

The Common Credit Assessment System for assessing the eligibility of enterprises

Under the Eurosystem's decentralised monetary policy framework, national central banks (NCBs) grant liquidity-providing refinancing and intraday credit to resident credit institutions. Sufficient eligible assets must be submitted as collateral for all Eurosystem lending operations. In order to protect the Eurosystem from financial risk, this collateral has to meet high credit quality standards. Eligible collateral for refinancing includes not only securities but also credit claims against non-financial corporations. This broad collateral framework promotes the equal treatment of counterparties throughout the euro area.

In order to establish whether credit claims meet the required high standard of credit quality, the Eurosystem relies, amongst other things, on NCBs' internal credit assessment systems (ICASs). The Bundesbank also operates a credit assessment system to measure enterprises' default risk, thereby expanding and simplifying the potential uses of corporate loans as collateral for monetary policy operations. Small and medium-sized institutions without an approved internal ratings-based (IRB) approach, in particular, can thus access central bank lending more easily. They can also submit credit claims against small and medium-sized enterprises (SMEs) as collateral, even when the enterprises concerned do not have an external rating.

The Bundesbank's use of credit claims as collateral at the beginning of the European monetary union (EMU) is rooted in the long tradition of rediscount business. With the introduction of the "single list" of collateral for monetary policy operations, corporate loans became eligible collateral throughout the euro area from 2007 onwards. During the financial crisis, banks' funding requirements rose, as did their interest in using credit claims as collateral. In order to assess the credit quality of SMEs as well, some of the Eurosystem's NCBs have built up new internal credit assessment systems.

The Bundesbank has recently redesigned its credit assessment system and transferred the model-based rating functionality to the Common Credit Assessment System (CoCAS) developed jointly by the Oesterreichische Nationalbank and the Bundesbank. CoCAS can also be used by other Eurosystem NCBs for their credit assessment procedures and thus forms a basis for harmonising the procedures for assessing credit risk in the Eurosystem. In addition, the Bundesbank has modernised the underlying mathematical models. Whereas at the beginning of EMU a distinction was made only between eligible and ineligible enterprises, a master scale similar in granularity to those used by external credit assessment institutions (ECAIs) is now in use.

Motivation for the Bundesbank's credit assessment system

Purpose of the credit assessment system

The Bundesbank uses its credit assessment system to estimate non-financial corporations' default risk.¹ Each bucket of the rating scale corresponds to an expected one-year probability of default. On the one hand, this credit assessment dictates whether credit institutions can pledge credit claims against these enterprises as collateral for monetary policy operations with the Bundesbank. On the other hand, in the case of eligible credit claims, the size of the haircut is based on the credit rating.

Added benefit

As an added benefit, the data collected for credit assessments also have a statistical use and are entered into the Bundesbank's financial statement data pool.² Macro and micro-economic studies are often based on the data collected in this way, including, for example, studies on monetary policy transmission³ as well as the regular article in the Bundesbank's Monthly Report entitled "German enterprises' profitability and financing".

Credit claims used as collateral have a long tradition in central bank refinancing ...

In some European countries, there is a long tradition of using credit claims as collateral in central bank refinancing operations. At the beginning of EMU, the Bundesbank's use of tier two assets, the eligibility of which it established itself, for monetary policy operations⁴ represented a continuation of its rediscount business, in which credit institutions could use trade bills as collateral for monetary policy operations.⁵ With the transition to the single list of collateral, credit claims replaced trade bills as eligible collateral.

... and provide a greater collateral buffer for credit institutions as well as more operational flexibility

Allowing credit claims to be submitted to the central bank as collateral widens the pool of eligible collateral for credit institutions. From the central bank's perspective, accepting credit claims can also have a positive effect if it means that, in total, banks are able to submit more – and more diversified – collateral as a counterweight to the volume of refinancing granted.

Compared with marketable assets, credit claims are less liquid⁶ and, as a rule, are not accepted between commercial banks as collateral for secured money market transactions. From the institutions' point of view, the opportunity costs of using credit claims as collateral for monetary policy refinancing operations are therefore low. On the other hand, it is easier to trade marketable assets on securities trading platforms or convert them into liquidity in the repo market, which is why their use as collateral for refinancing operations with the central bank is associated with higher opportunity costs for credit institutions than credit claims. This is particularly the case when the Eurosystem's monetary policy refinancing operations are conducted with full allotment, which leads to excess liquidity in the banking system and in the interbank money market.⁷

Between the start of 2007 and end of 2009, the collateral value of the credit claims submitted to the Bundesbank increased approximately sevenfold. The creation of the Bundesbank's electronic platform "Credit claims – submission and administration" (*Kreditforderungen – Einreichung und Verwaltung*, or KEV) in 2007 boosted this growth. The increase is likely to

¹ As a rule, credit claims against financial institutions are ineligible and no credit assessment is conducted by the Bundesbank.

² Besides data from the Bundesbank's credit assessment system, the financial statement data pool also comprises data from other suppliers.

³ See, for example, U von Kalckreuth, Monetary Transmission in Germany: New Perspectives on Financial Constraints and Investment Spending, Deutsche Bundesbank Discussion Paper, No 19/2001.

⁴ See footnote 4 in the box on p 35.

⁵ The basic idea behind this was to mobilise capital for corporate financing and to anchor the monetary policy transmission mechanism in the real economy by monetary policy stimuli being passed on directly to enterprises through the refinancing channel.

