoral concentrations. Geographic concentrations are excluded due to a lack of data.

Fundamental approach

As empirical evidence is lacking, the assumptions are made in part because the guarantee holders or borrowers are uniquely linked to only one sector, and in part because the variation in the guarantee holder's or borrower's default rate is entirely explained by changes in the background factors in the modelling.

Specific basic assumptions

A quantitative analysis contains a number of necessary basic assumptions. The Debt Office has made the following choices:

- The calculations are made for a time horizon of one and three years, respectively.⁵⁰
- It may take several years before the final net loss (actual loss after any recoveries) can be determined following a default. At the same time, recoveries – partial or full – can even be made

⁵⁰ With the length of the time horizon, both the individual guarantee holders' and the borrowers' (cumulative) likelihood of default and the degree of covariance between them increases. Thus, the longer the time horizon, the greater the risk of unexpected loss.

in the short term. Therefore, both gross losses (losses irrespective of potential recoveries) and net losses are calculated.

Implementation

In accordance with the delimitations made, calculations are made for a portfolio totaling SEK 282 (297) billion and distributed among just over 2,900 (800) commitments.

Data

Data for the model has been taken from the international credit rating agencies' databases and methodology documentation:

- For each sector category in Table 12, the report has a time series compiled with the aggregate default rate for each sector.⁵¹
- For individual guarantees and loans, the default rate for various rating categories (for each time horizon) is matched with assessments of creditworthiness that each responsible agency makes in connection with expected losses recorded in the annual accounts.⁵²
- The recovery rates given default assessed by the responsible authority for the individual guarantees and loans in the portfolio have been divided into the categories high, normal and low recovery.⁵³
- For the connection between default rate and recovery rate given default, the correlation between the aggregate default rate and the recovery rate given default has been studied.⁵⁴

Monte Carlo simulation

The calculations have been performed using the Monte Carlo simulation method for making digital calculations with the model. The advantage of this method is that it is flexible. The disadvantage is the difficulty in obtaining a high level of precision in the calculations of less probable outcomes (which entails a risk of underestimating the so-called tail in the loss distribution). For each run of the model, 250,000 portfolio outcomes have been simulated.

Model uncertainty

Forward-looking calculations based on historical data add to the assumption that the course of events that forms the basis for the estimates of the parameters will recur in the future, which is

⁵¹ Standard & Poor's. *CreditPro® - Corporate Ratings. "Comparative Marginal Default Rate (percent, NR Included) Conditional on Survival, Number of Issuers (All), All Rated" (14/02/2019).*

⁵² Moody's Investors Service (2018). *Moody's Annual Default Study Corporate Default and Recovery Rates 1920–2017, Exhibit 35 – Average Cumulative Issuer-Weighted Global Default Rates by Alphanumeric Rating, 1983–2017. The default rates have then been adjusted with a smoothing algorithm developed by the Debt Office to produce "ideal default rates", i.e. default rates that are strictly increasing (decreasing) for lower (higher) ratings.*

⁵³ Moody's Investors Service (2015). *Moody's Approach to Rating Corporate Synthetic Collateralised Debt Obligations. Exhibit 3: Mean and Standard Deviation Assumptions by Asset Type, Seniority and Security.*

⁵⁴ Moody's Investors Service (2018). *Moody's Annual Default Study Corporate Default and Recovery Rates 1920–2017. Exhibit 31 - Annual Issuer-Weighted Corporate Default Rates by Alphanumeric Rating, 1983–2017 (All rated) and Exhibit 20 - Annual Defaulted Corporate Bond and Loan Recoveries (All Bonds).*

always associated with uncertainty. In addition, historical data is often limited to variations, and thereby risk, under normal circumstances.

One way to account for this is to perform supplementary calculations in which different parameters in the model are stressed. This entails adjustments in regard to situations that occur less frequently, but which are particularly unfavourable, and lead to more and larger credit losses.

The Debt Office has stressed the parameters by doubling the standard deviation for background factors included in the model. Also, the spread has increased around the expected recovery rate given default. At the same time, the Debt Office has assumed a high correlation between the default rate and rate of recovery given default in regard to changes in the general economic environment.

Results

Table 22 below summarises the results of the various calculations. The calculations when accounting for recoveries are shown in parentheses.

Table 22. Calculations of expected losses as at 31 December 2018, SEK billion

	<i>Expected loss</i>	<i>Unexpected loss</i>		
		<i>90%</i>	<i>95%</i>	<i>99%</i>
<i>Confidence level¹</i>	-			
<i>Base calculations</i>				
1-year time horizon	1.98 (1.46)	4.02 (4.54)	5.02 (5.54)	7.02 (7.54)
3-year time horizon	7.06 (4.86)	9.94 (9.14)	12.94 (11.14)	20.94 (19.14)
<i>Stressed calculations</i>				
1-year time horizon	1.79 (1.38)	4.21 (4.62)	5.21 (5.62)	8.21 (7.62)
3-year time horizon	6.86 (4.88)	11.14 (11.12)	14.14 (14.12)	24.14 (22.12)

¹ The higher the confidence level, the lower the probability of losses greater than those calculated for the selected confidence level.

