VALUATION OF FINANCIAL GUARANTEES

REVIEW OF FINANCIAL MODELS

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List of Abbreviations

The following abbreviations and symbols are used in this guide:

AAF	Annuity adjustment factor
ABL	Asset-backed loan
ac.finance.CDS	Excel/java based CDS and financial guarantee valuation tool developed as part of this guide
CDS	Credit Default Swap
CNS	Corporate Note Search
CUP	Comparable uncontrolled price
EAD	Exposure at default
FRN	Floating-rate note
L/C, LoC	Letter of Credit
LGD	Loss given default
MYCA	Market Yield Curve Analysis
NPV	Net present value
OECD Guidelines	"BEPS Actions 8 – 10, Financial Transactions", a draft published in July – September 2018 for the purposes of public discussion
PD	Probability of default
ROE	Return on equity

Section 1 Introduction

Loan guarantees are an example of risk transfer analysis. While the transactions are not as common as loan transactions, they are relatively common and the analysis of loan guarantees is included in the OECD guidelines. The OECD guidelines state that, similar to loan analysis, a loan guarantee analysis should involve two components: (i) a debt capacity assessment of the borrower to estimate whether the guarantee fee applies to the full or partial loan balance[1]; and (ii) guarantee fee pricing. In practice, the transfer pricing analysis is limited in most cases to pricing only.

This guide covers the analysis of single guarantees only, which involve one guarantor and one guaranteed entity. Cross guarantees with multiple borrowers and multiple guarantors are covered in a separate "Cooperative Games" guide.

1.1 Objective

The objective of this guide is to review financial guarantee valuation models from different angles: (i) from the perspective of existing practice to perform the analysis of financial guarantees; (ii) from the perspective of standard models developed in financial theory; and (iii) from the perspective of the OECD guidelines on financial guarantee valuation methods.

Each angle has typically a different focus. For example, the focus of the financial theory is to develop a formal valuation model for a financial transaction in which the market price is derived based on the explicitly stated underlying assumptions and formally defined model concepts. From the existing practice perspective, the focus is to implement the valuation model with less emphasis on theoretical aspects of the model and larger focus on potential practical problems and proper documentation of the results. The focus of the OECD guidelines is to summarize the existing practice as a list of general valuation principals and methods.

As part of financial theory review, current guide describes two standard CDS valuation models developed by (i) Darrell Duffie and (ii) John Hull and Alan White. The guide develops then the extensions of the CDS models for the intercompany loan guarantees.

As part of OECD guidelines review, the guide summarizes the methods listed in the OECD guidelines. With the exception of a standard CUP method, the list includes the following methods applied traditionally in transfer pricing: (i) Yield method, (ii) Cost method, (iii) Expected Loss method, and (iv) Capital Support method.

If a transfer pricing practitioner plans to apply Cost or Capital Support transfer pricing method, then this guide will not provide any support for the methods from the theoretical perspective (the methods are outside the scope of this guide). The focus of the guide is to provide a formal theoretical framework for the Yield and Expected Loss methods. Note that while the results of the analysis performed (i) based on the OECD guidelines and (ii) based on the theoretical CDS valuation models and their extensions should generally coincide, there are still certain conceptual differences in how the results shall be interpreted. Note also that the OECD guidelines describe only generic valuation principals and implementation of the valuation

[1] This part of the guarantee fee analysis is referred to as transaction delineation in the OECD guidelines.

methods in existing transfer pricing practice may not be in line with the theoretical models (which are very precise and formal with respect to how the valuation shall be performed).

The guide provides recommendations on how to perform the analysis of financial guarantees so that (i) the analysis is fully consistent with the theoretical models and (ii) the analysis is documented so that it is consistent with the OECD guidelines (properly interpreted).

1.2 Terminology

The section presents terminology and definitions used in the analysis of the financial guarantees. First, we provide definitions of different guaranteed or collateralized financial instruments.

Loan guarantee: A loan guarantee, in finance, is a promise by one party (the guarantor) to assume the debt obligation of a borrower if that borrower defaults. A guarantee can be limited or unlimited, making the guarantor liable for only a portion or all of the debt.[2]

Asset Backed Loans (ABL): ABL are collateralized credit facilities that are typically provided to borrowers with high financial leverage and marginal cash flows. Asset backed lending's primary focus is on collateral and liquidity with leverage and cash flow being secondary considerations. Borrowings under an asset-based facility are limited by the collateral base, which is measured by liquidation value of accounts receivable, inventory and fixed assets rather than by reference to direct, ongoing cash generation capacity.[3]

Credit Default Swap (CDS): A credit default swap is a financial swap agreement that the seller of the CDS will compensate the buyer in the event of a debt default (by the debtor) or other credit event. That is, the seller of the CDS insures the buyer against some reference asset defaulting. The buyer of the CDS makes a series of payments (the CDS "fee" or "spread") to the seller and, in exchange, may expect to receive a payoff if the asset defaults.

In the event of default, the buyer of the CDS receives compensation (usually the face value of the loan), and the seller of the CDS takes possession of the defaulted loan or its market value in cash. However, anyone can purchase a CDS, even buyers who do not hold the loan instrument and who have no direct insurable interest in the loan (these are called "naked" CDSs). If there are more CDS contracts outstanding than bonds in existence, a protocol exists to hold a credit event auction. The payment received is often substantially less than the face value of the loan.

Most CDSs are documented using standard forms drafted by the International Swaps and Derivatives Association (ISDA), although there are many variants. In addition to the basic, single-name swaps, there are basket default swaps (BDSs), index CDSs, funded CDSs (also called credit-linked notes), as well as loan-only credit default swaps (LCDS).

A CDS is linked to a "reference entity" or "reference obligor", usually a corporation or government. The reference entity is not a party to the contract. The buyer makes regular premium payments to the seller, the premium amounts constituting the "spread" charged by the seller to insure against a credit event. If the reference entity defaults, the protection seller pays the buyer the par value of the bond in exchange for physical delivery of the bond, although settlement may also be by cash or auction.

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[2] https://en.wikipedia.org/wiki/Loan_guarantee

[3] https://en.wikipedia.org/wiki/Asset_backed_lending

A default is often referred to as a “credit event” and includes such events as failure to pay, restructuring and bankruptcy, or even a drop in the borrower’s credit rating. CDS contracts on sovereign obligations also usually include as credit events repudiation, moratorium and acceleration. Most CDSs are in the $10–$20 million range with maturities between one and 10 years. Five years is the most typical maturity.[4]

CDS contracts can generally are viewed as market comparables for the loan guarantees. However it is typically assumed that CDS contracts are purchased from banks with high (A or above) credit rating and as a result the systematic risk of default by the CDS seller (counter-party risk) is not material and can be disregarded.[5] Within the transfer pricing context, the counter-party risk in a loan guarantee is often one of the key risk factors which should be adjusted for in the guarantee valuation analysis.

Next we provide some definitions related to the structure of the financial guarantee transaction.

Guarantor: seller of the guarantee contract. In the context of the intercompany transactions we assume that the Guarantor is parent of the group (Parent).

Guaranteed entity: buyer of the guarantee contract. In the context of the intercompany transactions we assume that the guaranteed entity is a bank (Bank).

Reference entity: the entity against which default the guarantee is issued. In the context of the intercompany transactions we assume that the reference entity is a subsidiary of the parent group (Subsidiary). In the context of the guaranteed loan transactions we refer to the subsidiary entity as the borrower (Borrower).

Credit event: the event that triggers the compensation from the guarantor to the guaranteed entity under the guarantee contract. In the notes, the credit event is assumed to be a default by the reference entity on its debt obligations. However, in general credit event may include for example a downgrade in the credit rating of the reference entity, etc.

Marginal probability of Default (PD or p_t): marginal probability that the credit event is triggered during the period. For partial period Δt, the probability of default during the period is equal to $p_t \times \Delta t$. We distinguish between the marginal and cumulative PD values.

Cumulative probability of default (CPD or P_t): cumulative sum of default probabilities between periods 0 and t ($P_t = \sum_{s \leq t} p_s$).