⁶ Since central banks also find it more difficult to convert credit claims into liquidity in the event of insolvency, they are subject to larger haircuts than marketable assets.

⁷ Interest rates in the repo market are often lower than the key interest rate applied to the Eurosystem's refinancing operations. The repo market gained significance in the financial crisis, while the scale of unsecured money market transactions between banks is still very much smaller than was previously normal because of increased risk perception. See Deutsche Bundesbank, The financial system in transition: the new importance of repo markets, Monthly Report, December 2013, pp 57-71.

The Eurosystem collateral framework

Equal treatment of counterparties

In the context of monetary policy operations in the Eurosystem, national central banks (NCBs) grant liquidity-providing refinancing and intraday credit to domestic credit institutions. Pursuant to Article 18.1 of the Statute of the European System of Central Banks and of the European Central Bank (ESCB Statute), all Eurosystem credit operations must be based on adequate eligible collateral. This is especially designed to ensure that the Eurosystem is protected against losses. As a rule, eligible monetary policy counterparties have access to Eurosystem monetary policy operations on equal terms if they have sufficient eligible collateral. In this respect, the Eurosystem remains competitively neutral towards banks when implementing monetary policy operations.

Neutrality with regard to institutions' business models

The Eurosystem accepts a wide range of marketable (interest-bearing securities) and non-marketable assets (eg credit claims). Together with the broad group of counterparties, the extensive collateral framework promotes the equal treatment of counterparties throughout the euro area. The fundamental neutrality of the Eurosystem with regard to the type of collateral accepted enables banks with different business models to participate in monetary policy operations – without the banks having to acquire or hold certain eligible assets in order to do this.

“High credit standards” for eligible collateral

The monetary policy framework¹ describes the acceptance criteria for eligible collateral in detail. One of the most important requirements is that the collateral must meet “high credit standards”. These are determined using the expected probability of default (over a one-year horizon) of the credit claim obligor, issuer of a security or, where rele-

vant, a guarantor. Currently, the probability of default must not exceed 40 basis points, which is equivalent to a long-term rating of at least BBB– by Fitch or Standard & Poor's, Baa3 by Moody's or BBBL by DBRS (investment grade). The definition of default in the monetary policy framework encompasses all defaults pursuant to Article 178 of the Capital Requirements Regulation (CRR).² The Eurosystem's credit quality steps (CQS) are broken down into eight different grades. Eligible collateral is usually graded in the first three CQSs, with these being subject to various haircuts.³

Single list

Since 2007, the eligibility criteria for collateral submitted for monetary policy operations and intraday credit have been harmonised across the Eurosystem in a single framework for eligible assets known as the “single list”. The single list replaced the former two-tier system which had been in place since the start of Economic and Monetary Union.⁴

Expansion of collateral framework

The collateral framework experienced several – sometimes far-reaching – changes

¹ See ECB (2011), The implementation of monetary policy in the euro area: General documentation on Eurosystem monetary policy instruments and procedures, valid from 1 January 2012, Chapter 6, available online at www.ecb.eu.

² See Official Journal of the European Union L 176/112 of 27 June 2013, available online at eur-lex.europa.eu.

³ The size of the current haircuts according to risk category and residual maturity is published on the ECB's website (www.ecb.europa.eu/mopo/assets/risk/liquidity/html/index.en.html).

⁴ Collateral was previously divided into two tiers. Tier one consisted of collateral that fulfilled euro-area-wide eligibility criteria. Tier two comprised collateral deemed to be of particular importance for national financial markets, which could only be submitted to the respective NCB. At the start of monetary union, tier two encompassed trade bills, credit claims and commercial paper, amongst others. See Deutsche Bundesbank, The creation of a single list of eligible collateral throughout the euro area, Monthly Report, April 2006, pp 29-38.

in the course of the financial crisis and subsequent sovereign debt crisis. In particular, the Governing Council cut the general credit quality threshold for eligible collateral at the beginning of the financial crisis, initially temporarily but later permanently, from A- to BBB-. As the sovereign debt crisis progressed, the Governing Council also approved specific national eligibility criteria for credit claims enabling the NCBs in question, at their own risk, to temporarily accept additional credit claims which do not have to meet the general eligibility criteria and which may also have a higher probability of default.⁵ Not least for this reason, the significance of credit claims as collateral for Eurosystem refinancing operations has grown markedly compared with that of marketable assets since the beginning of the crisis.

Credit claims currently account for around one-fifth of the total collateral volume of the assets submitted to the Eurosystem NCBs. The share of credit claims in the collateral volume of assets pledged to the Bundesbank is currently 13%, with loans to public debtors accounting for around half of this figure. These are not classified using the Bundesbank's credit assessment system but by credit rating agencies. The credit-worthiness of business enterprises is primarily determined using the Bundesbank's credit assessment system.

Framework for credit assessments

Together with the single list, a new framework for credit assessments (Eurosystem credit assessment framework: ECAF) entered into force in 2007. It defines the procedures, rules and techniques which ensure that the Eurosystem requirement of high credit standards for all eligible assets is met.