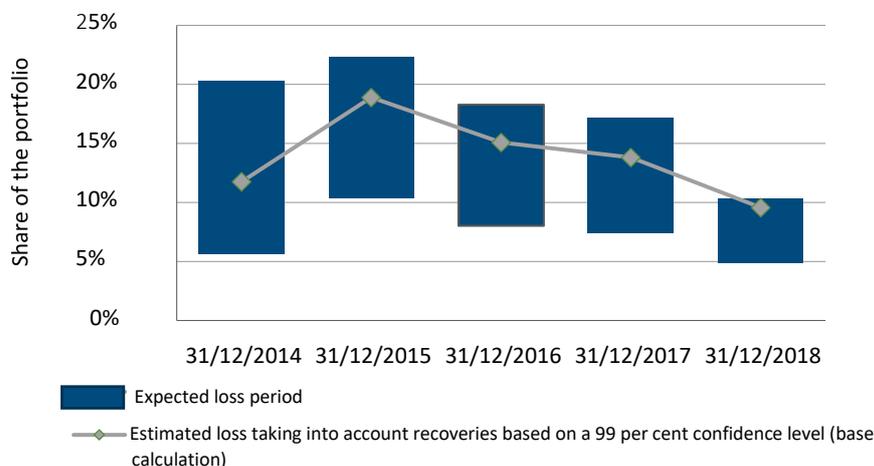
The losses simulated irrespective of recoveries are in, order of size, SEK 6–28 billion when expected and unexpected losses are compiled, which corresponds to 2–10 per cent of the portfolio in the calculation example. The wide range reflects the fact that the longer the time horizon and the higher the degree of confidence chosen is, the larger the simulated losses are – and vice versa.

When accounting for recoveries, the corresponding losses are naturally lower. The losses calculated are in the range of SEK 6–24 billion, which corresponds to 2–8 per cent of the portfolio.

When the model's parameters are stressed, the simulated losses increase to a range of 2–11 per cent of the portfolio irrespective of recoveries, and 2–10 per cent when accounting for recoveries.

Figure 22 compares the year's calculations for a three-year time horizon with comparable calculations from previous years.

Figure 22. Comparison over time of estimated losses for a three-year time horizon



As shown in the figure, the size and trend of the estimated losses have decreased since the prior year-end. The decrease is partly because the exposure in the calculations as at 31 December 2018 corresponds to the amounts that can be met within a five-year period.⁵⁵ In previous years, the exposure corresponded mainly to the total guarantee commitments, with only a few commitments adjusted for what could be fulfilled within a five-year period. Even without this change of method, exposure to borrowers and guarantee holders with a speculative grade rating has decreased compared with the previous year, which explains why the estimated losses in the portfolio have decreased since the previous year.

Modelling of covariance with a factor model

The Debt Office has chosen to develop a multi-factor model based on the established portfolio model CreditRisk+.⁵⁶ In technical terms, the specific model chosen is a Compound Gamma Model.⁵⁷

Background factors to explain indirect covariance

An established approach to modelling the risk for clusters of losses in a guarantee and lending portfolio is to use a factor model. This is a model in which covariance between

⁵⁵ The Debt Office did not have access to information about maximum fulfilment of one or three years when the calculations were made.

⁵⁶ CreditRisk+ was developed by Credit Suisse First Boston International, *CreditRisk+ A Credit Risk Management Framework* (1997). The model was never commercialised. Instead, the idea was from the beginning that the model could be modified after the user's requirements and preferences.

⁵⁷ Hickman, Andrew and Koyluoglu H. Ugur (1998): *Reconcilable Differences*. *Risk*, Volume 11, Issue 10. pp. 56–62.

different guarantee holders and borrowers are explained by a smaller number of background factors. To the extent that the creditworthiness of individual guarantee holders and borrowers depends on changes in the same underlying background factor(s), it can be assumed that their default rates indirectly covary.

Once it has been taken into account what different guarantee holders and borrowers have in common in terms of dependence on one or more background factors, it is possible to treat them as if they were independent.⁵⁸ This is a key step in designing most portfolio models. The reason is that it is much easier to make calculations of the risk of several losses at the same time.

Average default rates as background factors

The background factors explaining covariance between individual guarantee holders and borrowers differ between different factor models. Nevertheless, they are based on the same mathematical framework and basic elements.⁵⁹ The choice of specific factor model is less about accuracy and more about what is practically feasible.

Here, the Debt Office has chosen a factor model in which the background factors consist of the aggregate default rate for different sectors.

Covariance within and between sectors

In the portfolio model, the degree of covariance between different guarantee holders and borrowers depends on whether they belong to the same or different sectors.

For guarantee holders and borrowers in the same sector, it is assumed that the more the aggregate default rate for the sector varies over time, the stronger the covariance is between the guarantee holders and the borrowers in the sector. A concentration on a sector with large fluctuations in the aggregate default rate is assumed to entail a higher risk of loss clustering than the corresponding concentration on a sector with minor fluctuations.

Covariances between guarantee holders and borrowers in different sectors are modelled by taking into account the average correlation between the aggregate default rate in different sectors. In simplified terms, this means that the more correlated different sectors are altogether, the greater the impact of changes in the general economic development is on the risk of loss clustering.

By taking into account covariance both within sectors and between sectors, the model provides differing results for portfolios with different compositions – and thus different risk profiles.

⁵⁸ This implies a basic assumption of what is called conditional independence.

⁵⁹ Hickman, Andrew and Koyluoglu H. Ugur (1998): *Reconcilable Differences*. *Risk*, Volume 11, Issue 10. pp. 56–62.

The Swedish National Debt Office is the central government financial manager and the national resolution and deposit insurance authority. The Debt Office thus plays an important role in the Swedish economy as well as in the financial market.



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