Survival probability ($1 - P_t$): probability of non-default until period t;

Hazard Rate (h_t): hazard rate represent the PD value in period t conditional on the event that the credit event was not triggered prior to period t ($h_t = \frac{p_t}{1-P_t}$). For partial period Δt, the hazard rate is defined as $h_t = \frac{p_t \times \Delta t}{1-P_t}$.

Exposure in the guarantee contract: the maximum payout from the guarantor to the guaranteed entity in the case if the credit event is triggered. In the case of the guaranteed loan, the exposure is equal to the loan face value.

[4] https://en.wikipedia.org/wiki/Credit_default_swap

[5] In practice CDS contracts can create a large risk exposure for a bank.

Recovery rate (R): the recovery rate measures (in percentage points) the losses that are expected to be recovered by the guarantor in the case of the credit event. For example, in the case of the loan guarantee the recovery rate measures the percentage of the defaulted loan face value that is expected to be recovered by the loan holder.

Loss given default (LGD): LGD is equal to exposure x (1 – recovery rate) and represents and actual loss of the guarantor in the case if the credit event is triggered.

Counter-party risk (or systematic risk): the risk that guarantor default on the guarantee contract.

Fixed guarantee fee: fixed fee represents the one-time fixed payment from the guaranteed entity to the guarantor at the guarantee issue date.

Periodic guarantee fee: periodic fee represents periodic (annual) payments from the guaranteed entity to the guarantor over the duration of the guarantee contract or until the credit event is triggered.

In general, the structure of a guarantee fee may include both the fixed fee and the periodic fee. In the notes however we assume that only the periodic fee is paid by the guaranteed entity.

1.3 Types of financial guarantees

The section described the types of financial guarantees analysed in this guide.

1.3.1 Guaranteed loans

Loan guarantee is a base model for other financial guarantee transactions covered in these notes. Reference entity in the loan guarantee is the borrowing entity and the credit event is the default of the borrower on the respective loan obligation. Guarantor exposure equals to the loan face value.

As the credit event is triggered, the guarantor receives the defaulted loan and pays the loan face value to the guaranteed entity. (Alternatively, the guarantor may continue to pay interest on the defaulted loan and repay the loan face value at maturity).

Recovery rate is equal to the defaulted loan residual value.

1.3.2 Asset-backed loans

The ABL is similar to the guaranteed loan with the exception that the credit rating of the loan is enhanced through the provision of the collateral assets. Reference entity in the loan guarantee is the borrowing entity and the credit event is the default of the borrower on the respective loan obligation. Collateral provider exposure equals to the collateral asset value.

As the credit event is triggered, the collateral provider loses its collateral assets. Recovery rate is determined by the actual value of the collateral assets transferred to the guaranteed entity (as a percentage of the total collateral assets value).

1.3.3 Guaranteed derivative instruments

The guarantee transaction is illustrated for the forward contract used as the underlying instrument. The description can be extended directly to any other derivative instrument or a portfolio of derivative instruments.

Reference entity in the forward guarantee is the entity that entered with the guaranteed entity into a forward contract. The credit event is the default of the reference entity on the respective forward contract obligation. Note that the exposure in a forward contract is two-sided. Therefore, if the reference entity declares a default it may be either in the loss or gain position in the forward contract. If the reference entity is in the gain position, then it is assumed that the guarantor receives zero benefit from the forward guarantee (technically the forward contract is settled between the reference and the guaranteed entities and there is no default on the forward contract). If the forward contract is in the loss position, then the guarantor is required to cover the losses to the guaranteed entity. Therefore, from the guarantor's perspective the exposure in the guarantee contract is one-sided.

Another difference of a forward contract from the loan transaction is that the exposure of the guarantor in the forward contract changes on a daily basis. In theory an average exposure of the guarantor can be estimated.[6] It is recommended however to track the exposure and estimate the guarantee fee on a daily basis. The daily guarantee fees are aggregated then into an annual fee.

Recovery rate depends on the ranking of the guarantor claims to the reference entity in the event of the default by the reference entity and assuming that the guarantor is covering the losses in the forward contract.

An example of a guarantee contract payout structure in a forward contract guarantee agreement is described below.

- An applicable guarantee fee f is estimated as a percentage of the guarantor's exposure in the forward guarantee agreement.
- Exposure in the forward agreement is estimated on a daily basis.
- The guarantee fee dollar value is estimated on a daily basis as a product of day-specific exposure and guarantee fee f.
- Annual guarantee fee dollar value is estimated as the aggregate sum of daily guarantee fee dollar values.
- The forward guarantee agreement may include a provision that sets a cap on the total payout to the guaranteed entity.

1.3.4 Other types of guarantees

In practice a variety of other guarantee transaction types can be observed, and the analysis presented in this guide must be modified to account for the specific features of each guarantee types. A selected list of other guarantee transactions types is presented below.

- Performance guarantees
- Guarantees for commercial paper programs
- Guarantees for lease agreements
- Cross-guarantees in a loan facility
- Cross-guarantees in a cash pool arrangement

[6] Assuming one-sided exposure of the guarantor in the forward guarantee agreement, the expected exposure of the guarantor can be estimated using a call (put) option model.

- ► Insurance against accounts receivables losses
- ► CDS transactions issued for the purpose of mortgage backed securities (MBS) credit enhancement
- ► Commitment to provide financing in the form of equity injection for the regulatory capital compliance requirements
- ► Commitment to raise funds in the market and provide financing for acquisition purposes
- ► Guarantee to a lender in a syndicate loan transaction

1.4 Overview of a guarantee analysis

A guarantee analysis consists of two major steps:

1. Estimation of credit enhancement measured as improvement in the guaranteed entity credit score.
2. Pricing of the credit enhancement based on the arbitrage-free valuation methods.

From transfer pricing perspective, guarantee fee is allocated from the guaranteed entity to the guarantor as a compensation for the credit enhancement function performed by the guarantor, which is (i) a benefit for the guaranteed entity in the form of a reduced financing cost and (ii) a cost to the guarantor in the form o increased credit exposure to the default by the guaranteed entity.

Similar to interest benchmarking analysis, guarantee fee analysis involves two major steps: (i) credit rating estimation of the guarantor / guaranteed entity; and (ii) estimation of the financing costs for the guaranteed / non-guaranteed underlying instrument. The difference from the interest benchmarking analysis is hat in the guarantee fee analysis a marginal change in the credit score and respective financing cost is estimated. Effectively, guarantee fee can be viewed as equivalent to interest benchmarking analysis, which is performed for two borrowers and two transactions: (i) guarantor (as effective borrower) and guaranteed loan; and (ii) borrower (on a stand-alone basis as actual borrower) and non-guaranteed loan. An incremental change in the financing costs estimated under the two separate interest benchmarking analysis is interpreted as a guarantee fee, which should be transferred between the borrower and the guarantor.[7]

[7] As discussed in Section 3.3.2, from the arbitrage -free pricing perspective, a guarantee fee analysis can be equivalently interpreted as a back-to-back loan analysis, which involves two separate interest benchmarking analysis: (i) analysis of a loan from lender to the guarantor; and (ii) a back-to-back loan from the guarantor to the borrower.

Section 2 Functional Analysis

In current practice, the functional analysis for a treasury or a risk transfer transaction is typically a formality. A single template description of the functional analysis is copied into a transfer pricing report with minimum changes. However, in the case of a financial guarantee transactions functional analysis is not just a formality. The purpose of this section is to compare the Yield (also referred to as Expected Benefit) guarantee valuation approach (described in the OECD Guidelines and summarized in the Appendix A of these notes) with the arbitrage valuation approach from the perspective of the functions performed by the counter-parties in a financial guarantee transaction.

The section below shows that if a formal review and description of the functions is performed, then the results of the functional analysis are consistent with the arbitrage valuation approach. The Expected Benefit approach is not supported by the functional analysis.