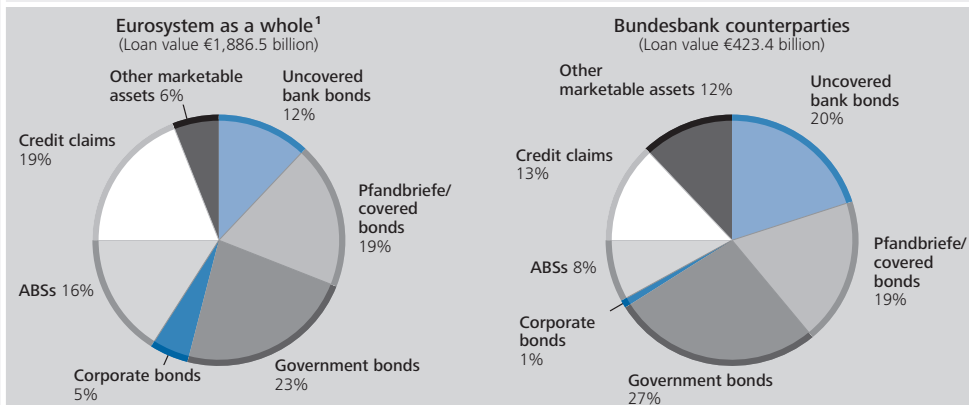
The ECAF is rooted in the principles of accuracy, consistency and comparability between the eligible credit assessment sources in the Eurosystem. It envisages four possible credit assessment sources for the evaluation of the credit standard of eligible assets. These are external credit assessment institutions (ECAIs), credit institutions' internal ratings-based (IRB) systems, third-party providers' rating tools and NCBs' in-house credit assessment systems (ICASs).⁶ Besides the Bundesbank and the Oesterreichische Nationalbank, the NCBs of Belgium, Spain, France, Italy and Slovenia also have an accepted ICAS to assess non-financial corporations.

⁵ The Bundesbank is not making use of this option. See the ECB's press release of 9 February 2012.

⁶ The monetary policy framework contains a detailed description of all ECAF rating sources, their respective eligibility criteria and characteristics. See also Deutsche Bundesbank, The creation of a single list of eligible collateral throughout the euro area, Monthly Report, April 2006, pp 29-38.

Use of collateral*

As at the third quarter of 2014



* Excluding term deposits.¹ Source: ECB. Deutsche Bundesbank

also be linked to institutions' growing liquidity needs during the liquidity and financial crisis and the higher quality requirements for collateral in the repo market. The subsequent slight decline in the collateral value of credit claims submitted to the Bundesbank is probably particularly attributable to the fact that the Bundesbank's counterparties then used monetary policy refinancing operations on a far smaller scale than at the height of the financial crisis. The share of credit claims in the collateral submitted to the Bundesbank by German counterparties rose continuously, however, from 5% in 2007 to 12% in 2010 and 13% in 2014 (see the chart on page 38).

NCBs' internal credit assessment systems increase the availability of assessment sources in the Eurosystem, ...

The NCBs' in-house credit assessment systems increase the availability of assessment sources in the Eurosystem and allow benchmarking of rating results. The growing number of internal credit assessment systems employed by NCBs shows that the Eurosystem is striving to expand capacity for internal ratings.⁸ The increasing diversification of credit assessment systems authorised by the Eurosystem is pushing up the volume of potentially eligible collateral.

... which benefits smaller credit institutions

The Bundesbank's credit assessment system makes it easier for small and medium-sized credit institutions in Germany which do not use IRB approaches or external rating tools to also submit their loans to small and medium-sized non-financial corporations as collateral for refinancing operations with the Bundesbank. Since all enterprises can have themselves assessed by the Bundesbank, SMEs also have access to an assessment system, whereas typically only large enterprises can afford to be rated by an ECAI or need such a rating for capital market purposes. In fact, 54% of the enterprises assessed by the Bundesbank are small or micro-enterprises.⁹ Just 0.3% of the enterprises undergoing a credit assessment have a rating from an ECAI authorised within the Eurosystem credit assessment framework (ECAAF).

Unlike ECAIs, the Bundesbank does not publish the results of its credit assessments because

they only serve internal Eurosystem purposes; the corporate data used in the process are treated as strictly confidential. Only the enterprise involved is informed of the results. The Bundesbank's monetary policy counterparties can find out which enterprises are eligible. The Bundesbank remains neutral and has no direct influence on the market for corporate loans.¹⁰

Bundesbank has no direct influence on the market for corporate loans

■ Credit assessment procedure

The Bundesbank's credit assessment procedure consists of two stages. The first stage is based on the annual accounts of the enterprises concerned. After financial ratios have been calculated from the annual accounts, statistical models derive a proposal for the enterprise's credit rating from these ratios. The second stage comprises expert analysis; Bundesbank analysts identify and examine additional quantitative and qualitative information that can have a material impact on the credit rating but that cannot be analysed sufficiently, or at all, in the first stage. Only after this is the final credit rating (notch) specified, which may correspond to the model proposal but which can also differ from it. The scope for deviating from the model proposal in favour of a better credit rating is limited, however.