2.1 Guarantee as a risk transfer transaction

At a very high level, the Expected Benefit approach for a guaranteed loan transaction can be summarized as follows. There are three counter-parties in a guaranteed loan transaction: Guarantor (Parent), Guaranteed Entity (Bank), and Reference Entity (Borrower, subsidiary of the Parent). In the absence of the guarantee from the Parent, the Bank will loan the funds to the Borrower at a high rate y^B, which reflects the stand-alone default risk of the Borrower. If the Parent agrees to guarantee the loan, the Bank will agree to reduce the interest rate on the loan to y^G, where $y^G < y^B$ is the interest rate assessed by the Bank based on the default risk of the Parent group. The difference between the two interest rates, $f = y^B - y^G$, is interpreted under the Expected Benefit approach as the benefit to the group from the guarantee provided by the Parent. The benefit equals to the reduction in the lending cost. It is assumed that the benefit is divided between the Borrower and the Parent. The exact shares in which the benefit is divided are not specified but in practice either 50:50 split or 75:25 split of the benefit is applied between the Parent and the Borrower.

Prior to analysing the functions performed by the Parent and Borrower in the guaranteed loan transaction, we discuss first the functions performed in comparable transactions that are traded in the market. The closest comparable for a guaranteed loan, which is traded in the market, is a CDS instrument. The CDS instrument is issued with the same purpose as the guaranteed loan: to hedge the default risk of the reference entity. The key difference between a CDS instrument and a guaranteed loan is that the Borrower (reference entity) is not a counter-party in the CDS instrument. The CDS instrument is issued between the guaranteed entity and the guarantor. Since the reference entity (the Borrower) is not a counter-party in the CDS transaction, it does not perform any functions in the transaction. Therefore, the Expected Benefit approach and the language applied to describe the approach are not applicable to a CDS transaction. If the Expected Benefit approach is presented so that to be consistent with the traditional CDS valuation approaches described in the literature[8], it needs to be modified to include a formal discussion of the functions performed by the borrower in the transaction (which are not performed in a CDS transaction) and the valuation methodology for the functions.

Another important observation from the functional analysis of a CDS transaction presented above is that the treasury transaction and risk hedging transaction are often unbundled in the market. Lending and risk hedging activities of a bank can generally be separated in time, performed by different groups within a bank

[8] In the next section we discuss two CDS valuation approaches developed by (i) Darrell Duffie and by (ii) John Hull and Alan White.

and will be performed with different counter-parties. A guaranteed loan is technically a bundled transaction that includes both the lending transaction and a risk hedging transaction. We argue however that conceptually the lending and risk hedging components of a guaranteed loan can be unbundled and analyzed separately. We illustrate the point by the following example.

Example. Suppose that in the absence of the Parent guarantee, the Bank will lend the funds to the Borrower at $y^B = 10\%$ on stand-alone basis. If the Parent guarantees the loan, the Bank agrees to reduce the interest rate to $y^G = 2\%$. Under the Expected Benefit approach, the spread between the interest rates, $s = y^B - y^G = 10\% - 2\% = 8\%$, is split in 50:50 between the Borrower and the Guarantor. The estimated guarantee fee is $f = 0.5 \times s = 4\%$. As a result, the effective interest rate paid by the Borrower is $y^{B.G} = y^G + f = 2\% + 4\% = 6\%$, where $y^{B.G}$ represents effective interest rate paid by the Borrower on the guarantees loan.

In the above example, in which the lending transaction is bundled with the risk hedging transaction, the borrower's borrowing cost is effectively reduced from 10% to 6%. In the context of an arm's length negotiation between the Bank, the Parent, and the Borrower, the Bank and the Parent have an incentive to unbundle the transaction. Under the agreement between the Bank and the Parent, the Bank provides a non-guaranteed loan to the Borrower at the market 10% and then the Bank and the Parent enter into a guarantee agreement to reallocate the loan default risk between the Bank and the Parent. The Borrower is represented only as a reference entity in the guarantee agreement without contributing any risk hedging functions and therefore does not have any bargaining power to disagree with such arrangement.

The purpose of unbundling the lending and risk hedging transactions is to price the two transactions separately by referencing the transaction price to the estimated arm's length price in the respective market. The approach is consistent with the transfer pricing CUP valuation approach (or arbitrage pricing approach) and the approach eliminates any subjective bargaining considerations from the analysis of a guarantee transaction.

To summarize:

- Guarantee should be viewed as a risk transfer transaction. The functional purpose of a guarantee is to transfer default risk of a reference entity between the guarantor and the guaranteed entity. The borrowing entity does not perform any functions in a risk transfer transaction and is used only as a reference entity.
- Guarantee transaction should be unbundled from the lending transaction and priced as a separate transaction.
- Guarantees should be priced consistently with the traditional valuation methods applied to price CDS instruments.

2.2 Halo effect and implicit guarantees

In a risk assessment of a borrowing entity, the stand-alone credit rating is typically distinguished from the halo-adjusted credit rating of the borrower. The halo-adjusted credit rating takes into account the implicit support that the borrower is expected to receive from the group in the event of financial distress. The halo effect is accounted for through the adjustment of the borrower's credit rating and respective reduction in the borrowing costs. The impact of the halo adjustment can be illustrated through the following example.

Example. Suppose that the stand-alone credit rating of the borrower is B and credit rating of the group is BBB. Suppose also that the stand-alone interest rate estimated for the borrower is 10% and for the group is 2%. Since the credit rating of the group is higher than the credit rating of the borrower, a positive halo effect adjustment is expected from the fact that the borrower is a part of the group. If for example the borrower is assessed as a strategically important entity for the group, then the borrower's halo adjusted credit rating would be estimated as BB, three-notches above the stand-alone credit rating of B. The applicable borrowing rate, applicable to the borrower and adjusted for the group implicit support, would be for example 5%.

Note that halo adjustment takes into account the fact that the borrower is a part of a broader corporate group and therefore does not assess the borrower as an entity, which is at arm's length from other entities in the group. Therefore, the practice of applying the halo adjustment may differ in different tax jurisdictions. For example, in US the practice is not to apply the halo adjustment in the interest benchmarking analysis, while in a Canadian interest benchmarking analysis the practice is to perform the halo adjustment.

The implicit group support and respective halo adjustment reduces the borrowing costs and therefore presents a benefit to the borrowing entity. Similarly, the halo adjustment reduces the guarantee fee paid by the borrowing entity in a guaranteed loan transaction. Note however that the benefit allocated to the borrower in a guaranteed loan transaction is due to the fact that the borrower is a part of the parent corporate group and is not due to the functions performed by the borrower in the guarantee transaction.

In theory, the practice of applying halo adjustment shall be consistent in both interest benchmarking analysis to determine the applicable interest rates and in guarantee analysis to determine the applicable guarantee fee. In Canadian analysis the practice is to always apply the halo adjustment. In the US analysis the practice is generally not to apply the halo analysis in interest benchmarking analysis and to apply it in a guarantee analysis. Therefore, the results of the US interest benchmarking and guarantee analyses may generally be not consistent with each other.

Section 3 Modelling Financial Guarantees

In this section we describe two alternative approaches to the financial guarantee's valuation: arbitrage approach and insurance (NPV-based) approach.

Under the arbitrage approach, the payoff structure under the guarantee transaction is replicated using the payoffs in the underlying reference debt instruments. The guarantee fee valuation under the arbitrage approach is effectively reduced to the interest rate benchmarking analysis. The arbitrage approach is based on the "law of one price": identical (comparable) financial instruments must be priced equally. Therefore, the arbitrage approach is similar conceptually to the CUP approach in transfer pricing.

In the OECD guidelines the equivalent of the arbitrage approach is the 'Yield' approach. There are however important differences between the arbitrage approach presented in these notes and the 'Yield' approach.

- **Difference in valuation.** Under the arbitrage approach, the guarantee fee paid to the guarantor equals to the full (100%) spread between the yield rates estimated for the borrower's and the group. Under the Yield approach, the spread is split between the guarantor and the borrower in certain proportions, which are not specified.
- **Difference in interpretation**. Under the arbitrage approach, the payout structure of a guarantee transaction is replicated using the payout structure of debt instruments (alternatively the payout structure can be replicated using the payout structure of CDS instruments). Therefore, the guarantee fee is interpreted as a market price, which is taken as given by each counter-party and which estimated based on a sample of comparable market prices. Yield approach assumes also a bargaining component between the borrower (reference entity) and the parent (guarantor) in the determination of the guarantee fee. The details of the bargaining procedure and bargaining output however are not included in the approach description.
- **Difference in the analysis documentation language**. Current practice is to describe the guarantee fee estimation approach based on the yield spread analysis as the Yield (often also referred to as Expected Benefit) approach, which is categorized as an "Other" approach under the transfer pricing methods classification. The arbitrage approach is similar conceptually to a CUP approach under the transfer pricing methods classification.