Structure of the credit assessment

Operational credit assessments are conducted at the Bundesbank's Regional Offices, while Central Office is responsible for conceptual issues and manages the mathematical model and the technical system in particular. The decentralised structure of the credit risk assessment procedure facilitates closer contact with the enterprises, which may be intensified by

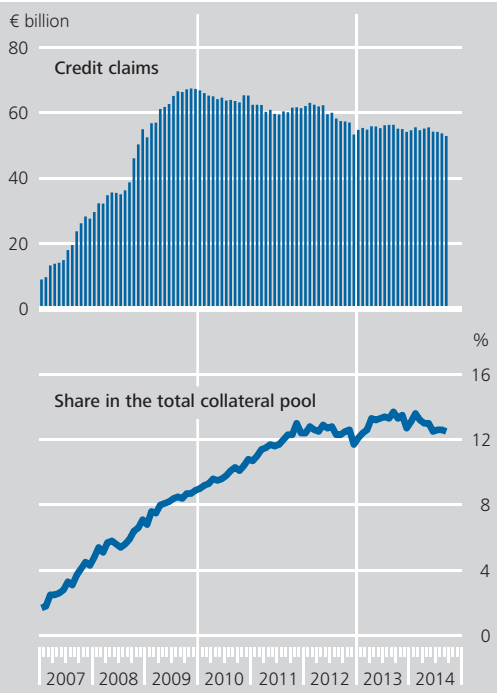
⁸ See the ECB's press release of 8 December 2011. In the last three years, three Eurosystem NCBs – the Italian, Slovenian and Belgian central banks – have set up their own internal credit assessment systems. At the same time, the number of IRB approaches approved for Eurosystem purposes has approximately tripled.

⁹ Within the meaning of the size definition for incorporated enterprises contained in sections 267 and 267a of the German Commercial Code (*Handelsgesetzbuch*).

¹⁰ Enterprises and credit institutions are not charged a fee for the credit assessment.

Collateral value of credit claims and share in the Bundesbank's total collateral pool

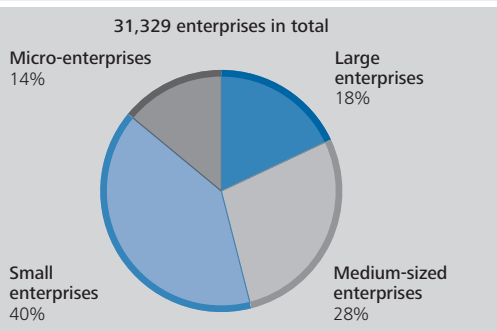
As at September 2014



Deutsche Bundesbank

Distribution of enterprise sizes* for enterprises evaluated in the last five years using the Bundesbank's credit assessment system

As at October 2014



* The definition is based on the size definition for incorporated enterprises contained in sections 267 and 267a of the German Commercial Code and stipulates the following.

Micro-enterprises are enterprises that do not meet at least two of the following conditions: employees > 10, total assets > €0.35 million, turnover > €0.70 million.

Small enterprises are enterprises that are not micro-enterprises and that do not meet at least two of the following conditions: employees > 50, total assets > €4.84 million, turnover > €9.68 million.

Medium-sized enterprises are enterprises that are not micro or small enterprises and that do not meet at least two of the following conditions: employees > 250, total assets > €19.25 million, turnover > €38.5 million.

Large enterprises are enterprises that meet at least two of the following three conditions: employees > 250, total assets > €19.25 million, turnover > €38.5 million.

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conducting an on-site interview with the management of the relevant enterprise.

If a credit institution wishes to submit credit claims against an enterprise to the Bundesbank as collateral, it can do so using the Bundesbank's KEV platform. If the Bundesbank does not have a current, valid rating for the enterprise from its credit assessment system, the responsible Regional Office contacts the enterprise concerned. By submitting its annual accounts for the last two years as well as additional information, the enterprise agrees both to the credit assessment being conducted and to the required data being used.¹¹ An enterprise can also approach the Bundesbank itself and request to receive a credit assessment.¹²

Procedure

Once the annual accounts have been received, the analysts at the Bundesbank's Regional Offices enter the individual items into the data management system of the Bundesbank's credit assessment platform. Around 30,000 sets of annual accounts are captured in this process each year. In addition, the enterprise's or group's master data, such as address, legal form, group affiliation and type of economic activity, are kept up to date.¹³ After the annual accounts data have been recorded, they are transferred to the Common Credit Assessment System, where the actual rating is assigned.

Data capture

11 To update the credit rating, the Bundesbank writes to enterprises that have already been rated in the following years and asks them to submit their new annual accounts (if they have not already done so).

12 The initiative for a credit assessment can come from either the submitting bank or the enterprise. It is irrelevant whether the enterprise meets high credit quality standards and its loan can potentially be submitted as collateral. The Bundesbank endeavours to broaden the group of assessed companies beyond the circle of eligible enterprises. This permits robust calibration of the credit assessment systems.

13 The Bundesbank analysts classify the type of economic activity using the "Classification of Economic Activities – with notes – 2008 edition" issued by the Federal Statistical Office.

The Common Credit Assessment System

The CoCAS project

Since 2011, the Bundesbank and the Oesterreichische Nationalbank (OeNB) have jointly operated a single platform called the Common Credit Assessment System (CoCAS) for conducting credit assessments of enterprises that apply the International Financial Reporting Standards (IFRSs) to their accounts. The OeNB and the Bundesbank created CoCAS between 2008 and 2011 as a joint project.¹⁴ The idea behind CoCAS was to develop a harmonised tool for model-based credit assessments on the basis of the uniform accounting rules in the IFRSs which may also be used by other Eurosystem NCBs as part of their respective credit assessment systems.