The arbitrage approach estimates the guarantee fee based on the implied market credit risk, which is assessed based on the credit risk premiums in the market bond yields or in CDS instruments. An alternative guarantee fee estimation approach is the insurance approach. Under the approach the guarantee fee is estimated based on the historical bond default and recovery data. The historical data is used to derive historical PDs and LGDs values and to construct explicitly the cash flows to estimate the net present value (**NPV**) of a guarantee contract. Under the OECD guidelines, the approach is referred to as the Expected Cost approach. Our recommendation is to refer to the approach as the (i) Insurance approach or as the (ii) NPV-based valuation approach. The Insurance approach name emphasizes the similarity between a guarantee contract and an insurance policy and the similarity with the respective insurance estimation methods. The NPV-based valuation approach name emphasizes that the guarantee fee is estimated based on net present value calculations. The naming convention is more generic and more intuitive (compared to the Expected Cost name) and is consistent with other NPV-based methods naming conventions applied for example in loan valuation analysis.[9]

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[9] A standard practice in transfer pricing is to apply the NPV calculations to estimate a loan value. The method is typically applied as part of the loan refinancing analysis and is referred to as the "NPV loan valuation model".

3.1 Overview of financial guarantee modelling

As discusses in the previous section, a guarantor enhances the credit rating of the guaranteed transaction. As a result, the guarantor incurs a cost from the increased risk exposure to the borrower's default on the guaranteed instrument and, at the same time, provides a benefit to the guaranteed entity in the form of the lower financial costs of the guaranteed transaction.

In most cases, a guarantee fee analysis is performed in the context of a parent entity providing a guarantee to its subsidiary on a 3rd-party loan issued by the subsidiary. At the initial stage of the analysis, the facts related to the guarantee transaction are reviewed including (i) review of the guaranteed transaction and the list of guarantors; (ii) review of the public credit rating information for the guarantor and guaranteed entity; (iii) organizational chart of the corporate group; (iv) financial data of the covered entities. Guarantee analysis is typically performed for a specific fiscal year and is updated on an annual basis for the guaranteed instrument.[10]

Guarantee fee analysis involves two major steps:

1. Estimation of the credit enhancement for the tested transaction in terms of the improved transaction credit score.
2. Pricing the credit enhancement using arbitrage free valuation methods.

The steps of the analysis are reviewed in more detail in the sections below. Extension of the analysis to cross-guarantees and net guarantee fee allocations among multiple borrowers and guarantors within a corporate group is discussed in the "Cooperative Games" guide.

3.2 Credit enhancement modelling

Guarantee fee prices credit enhancement of the guaranteed transaction. Therefore, a credit enhancement notion must be formally defined and measured to estimate a guarantee fee. We assume that credit enhancement is defined as improvement in the issuer and transaction-specific credit ratings in the preens of the guarantee from the entity with a stronger credit rating. Specifically, credit enhancement is measured as improvement in the credit score of the borrowing entity, which is effectively replaced by the credit score of the guarantor (an effective borrower in the guaranteed transaction).

Credit score estimation depends on the specific credit rating modelling approach selected for the guarantor and the guaranteed entity. Specifically, we assume that Moody's sector-specific grid rating model (**MRM**) is applied for credit rating estimation (see "Credit Rating Analysis" guide for further details on MRM approach).[11] The MRM modelling approach converts the rated entity financial data into the respective credit scores using a sector-specific grid mapping between financial data and the score values.[12] The credit scores estimated for a set of quantitative factors are aggregated then into a consensus score estimated as the weighted-average of factor-specific scores.

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[10] An intercompany guarantee for the underlying instrument is assumed to be rolled over on an annual basis.

[11] Other credit rating methodologies, such as for example Moody's RiskCalc model, can also potentially be applied for credit enhancement estimation. However, RiskCalc model converts a set of quantitative metrics into a related default probability. A mapping from default probabilities to alpha-numeric scores must be known to estimate the related financial costs for the guaranteed and non-guaranteed loans.

[12] More recent MRM methodologies typically model continues mapping from the quantitative metrics into the credit scores and therefore allow potentially estimating small guarantee fees which correspond to a marginal credit enhancement of the borrower's credit rating. Older models assume discrete mapping and may produce zero guarantee fee even in the presence of a positive credit enhancement. It is recommended to convert discrete mapping grids into equivalent continuous mapping grids.

Under the approach, credit enhancement is estimated as follows:

1. Estimate the MRM financial metrics for the guaranteed entity on a stand-alone basis.
2. Estimate the credit score for the guaranteed entity on a stand-alone basis (**stand-alone credit score**).
3. Consolidate the MRM financial metrics for the guarantor and guaranteed entity.
4. Estimate the credit score using consolidated MRM financial metrics (**consolidated credit score**).

The credit enhancement is measured as improvement in the consolidated credit score over the stand-alone credit score. Moody's MRM methodology provided mapping between credit scores and respective alpha-numeric credit ratings. The respective credit ratings can be applied to estimate the borrowing costs for the borrowing entity. Therefore, the approach described above can be applied to convert the spread between the consolidated and stand-alone credit scores into the respective borrowing costs for the guaranteed and non-guaranteed loans.

Assuming given borrowing costs for the guaranteed and non-guaranteed loans, the relation between the guarantee fee analysis and arbitrage-free/insurance valuation methods is discussed in detail in the sections below.

3.3 Guarantee fee pricing: Arbitrage approach

We describe first traditional arbitrage approaches applied for the valuation of CDS instruments. We show then how the CDS valuation methodology can be extended to price intercompany loan guarantees.

3.3.1 Darrell Duffie CDS valuation model

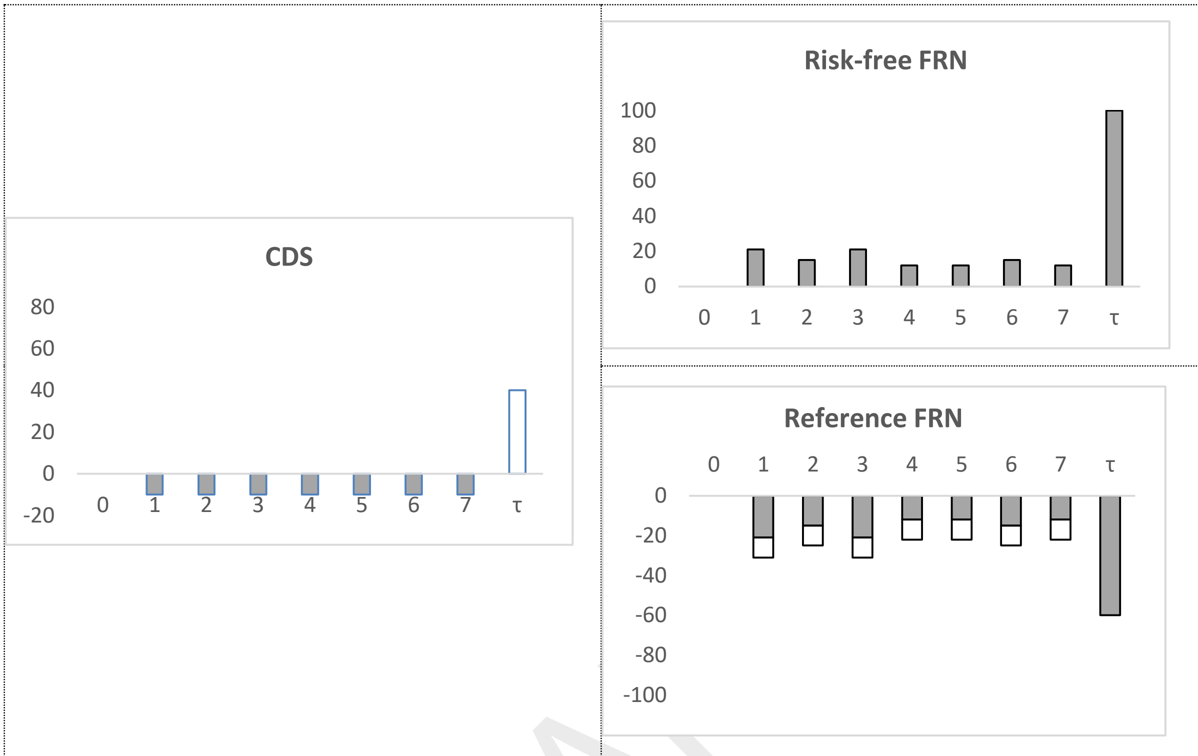
In this section we describe the arbitrage approach for the CDS valuation that was proposed by Darrell Duffie.[13] Conceptually the arbitrage principle applied to evaluate a CDS contract is simple. A CDS contract is structured so that to hedge against the default risk of a reference entity. Therefore, a combination of a bond obligation issued by a reference entity and a respective CDS contract effectively represent a risk-free bond instrument. As a result, the value of the CDS contract can be derived from the prices of the (i) bond obligation issued by a reference entity and the (ii) risk-free bond instrument. Formally the arbitrage approach and the assumptions required to make the arbitrage to be exact are outlined as follows.

Duffie illustrates the arbitrage pricing approach with the following diagram. The arbitrage argument is presented for a floating rate note (**FRN**) with the interest rate calculated as a base rate (typically Libor) plus spread. The argument can be modified for a note with fixed rate interest payments. However, for a fixed rate note additional adjustments must be performed to make the arbitrage exact.[14]

[13] "Credit Swap Valuation", Darrell Duffie, Financial Analyst Journal, pp73-87, 1999

[14] In the above example period τ represents the date when the borrower defaults on the bond obligation. The recovery rate in the example is assumed to be R=60%.

Exhibit 3.1 Replicating CDS payout structure with the reference bond and risk-free bond payout structures



Under the hedging strategy, the payout structure of a CDS contract (left panel of Exhibit 3.1) is replicated as follows:

1. Investor shorts the reference bond traded at par (bottom-right panel of Exhibit 3.1).
2. The investor uses the received par value from the shorted reference bond to purchase a risk-free bond at par value (top-right panel of Exhibit 3.1).

If the credit event occurs before the reference bond maturity date, the investor liquidates the portfolio, uses the collected par value of the risk-free bond to settle the CDS contract and uses the collected defaulted reference bond to settle the shorted reference bond contract. Note that the assumption of floating rate interest payment structure is necessary to ensure that the risk-free FRN can be sold at par value at any period in time.

If the arbitrage argument is modified for the fixed rate interest note so that both the reference note and risk-free note have fixed rate coupon payments, then the arbitrage relationship becomes not exact (however it is still a reasonably good approximation of the arbitrage relationship). The reason is that that the risk-free note with fixed interest rate has par value only at the issue (and maturity) date and between the issue and maturity date it can be traded either above or below the par value. To make the arbitrage argument exact, the risk-free note must include a conditional termination provision pursuant to which the risk-free note is exercised at par value upon the occurrence of the credit event. The interest rate on the risk-free note must be adjusted to take into account the note conditional termination provision.

The arbitrage relationship can be represented for the FRN with the following equation (assuming that Libor rate is used as a base rate for the FRN):

CDS spread = note spread over Libor

In the case of a fixed rate note, the relationship can be approximated with the following equation

(3.1) $$s = y - y^{rf}$$

where s is the CDS spread, y is the fixed interest rate on the note and y^{rf} is the risk-free rate (adjusted for the conditional termination provision).

A selected list of assumptions required for the arbitrage argument is provided below. The full list of assumptions can be found in the Duffie paper.

- **No counter-party risk**. There is no risk that the guarantor defaults. The terminal CDS payout to the guaranteed entity at the credit event, equal to $L = 100 \times (1 - R)$, is paid by the guarantor with probability one.[15]
- **Risk-free FRN**. For simplicity, the risk-free FRN is assumed to be a note with the interest equal to the Libor rate plus zero spread. In practice Libor rate is not risk free.
- **Maturity type**. For simplicity, the reference bond is assumed to be a bullet loan with no pre-payment or pay-on-demand option. If the reference bond is callable and the call option is exercised, then the CDS contract must also be settled at the option exercise date.
- **Bid-ask spread**. The bid-ask spread for the risk-free FRN is assumed to be zero.

3.3.2 Yield-based arbitrage approach: guaranteed loan

CDS instruments are typically issued by investment banks with high credit rating. Therefore, the counter-party risk (the risk of default by the guarantor) is deemed as not material in these transactions. A key difference between a CDS contract and an intercompany loan guarantee is that the guarantee can be provided by a company that may not have a high credit rating and therefore the counter-party risk may be very substantial. In practice the value of the guarantee from the parent group may in some cases be equal to zero when, for example, the borrowing entity is a core entity for the group and the default of the entity automatically results in the default of the whole group. In this section the CDS arbitrage valuation approach is modified to take into account the counter-party risk. The modified approach is applied to price loan guarantee transactions.

We will also analyze two slightly different loan guarantee contracts.

1. Under the first guarantee contract structure, in the event of default by the borrowing entity the face value of the loan is repaid by the guarantor to the guaranteed entity immediately after the default event. This structure replicates exactly the default terms of a CDS contract.
2. Under an alternative guarantee contract structure, in the event of default by the borrowing entity the guarantor continues to pay interest to the guaranteed entity and repays the loan face value on the loan maturity date.

Under the first guarantee contract structure, the modified CDS arbitrage argument is applied directly to the floating-rate loans and can be used only as an approximation for the fixed rate notes. Under the alternative guarantee contract structure, the modified CDS arbitrage argument can be applied directly to both floating and fixed rate loans.

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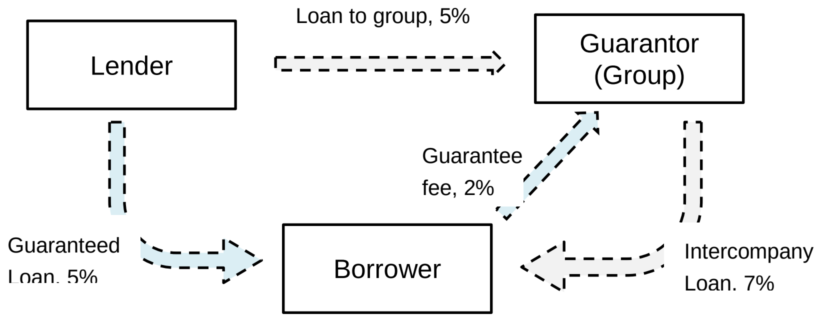
[15] In practice however the risk exposure of the CDS sellers can be material.

The arbitrage argument applied to derive the guarantee fee in a guaranteed loan transaction is similar to the argument described in the above Darrell Duffie model for CDS contracts. Effectively the argument can be presented by the following simple statement:

Guaranteed Loan is equivalent to a Back-to-Back Loan

The equivalence between the guaranteed loan and back-to-back loans is illustrated in the exhibit below.

Exhibit 3.2 Equivalence between back-to-back and guaranteed loans



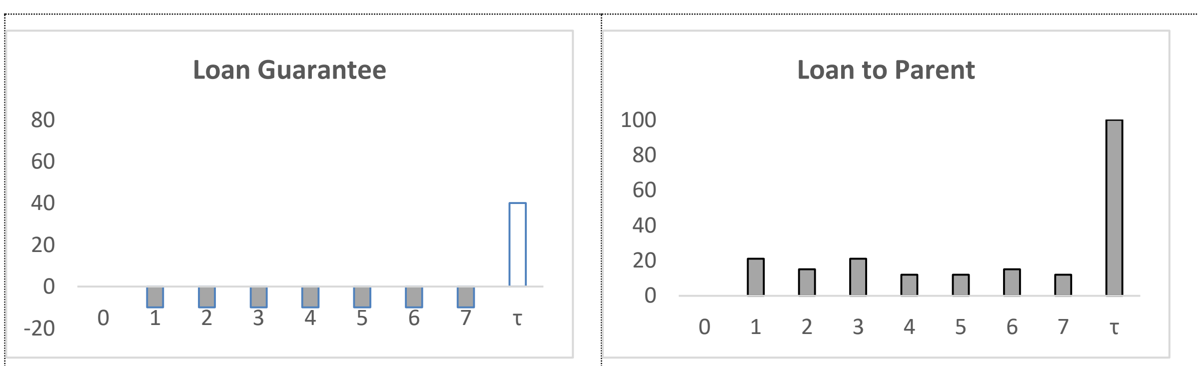
The modified arbitrage pricing approach is illustrated with the Exhibit 3.3 below (for the floating rate loan). Note that the argument is almost exactly the same as for the CDS contract with the difference that the risk-free FRN is replaced with the loan to the Parent. The adjustment is performed to account for the counter-party risk.