CoCAS contributes to harmonisation in the Eurosystem

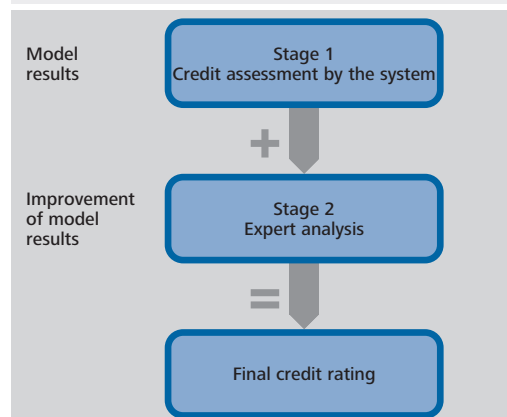
CoCAS thus opens up a path towards harmonisation for the internal credit assessment systems of different central banks in the Eurosystem, at least as far as the statistical analysis in the first stage is concerned. At present, CoCAS is used by its two providers, the OeNB and the Bundesbank, as well as by the central banks of Spain and Belgium, and from 2015, by the Portuguese central bank.

Since CoCAS can be configured very flexibly, it can be used for different mathematical models which can also be based on national generally accepted accounting principles (GAAP). Since 2014, the OeNB and the Bundesbank have also shared models in CoCAS for enterprises that use the accounting standards of the Austrian Commercial Code (*Unternehmensgesetzbuch*) and the German Commercial Code (*Handelsgesetzbuch*) respectively.¹⁵

The CoCAS model

The OeNB developed the methodology for the CoCAS mathematical models in cooperation with the Vienna University of Economics and Business.¹⁶ Originally, this methodology was intended to produce credit ratings for the IFRS annual accounts of German and Austrian groups of companies. These are large, capital-market oriented groups with low default

The Bundesbank's credit assessment procedure



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rates.¹⁷ The idea behind the approach is to consider internal and external ratings (from credit institutions and ECAs) in addition to the default data and balance sheet ratios used in binary classification methods, as this allows for a more precise forecast of the probability of default.

The CoCAS model design is based on a three-step estimation procedure. The first step considers available internal and external ratings to determine a "consensus rating" for the relevant enterprise in the form of a score. This score expresses the average market perception of the enterprise, ie the mean of assessments carried out by credit institutions and ECAs. The internal ratings captured by the model are taken

Model design

¹⁴ The Bundesbank is mainly tasked with developing and operating the IT infrastructure, while the OeNB's chief responsibility is for model development processes.

¹⁵ This was only possible because the accounting rules contained in the Austrian and German Commercial Codes are very similar. The OeNB had already been transferring the ratings of enterprises that use the Austrian Commercial Code accounting standards to CoCAS since 2012.

¹⁶ With regard to the methodology, see K Hornik, R Jankowitsch, C Leitner, M Lingo, S Pichler and G Winkler (2010), A latent variable approach to validate credit rating systems, in: D Rösch and H Scheule (eds), *Model Risk in Financial Crises*, pp 277-296.

¹⁷ For this reason, the traditional rating procedures based on logit/probit models, discriminant analyses, neural networks or support vector machines are unsuitable for these data, as they require a sufficient number of defaults for precise calibration.

The CoCAS model

The Common Credit Assessment System (CoCAS) classifies an enterprise by forecasting the consensus rating. This forecast is based on a linear equation of the score with typical ratios from the analysis of annual accounts.¹

For groups using the International Financial Reporting Standards (IFRS), a model with six ratios is applied. The forecast of the score for enterprise i takes the following form.

$$\hat{S}_i = \hat{\alpha}_0 + \hat{\alpha}_1 X_{i1} + \hat{\alpha}_2 X_{i2} + \hat{\alpha}_3 X_{i3} + \hat{\alpha}_4 X_{i4} + \hat{\alpha}_5 X_{i5} + \hat{\alpha}_6 X_{i6}.$$

By contrast, for enterprises using German Commercial Code accounting standards, a complex methodology comprising one basic model and several sector models is applied. The basic model with four ratios is identical for all enterprises and similar in terms of structure to the IFRS model. Subsequently, each enterprise is assigned to exactly one of 11 sectors according to its classification of economic activities; different models are applied to the different sectors. Accounts consolidated according to the German Commercial Code are assigned to a specific group model, which means that there is a total of 12 sector models ($j(i) \in \{1, \dots, 12\}$). The forecast from the basic model

$$\hat{G}_i = \hat{\alpha}_{0,G} + \hat{\alpha}_{1,G} Y_{i1} + \hat{\alpha}_{2,G} Y_{i2} + \hat{\alpha}_{3,G} Y_{i3} + \hat{\alpha}_{4,G} Y_{i4}$$

is an input variable of the forecast of the respective sector model, which comprises three additional sector-specific ratios.

$$\hat{S}_i = \hat{\alpha}_{0,j(i)} + \hat{\alpha}_{1,j(i)} X_{i1,j(i)} + \hat{\alpha}_{2,j(i)} X_{i2,j(i)} + \hat{\alpha}_{3,j(i)} X_{i3,j(i)} + \hat{\alpha}_{4,j(i)} \hat{G}_i.$$

$X_{i1,j(i)}$ represents the value of the first sector ratio for enterprise i in sector j , while $\hat{\alpha}_{1,j(i)}$ denotes the coefficient of this ratio. The sector model j used for the forecast depends on the classification of economic activities of enterprise i .