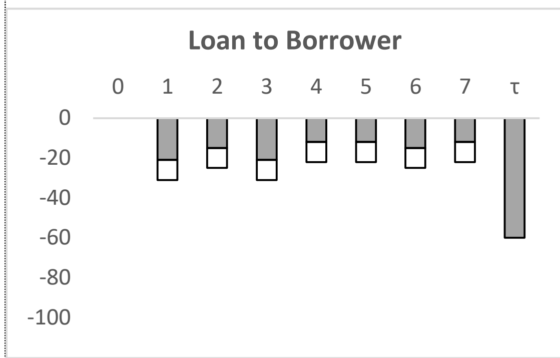
Under the hedging strategy, the payout structure of a loan guarantee contract (left panel of Exhibit 3.2) is replicated as follows:

1. The Bank shorts the loan to the Borrower by selling it to the Parent (bottom-right panel of Exhibit 3.3).
2. The investor uses the received par value from the shorted loan to make a loan to the Parent. Both loans have the same terms and conditions (top-right panel of Exhibit 3.3).

Effectively the hedging strategy replaces a guaranteed loan with a back-to-back loan structure.

Exhibit 3.3 Replicating loan guarantee payout structure with the back-to-back loan transaction





The arbitrage relationship can be represented with the following equation:

(3.2)
$$f = y^B - y^G$$

where f is the guarantee fee, y^B is the interest rate applicable to the Borrower and y^G is the interest rate applicable to the Parent group.

The modified list of assumption required for the arbitrage argument to be exact is provided below.

- **Credit ranking structure**. A default by the Parent automatically results in the default by the Borrower. The assumption is required to rule out the events in which the Parent defaults on its loan obligations and the Borrower does not default.
- **Maturity type**. For simplicity, the both loans are assumed to be a bullet loans with no pre-payment or pay-on-demand option. The assumption is required to rule out the situations in which the Borrower has incentive to prepay the loan early and the Parent does not have this incentive.

Note that the loans are not required to be traded in the market. Therefore, some assumptions (such as zero bid-ask spread), which were discussed in the CDS arbitrage valuation approach, are not necessary for the arbitrage argument applied to loan guarantees.

A step-by-step procedure to perform the guarantee fee analysis based on equation (3.2) is provided in the Appendix B.

3.3.3 CDS-based arbitrage approach: guaranteed loan

Section above described the guarantee valuation approaches based on the arbitrage relationship between the guarantees and respective underlying debt obligations. The guarantee fee was derived as a function of the underlying notes yields. However, a direct comparable to a loan guarantee is not an underlying loan transaction but a CDS instrument. Therefore, from transfer pricing perspective it is more intuitive to price a guarantee fee based on a reference to respective CDS instruments.

Similar to debt transactions, CDS instruments are publicly traded in the market and CDS price information is available through Bloomberg or other databases. In this section we derive am equation that can be used as a base to perform CDS-based arbitrage valuation of a loan guarantee. A step-by-step procedure, which implements the valuation approach is described in the Appendix. Note however that in practice the yield-based approach is applied more often due to high liquidity in the bonds/notes market and as a result more robust results produced by the yield-based approach compared to the CDS-based approach.

The equation for the guarantee fee in the CDS-based approach is derived from equations (3.1) and (3.2). Formally,

$$f = y^B - y^G = (y^B - y^{rf}) - (y^G - y^{rf}) = s^B - s^G$$

Where s^B is the CDS spread estimated for the borrowing entity and s^G is the CDS spread estimated for the parent group. The equation can be summarised as follows:

$$f = s^B - s^G \quad (3.3)$$

An arbitrage relationship, similar to the relationship presented in the Exhibit 3.3, which relates the guarantee fee to the respective CDS spreads estimated for the borrowing entity and the parent group can also be derived for the equation (3.3).

3.3.4 Arbitrage approach: other reference instruments

As discussed above, the guarantee fee analysis is performed not only for the loan transactions but also for other instruments, such as portfolios of derivative instruments or asset-backed loans. In this section we discuss briefly how the approach is modified to account for different underlying reference transactions.

In general, a guarantee fee analysis is performed in three steps:

- Estimate the exposure of the guarantor in the guarantee contract
- Estimate guarantee fee as a percentage of the exposure in the guarantee contract
- Estimate guarantee fee $ amount as a product of the exposure in the guarantee contract and the guarantee fee % value.

The difference between different underlying reference instruments is represent by different exposure of the guarantor in the guarantee contract. The analysis performed to estimate the guarantee fee % value is typically similar for each underlying instrument. The arbitrage argument can be extended for other instrument types.

For example, if the underlying instrument is a loan which is backed by the assets of the parent company, then the ABL can be replicated as a back-to-back loan transaction, where the ABL loan is made directly to the parent (or entity that provides the collateral) and the back-to-back non-collateralized loan is made by the parent to the borrower. The difference between the yields on the non-collateralized loan to the borrower and the ABL loan to the parent is retained by the parent as a fee from providing the collateral for the loan transaction. The analysis in the case of ABL loans may be more complex if multiple entities of the group pledge their assets as a collateral. Exposure in the ABL loan is equal to the value of the pledged collateral.

Similarly, if the underlying instrument is a forward or another derivative contract (or a portfolio of derivative contracts), then the guaranteed forward contract between the Bank and the Subsidiary can be replicated as a back-to-back forward contract between the Bank and the Parent and offsetting forward contract between the Parent and the Subsidiary. Exposure in the forward contract typically changes on a daily basis as the underlying market price moves up or down. Both exposure and the guarantee fee $ amount should be calculated on daily basis and then aggregated on annual basis.

3.4 Guarantee fee pricing: Insurance approach

In the previous sections, guarantee transactions were analysed from the arbitrage perspective. A guarantee was viewed as a derivative of the underlying loan transaction and the guarantee fee was estimated as a function of the loan yield value. However, guarantees are also similar to insurance contracts and can be analysed from the perspective of insurance valuation methods.

Similar to an insurance contract, a guarantee contract payout to the guaranteed entity is contingent on a formally defined credit event. The guaranteed entity pays a guarantee fee (which is equivalent to insurance premium) to protect itself against the credit event. Insurance contract often cover only a specific percentage of the loss that occurs as a result of the credit event. The covered loss percentage parameter corresponds to the recovery rate parameter in a guarantee contract.

3.4.1 Hull-White CDS model

This section summarizes the CDS valuation model described in the Hull-White paper "*Valuation Credit Default Swaps I: No Counterparty Default Risk*".[16] Formally Hull-White model is an arbitrage valuation method, which is more generic approach compared to the Duffie arbitrage model. Valuation in the Hull-White CDS model is performed in two steps:

1. Estimate risk-neutral default probabilities.
2. Derive the arbitrage free equation for the CDS spread based on the estimated risk-neutral default probabilities.

The key difference of the Hull-White model from the Insurance valuation method presented below is in using the risk-neutral default probabilities instead of actual default probabilities estimated based on historical data. The equations for the CDS spread in the Hull-White and in the Insurance CDS valuation methods will be exactly the same. The difference in the results is due exclusively to the differences in the default probabilities applied to estimate the CDS spread.

In practice, the Hull-White model will produce the CDS spread values which approximate the spread values described by equation (3.1). Therefore, the Hull-White model can be used to validate the correctness of the Insurance model equations implementation and can be used to identify the source of differences between the Arbitrage and the Insurance approaches. This is the reason why we included the discussion of the Hull-White model as part of the Insurance methods discussion.