The advantage of this construction is that the uniform basic model enables comparisons between enterprises from different sectors and that classification changes resulting from an enterprise being assigned to a different sector are kept to a minimum. In addition, the breakdown into basic and sector models reduces the maximum total number of model ratios to be used. The table below provides an overview of the combination of ratios in the basic and sector models using wholesale trade as an example.²

An example of the models currently used for enterprises and groups using German Commercial Code accounting standards

Model	Ratio	Category
Basic model	Earnings before interest, taxes and depreciation	Size
	Total indebtedness ratio (adjusted)	Capital structure
	Capital interest burden	Expense structure
Wholesale trade	Liquidity ratio 1	Liquidity
	Short-term capital commitment	Liquidity
	Cash flow as a percentage of total assets	Cash flow
	Return on sales before extraordinary effects	Profitability

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¹ The score is a continuous variable which represents the consensus rating and is determined in the first step of model development. Risk classifications by banks are taken from the central credit register to estimate the consensus rating.

² The ratios used in the models are listed in the following documents, which can be found on the Bundesbank's website at www.bundesbank.de under Tasks => Monetary policy => Collateral => Downloads. These comprise "The Bundesbank's credit assessment process" for the basic model ratios and "Bonitätsanalyse der Deutschen Bundesbank für Konzerne, die nach International Financial Reporting Standards (IFRS) bilanzieren" (available in German only) for all IFRS models.

from the prudential reports of IRB-approach credit institutions submitted to the national credit registers of the central banks participating in CoCAS.¹⁸ The model therefore captures prudential data on each company from a variety of different sources. In terms of German banks using the IRB approach, approximately 24,500 reports are currently used per quarter. With regard to enterprises that apply IFRS accounting standards, the model additionally considers external ratings from ECAs accepted by the Eurosystem.¹⁹ Although the model uses ratings from institutions applying the IRB approach and ECAs, it also takes account of the specific deviation of each rating entity from the market view (bias) and makes adjustments for this in the “consensus rating”.

In the second step of the estimation procedure the consensus rating is linked to ratios from the enterprises’ annual accounts via a linear regression. The ratios serve to explain the consensus rating and the process behind it.

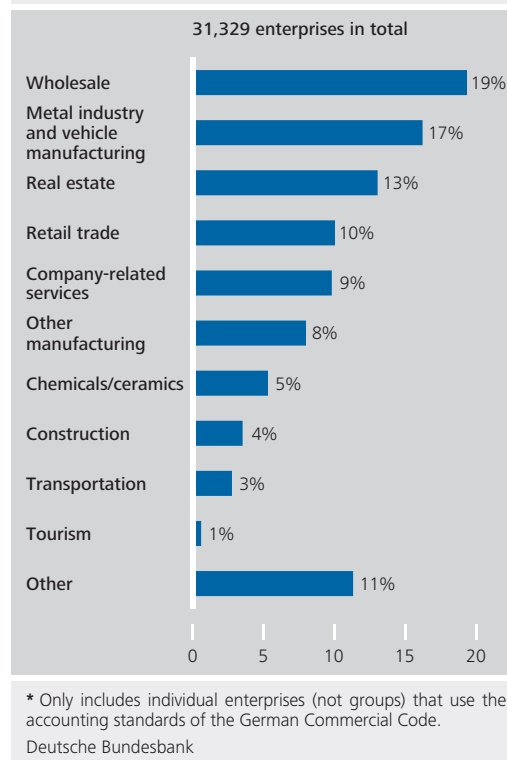
The first step in selecting the ratios is to establish a comprehensive catalogue of potentially suitable ratios. The decisive criteria in this respect are plausibility, interpretability and informative value from a business perspective. Statistical techniques are then used to identify the most relevant ratios for predicting the consensus rating. Significance, accuracy, robustness and data availability play an important role in this regard.

Care is also taken to ensure that traditional ratios covering profitability, balance sheet structure and liquidity as well as the ability to generate cash flow are taken into account. The catalogue of ratios and the selected ratios are reviewed on an annual basis using current annual accounts data.

The third step involves a comparison of the average probability of default expected by the model and the empirically observed default rate. If the empirical default rate is significantly

Sector distribution of enterprises evaluated in the last five years using the Bundesbank’s credit assessment system*

As at October 2014



greater than that suggested by the model, the model is recalibrated to be more conservative.

The model design results in a linear equation that has fixed parameters and is based on the selected ratios. This equation forecasts a score²⁰ for the given ratios which is then assigned to a notch on the Bundesbank’s rating scale.

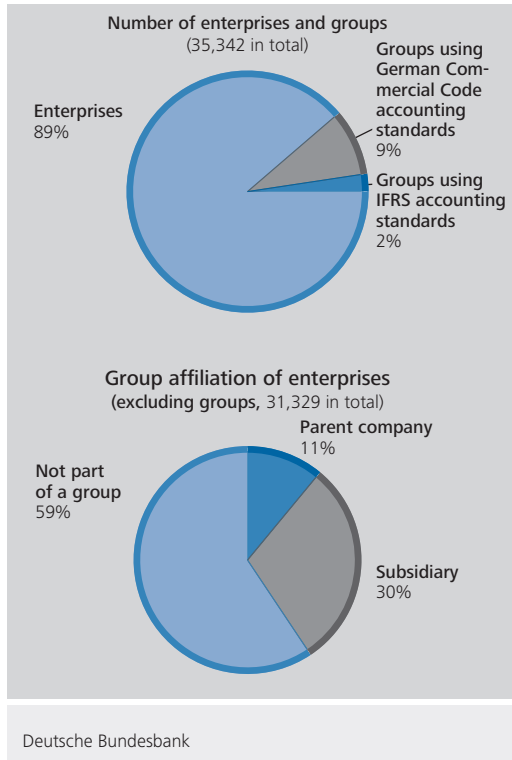
¹⁸ The credit register in Germany is administered by the Central Credit Register for Large Exposures and Loans of €1.5 Million or More (*Groß- und Millionenkreditevidenzzentrale*). The relevant rules on the reporting procedure are set out in the Regulation governing large exposures and loans of €1.5 million or more (*Großkredit- und Millionenkreditverordnung*) and the Audit Report Regulation (*Prüfungsberichtsverordnung*) – available at www.bafin.de – as well as section 14 of the German Banking Act (*Kreditwesengesetz*).

¹⁹ For enterprises using national accounting standards, only the respective prudential reports of German and Austrian credit institutions applying the IRB approach are used. This is because this data set contains a large number of small and medium-sized enterprises, for which the number of ratings from ECAs is insufficient.

²⁰ This score can correspond to the consensus rating, but may also differ from it.

Group structure of enterprises evaluated in the last five years using the Bundesbank's credit assessment system

As at October 2014



Advantages of CoCAS methodology

The innovation of the CoCAS methodology vis-à-vis traditional rating models is that it is not directly dependent on the availability of a minimum number of default events to provide robust estimates. In addition to capturing binary default events, the model design also takes into account enterprises' quantitative credit ratings, which are condensed in the first step of the model.

In the second step, the condensed prudential reports of the banks replace default events as the endogenous variable used to estimate model parameters. This second step marks a return to the original level of analysis involving annual financial ratios, irrespective of whether a rating exists for the enterprise in question. The credit assessment model – and thus also the credit rating calculated via CoCAS – therefore always departs in the details from the banks' assessments. Nevertheless, the model is able to provide a better explanation of market perception than conventional models based on

default data because it is based on more diverse information.

Actual defaults are only taken into account in the third step. Should credit institutions and ECAs have been mistaken on aggregate in their assessment of the enterprises' credit-worthiness, the third step of the calibration allows for a conservative correction to be made to the forecast.

Supplementary qualitative and quantitative expert analysis

The model-based credit risk assignment performed by the system in the first step of the rating procedure is essentially based on the balance sheet and the profit and loss account as well as the resulting ratios for the respective enterprise. However, this is insufficient for a reliable credit rating. First, there is a large amount of additional information not contained in annual accounts data that can be relevant for a credit rating but which cannot be sufficiently captured by a statistical model. Second, the delay between the reporting date/the compilation of the annual accounts and submission to the Bundesbank is unavoidable. It is therefore not possible for the relevant annual accounts data to be completely up to date. Third, the data can be distorted by special factors and one-off effects, meaning that the informative value of the ratios used in the first step, and thus the statistical model's proposal, may need to be revised in individual cases. This is why the model-based first step needs to be supplemented with an expert analysis carried out by analysts.

In principle, all relevant qualitative and quantitative information not already evaluated in the first step can be taken into account in the second step, provided this information is available to the Bundesbank's internal credit assessment system or can be procured at reasonable expense.

Necessity of the second step of the credit assessment system

Factors taken into account in the second step of the credit assessment system

Credit ratings of the Deutsche Bundesbank and of external rating agencies accepted by the Eurosystem

Item		Deutsche Bundesbank (notches)	S&P long-term	FITCH long-term	Moody's long-term	DBRS long-term	
Investment grade	Eligible PD ≤ 0.1% CQS 1-2	1	AAA	AAA	Aaa	AAA	
		2+	AA+	AA+	Aa1	AA (high)	
		2	AA	AA	Aa2	AA	
		2-	AA-	AA-	Aa3	AA (low)	
		3+	A+	A+	A1	A (high)	
	Eligible 0.1% < PD ≤ 0.4% CQS 3	3	A	A	A2	A	
		3-	A-	A-	A3	A (low)	
		4+	BBB+	BBB+	Baa1	BBB (high)	
		4	BBB	BBB	Baa2	BBB	
		4-	BBB-	BBB-	Baa3	BBB (low)	
Non-Investment grade	Non-eligible PD > 0.4% CQS ≥ 4	5+	BB+	BB+	Ba1	BB (high)	
		5	BB	BB	Ba2	BB	
		5-	BB-	BB-	Ba3	BB (low)	
	6+	6	B+	B+	B1	B (high)	
		6	B	B	B2	B	
		6-	B-	B-	B3	B (low)	
		7	7	CCC+	CCC+	Caa1	CCC
			7	CCC	CCC	Caa2	CC
			7	CCC-	CCC-	Caa3	C
			7	CC	CC	Ca	
		7	C	C	C		
8	SD/D	RD/D		D			

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Cash flow statement

In order to ensure that the classification of cash flow ratios for all enterprises/groups is as standardised as possible, the OeNB and the Bundesbank have produced their own type of cash flow statement, which is based on conventional approaches to cash flow analysis, using the annual accounts data of enterprises that apply national accounting standards. The aim is to provide analysts with as uniform a view as possible of enterprises' and groups' liquidity flows (inflows and outflows), as not all enterprises using national accounting standards are required to produce a cash flow statement.