3.4.1.1 Estimation of risk-neutral default probabilities

The risk-neutral default probabilities form a basis to value different derivative instruments of the corporate note transactions including CDS instruments. The risk-neutral default probabilities are derived as follows. Suppose that B_t denotes a term structure of bond prices issued by the reference entity and G_t denotes a term structure of bonds prices assuming that the bond pays the same interest and the bond has a zero probability of default. Suppose also $\alpha_{s,t}, s \leq t$ denotes the net present value of the loss conditional on default of bond G_t in period s. The $\alpha_{s,t}$ is described by the following equation

$$\alpha_{s,t} = D_t^* \times \left[F_{s,t} - R \times C_{s,t}\right]$$

where D_t^* is risk-free discount rate, $F_{s,t}$ is the forward price of bond G_t in period s, R represents the recovery rate, and $C_{s,t}$ represents the claim of the bond holder in the event of the bond default.[17] For simplicity we assume that $C_{s,t} = 1$ (the bond holders claim only the face value of the bond).

Suppose that p_t is risk-neutral default probability or equivalently a *price of the security which pays $1 dollar in period t conditional on reference entity default in period t and zero otherwise normalized by the risk-free*

[16] For simplicity we modify some of the assumptions of the Hull-White paper in this model presentation.

[17] Estimation of the bond price term structure and bond forward prices is discussed in a separate 'NPV Analysis' guide.

discount factor D_t^*. Then the difference between the risk-free and risky bonds equals the present value of bond losses:

$$G_t - B_t = \sum_{s=1}^{t} p_s \times \alpha_{s,r}$$

The above system of equations allows to calculate recursively the values p_t as follows:

$$p_t = \frac{G_t - B_t - \sum_{s=1}^{t-1} p_s \times \alpha_{s,r}}{\alpha_{t,t}} \tag{3.4}$$

The derived risk-neutral default probabilities can be used to valuate generic derivative instruments including CDS instruments as described in the section below.

3.4.1.2 Estimation of CDS spread

A CDS contract is replicated as the following portfolio: $CDS = \{\sum_t (1 - R) \times \mathcal{P}_t\}$, where $\mathcal{P}_t$ is the security that pays $1 conditional on reference entity default (and zero otherwise) and the price of the security is equal to $D_t^* \times p_t$. Conditional on the default, the CDS contract pays $1 - R$, which represents the note face value minus the recovered value. Therefore, the CDS price is estimated as

$$F = (1 - R) \times \sum_{t=1}^{T} D_t^* \times p_t \tag{3.5}$$

The next step is to convert the fixed CDS price F into the following payment structure

$$CDS\ spread = \begin{cases} f & no\ default \\ 0 & default \end{cases}$$

The payment structure can be replicated by the following portfolio. The total portfolio consists of $t = 1, \dots, T$ period-specific portfolios, where each period-specific portfolio has a long position in security that pays $1 in period t with certainty and short position in the security that pays $1 if the default occurred prior to or in period t (the latter security can be replicated as a portfolio of securities $\mathcal{P}_s, s < t$). The value of the portfolio is $D_t^* \times (1 - P_t)$, where $P_t = \sum_{s \le t} p_s$. Therefore, the value of the 'CDS spread' security is $f \times \sum_t D_t^* \times (1 - P_t)$. The value of f is selected so that $f \times \sum_t D_t^* \times (1 - P_t) \times \Delta t = F$ or

$$\underbrace{f \times \sum_t D_t^* \times (1 - P_t) \times \Delta t}_{NPV\ of\ expected\ compensation} = \underbrace{(1 - R) \times \sum_{t=1}^{T} D_t^* \times p_t}_{NPV\ of\ expected\ loss}$$

Periodic guarantee fee f is calculated from the equation as follows:

$$f = \frac{(1 - R) \times \sum_{t=1}^{T} D_t^* \times p_t}{\sum_t D_t^* \times (1 - P_t) \times \Delta t} \tag{3.6}$$

3.4.2 Loan guarantee model

There are two conceptual differences in the described below loan guarantee model and the Hull-White CDS model presented above.

1. The loan guarantee model takes into account the counter-party risk, which is one of the key factors that determines the guarantee fee. Therefore, modelling guarantee fees requires to model a stochastic process which determines the joint probability of default by the reference entity and the guarantor. The details of the modelling approach are provided in the Appendix C.

2. The loan guarantee model uses a stochastic model in which p_t values are interpreted as actual probabilities. The guarantee fee is estimated so that the expected guarantor's cost equals to the expected compensation to the guarantor under the guarantee agreement.[18]

Under the Insurance approach, the value of the guarantee contract is estimated directly by calculating the net present value of the guarantor's expected cost and expected compensation. The guarantee fee is estimated so that the NPV of the periodic guarantee payments to the guarantor is equal to the NPV of the guarantor's expected cost incurred in the event of default by the reference entity. The approach is referred in the OECD guidelines is referred to as the "Expected Cost" approach. Similar to the Hull-White CDS model the loan guarantee model estimation is performed in two steps:

1. Estimate default probabilities and recovery rates for the reference entity and the guarantor based on historical default data.
2. Derive the equation for the guarantee fee based on the estimated default probabilities and recovery rates.

Note that while the conceptual principals applied to derive the equations

3.4.2.1 Estimation of historical default probabilities and recovery rates

The guarantee fee model requires to estimate the following parameters as part of guarantee fee valuation.

1. Cumulative and marginal probability of default by the reference entity.
2. Cumulative and marginal probability of default by the guarantor.
3. Recovery rate on the reference entity debt obligations.

All above parameters are estimated based on historical default and recovery data. The default and recovery rate statistics van be found for example in Moody's publications.[19,20].

Examples of default probability and recovery rate statistics are presented in the exhibits below.

[18] In the Hull-White CDS model the risk-neutral default probabilities p_t are prices of securities that pay $1 conditional on reference entity default (normalized by risk-free discount factor). The Hull-White model is a pure arbitrage model with no stochastic valuations component.

[19] "Annual Default Study: Corporate Default and Recovery Rates, 1920-2017", Moody's Investor's Service, Data Report, February 2018. The report is updated by Moody's on annual basis. The publication date of the Moody's report should be selected consistently with the valuation date of the loan guarantee.

[20] Moody's publications are available via the Moody's website https://www.moodys.com/creditfoundations/Default-Trends-and-Rating-Transitions-05E002/reports. The default and rating transition probabilities are available via Excel tables. For example, the tables applicable for 2021 are available at the following link: https://www.moodys.com/research/Annual-default-study-Following-a-sharp-rise-in-2020-corporate--PBC_1263901 (the access is provided only to logged in users).

Exhibit 3.4 Historical default probabilities

Exhibit 36

Average Cumulative Issuer-Weighted Global Default Rates By Alphanumeric Rating, 1998-2017