Treatment of groups

When determining credit ratings, groups are subject to a special set of rules that take into account dependencies within the group. This applies in particular if a company belonging to the group is in default. Approximately 40% of enterprises assessed by the Bundesbank are part of a group.²¹ For this reason, the Bundesbank's provisions governing groups stipulate, among other things, that as a rule no company

belonging to a group can be given a better rating than the group as a whole. The group is given its own rating by the Bundesbank based on the consolidated annual accounts.

Risk classifications from credit institutions and default events reported in the credit register are available to analysts on a quarterly basis. Furthermore, the Bundesbank also takes into account all court insolvency proceedings registered in the portal of the justice authorities of the federal and state governments.²² Default events pursuant to Article 178 of the Capital Requirements Regulation (CRR) result in the enterprise in question being assigned to the lowest rating, provided these default events are material pur-

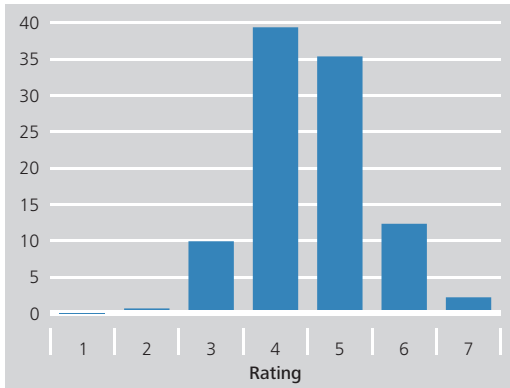
Reports from credit institutions

²¹ See chart on p 42 concerning group structure. Enterprises in a group can either be categorised as a parent company or a subsidiary. Depending on their capital market orientation, groups publish their consolidated annual accounts either using IFRS accounting standards or the accounting standards of the German Commercial Code.

²² www.insolvenzbeamtungen.de.

Distribution of rating classes for enterprises not currently in default and with a valid credit rating

%, as at 14 November 2014



Deutsche Bundesbank

suant to the CRR and not temporary in nature. Materiality is determined on the basis of the credit volume and is considered to exist if the defaulted credit volume is equal to or exceeds 2.5% of the enterprise's total credit amount.²³

Other important aspects

Moreover, the analyst can take other important aspects into account. These include the market and sector environment, the current market and business developments, the competitive situation, relationships with customers and suppliers, information about the management and external credit ratings from ECAs. Important sources of information in this respect include, in particular, quarterly bulletins, business evaluations, press reports and notices from the respective enterprise, but also information gained from direct contact with the enterprise. Overall, therefore, the second step of the credit assessment system provides a far more comprehensive and up-to-date picture of an enterprise's creditworthiness than is possible with the first step alone.

Final credit rating

Based on the aforementioned comprehensive analysis of all information, the enterprise is given a final credit rating class of between 1 and 8 on a scale containing a total of 18 notches. The notches 1 to 4- cover eligible companies (corresponding to the Eurosystem's Credit Quality Steps (CQS) 1 to 3) and 5+ to 8

cover non-eligible companies (CQS 4 to 8). Rating 8 is for enterprises in default (see the table on page 43). The rating is generally valid for one year, but can be changed at any time on the basis of current information. The master scale used by the Bundesbank draws on the rating scales of ECAs accepted by the Eurosystem. The status "eligible" is comparable to investment grade. Of the roughly 21,500 evaluated non-financial corporations with a valid rating,²⁴ approximately 12,000 are classified as eligible and roughly 9,500 have a rating of 4, which includes the notches 4+, 4 and 4-.²⁵

Fact sheet and balance sheet evaluation

The Bundesbank informs the enterprises of the result of the eligibility assessment in writing. This includes an independent assessment of their financial structure in comparison with peers in the same sector and over time. Documents provided in this context include a fact sheet and a balance sheet evaluation. The fact sheet contains the credit rating as well as multi-year and sectoral reference data for relevant ratios. These benchmark data relate to a peer group from the same sector and turnover size category as the enterprise. The balance sheet evaluation additionally draws on a multi-year comparison of key data from the cash flow statement.

■ Outlook

The in-house credit assessment systems of national central banks enlarge and diversify the available pool of eligible collateral for monetary policy refinancing operations and make an important contribution to the efficient implementation of monetary policy in the Eurosystem.

²³ With regard to the problem of aggregating divergent default reports from credit institutions see M Bingmer and L Auria (2013), The Implementation of the Basel II Default Definition by Credit Risk Assessment Systems: An Analysis of Possible Aggregation Procedures, in Global Credit Review, Vol 3, World Scientific Publishing Company and Risk Management Institute, NUS, pp 43-55.

²⁴ This figure refers to a specific reporting date and depends on the term of validity of the individual credit ratings.

²⁵ In the last five years, actual default rates in the rating categories classified as eligible were always lower than the official thresholds for the expected probability of default.

By modernising credit analysis procedures via CoCAS, the OeNB and the Bundesbank have laid solid groundwork for future developments. The flexible configurability of CoCAS makes it possible to quickly take into account new accounting rules and different national GAAP. An increasing number of the Eurosystem's central banks are participating in CoCAS as users. The system is therefore facilitating the harmonisation of statistical model-based credit analysis within the Eurosystem.

In addition, it is important to ensure that the various procedures are further improved and that current developments such as the modernisation of accounting law, the electronic submission of annual accounts, the definition of default and the modernisation of credit registers are taken into account. Finally, the OeNB and the Bundesbank also strive to draw on current developments in theoretical model research on an ongoing basis.