Rating	1	2	3	4	5	6	7	8	9	10
Aaa	0.00%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%
Aa1	0.00%	0.00%	0.00%	0.00%	0.03%	0.09%	0.09%	0.09%	0.14%	0.24%
Aa2	0.00%	0.01%	0.14%	0.29%	0.38%	0.48%	0.59%	0.71%	0.89%	1.05%
Aa3	0.05%	0.13%	0.18%	0.25%	0.39%	0.54%	0.80%	1.00%	1.10%	1.20%
A1	0.11%	0.25%	0.43%	0.64%	0.89%	1.18%	1.47%	1.73%	1.97%	2.23%
A2	0.07%	0.20%	0.39%	0.58%	0.85%	1.26%	1.64%	2.08%	2.60%	3.23%
A3	0.07%	0.19%	0.42%	0.63%	0.95%	1.14%	1.41%	1.75%	2.19%	2.62%
Baa1	0.15%	0.39%	0.64%	0.91%	1.10%	1.31%	1.50%	1.69%	1.87%	2.17%
Baa2	0.19%	0.43%	0.69%	0.97%	1.20%	1.48%	1.71%	1.90%	2.23%	2.57%
Baa3	0.25%	0.60%	0.96%	1.35%	1.81%	2.19%	2.59%	3.18%	3.70%	4.33%
Ba1	0.31%	1.20%	2.15%	3.01%	4.15%	5.15%	6.04%	6.78%	7.67%	8.62%
Ba2	0.68%	1.60%	2.84%	4.12%	5.24%	6.10%	6.83%	8.02%	9.39%	10.96%
Ba3	0.96%	2.67%	4.65%	6.85%	8.42%	9.97%	11.62%	13.52%	15.27%	16.72%
B1	1.33%	4.06%	7.10%	10.13%	12.86%	15.34%	17.89%	20.27%	22.59%	24.72%
B2	2.79%	7.28%	11.95%	16.47%	19.93%	23.02%	25.74%	28.09%	30.42%	32.40%
B3	3.84%	9.31%	15.25%	20.17%	24.60%	28.57%	31.72%	34.37%	36.85%	38.80%
Caa1	4.78%	11.14%	17.18%	22.42%	26.88%	30.42%	33.32%	36.02%	39.11%	42.13%
Caa2	9.46%	17.86%	25.19%	31.72%	36.83%	40.94%	44.63%	48.38%	51.99%	52.76%
Caa3	19.70%	31.91%	40.07%	45.14%	49.15%	51.73%	55.22%	58.36%	59.16%	59.16%
Ca-C	32.87%	43.91%	51.64%	56.52%	59.58%	61.00%	62.94%	64.12%	64.52%	64.52%
IG	0.12%	0.28%	0.49%	0.70%	0.94%	1.18%	1.43%	1.71%	2.01%	2.35%
SG	4.16%	8.42%	12.46%	15.93%	18.76%	21.12%	23.20%	25.11%	26.97%	28.58%
All	1.76%	3.49%	5.07%	6.38%	7.42%	8.28%	9.03%	9.72%	10.40%	11.03%

Exhibit 3.5 Historical recovery rates

Exhibit 7

Average corporate debt recovery rates measured by trading prices

Panel A - Recoveries	Issuer-weighted recoveries			Volume-weighted recoveries		
Priority Position	2017	2016	1983-2017	2017	2016	1983-2017
1st Lien Bank Loan	69.04%	75.05%	67.07%	74.73%	77.95%	63.74%
2nd Lien Bank Loan	17.87%	22.50%	30.38%	30.29%	22.50%	27.73%
Sr. Unsecured Bank Loan	9.00%	n.a.	45.87%	9.00%	n.a.	40.21%
1st Lien Bond	62.43%	48.72%	53.62%	66.21%	40.89%	53.80%
2nd Lien Bond	52.75%	34.07%	45.18%	36.61%	35.82%	43.63%
Sr. Unsecured Bond	53.85%	31.45%	37.74%	39.79%	27.10%	33.48%
Sr. Subordinated Bond	38.00%	36.72%	31.10%	50.62%	56.10%	26.34%
Subordinated Bond	74.38%	24.50%	32.05%	76.37%	24.50%	27.55%
Jr. Subordinated Bond	17.50%	0.63%	22.79%	4.84%	0.63%	13.97%

3.4.2.2 Estimation of guarantee fee

A formal insurance model for the loan guarantee is described in detail in the Appendix C. In this section we summarize the equations derived in the model and applied to estimate the guarantee fee.

The guarantee fee under the Insurance approach is estimated using the following formula.[21]

$$\underbrace{f^{EC} \times \sum_{t=1,\dots,T} D_t^* \times Q_t^0 \times \Delta t}_{NPV\ of\ expected\ compensation} = \underbrace{(1-R) \times \sum_{t=1,\dots,T} D_t^* \times Q_{t-1}^0 \times \left(h_t^B - h_t^{\prime G}\right)}_{NPV\ of\ expected\ loss\ from\ default}$$

[21] The f^{EC} refers to the guarantee fee component, which compensates guarantor's expected cost (EC). In the next section, we discuss the profit component, which compensates the guarantor's equity-at-risk.

$$f = \frac{1}{\sum_{t=1,\dots,T} D_t^* \times Q_t^0 \times \Delta t} \times (1-R) \times \sum_{t=1,\dots,T} D_t^* \times Q_{t-1}^0 \times \left(h_t^B - h_t^{\prime G}\right) \tag{3.7}$$

where D_t^* is risk-free discount factor, Q_t^0 is the cumulative probability that neither the Borrower nor the Parent is in the default state in period t, h_t^B is the borrower default hazard rate, $h_t^{\prime G}$ is the parent group default hazard rate, and R is the recovery rate on the borrower's debt obligations. The parent group default hazard rate term in the equation accounts for the counter-party default risk. The hazard rates h_t^B and $h_t^{\prime G}$, probabilities Q_{t-1}^0, and recovery rate R are estimated from the Moody's default probabilities and recovery rate tables.

The numerator in the equation

$$F = (1-R) \times \sum_{t=1,\dots,T} D_t^* \times Q_{t-1}^0 \times \left(h_t^B - h_t^{\prime G}\right)$$

represents the fixed $ value of the loan guarantee. The denominator

$$AAF = \sum_{t=1,\dots,T} D_t^* \times Q_t^0 \times \Delta t$$

represent the annuity adjustment factor (AAF). The periodic annual guarantee fee is calculated as the ratio of the fixed fee F and the AAF. Note that if the probability of default by the guarantor is zero ($h_t^{\prime G} = 0$) the equation (3.7) is exactly the same as equation (3.6) with the exception that the parameters $p_t = Q_{t-1}^0 \times h_t^B$ are actual and not risk-neutral default probabilities.

3.4.3 Equity at risk

The guarantee fee derived in equation (3.7) compensates the guarantor only for the expected loss F that is potentially incurred in the guarantee transaction. The OECD guidelines indicate[22] that the guarantee should be priced in such a way that the guarantor not only covers the expected loss on the guarantee but also generates a return on the transaction. The return can be estimated based on standard pricing models such as CAPM.

To be consistent with the OECD guidelines Expected Loss method, the guarantee fee estimated in equation (3.7) should be multiplied by $1 + r^*$ factor, where r^* is the rate of return estimated for the guarantor. The adjusted guarantee fee is described by the following equation.

$$f = (1 + r^*) \times \left[\frac{1}{\sum_{t=1,\dots,T} D_t^* \times Q_t^0 \times \Delta t} \times (1-R) \times \sum_{t=1,\dots,T} D_t^* \times Q_{t-1}^0 \times \left(h_t^B - h_t^{\prime G}\right)\right] \tag{3.8}$$

Note that unlike insurance companies, the guarantor is not required to set a regulatory capital as part of the guarantee contract. Therefore, the rationale that the guarantor must be compensated more than just the expected loss in a guarantee contract is not necessarily applicable for a guarantee transaction.

In practice, the return on equity-at-risk component r^* is applied to expected loss, which does not take into account the counterparty risk and is defined as

[22] See item 154 of the OECD guidelines which describes the Expected Loss guarantee valuation method.

$$EL = (1 - R) \times \sum_{t=1,\dots,T} D_t^* \times Q_{t-1}^0 \times h_t^B \tag{3.9}$$

The above definition follows the Moody's definition of expected loss:[23]

Expected Loss (EL) = Probability of Default (PD) x Loss Given Default (LGD) x Exposure at Default (EAD)[24]

In the above definition of equity-at-risk, Moody's refers to the equity-at-risk concept applied by Luxemburg Tax Authorities. Specifically, Moody's say "Equity-at-risk is defined as the necessary capital to assume the risk taken in the financial transaction. This notion is similar to current financial institutions regulations such as Basel III and IFRS 9. However, the provisioned capital required by the Luxembourg Tax Authorities must be less complex and less constraining than for financial institutions. Indeed, regulations attached to the transfer pricing activity differ from banking capital regulations. This equity-at-risk principle is based on the calculation of the loan's expected loss".[25]

The equity-at-risk calculations, presented in this section, can also be interpreted as the 'expected loss approach' as presented in section D.2.4 of the OECD Guidelines. Specifically, the guidelines describe the 'expected loss' approach as follows:

"*10.181. The valuation of expected loss method would estimate the value of a guarantee on the basis of calculating the probability of default and making adjustments to account for the expected recovery rate in the event of default. This would then be applied to the nominal amount guaranteed to arrive at a cost of providing the guarantee. The guarantee could then be priced based on an expected return on this amount of capital based on commercial pricing models such as the Capital Asset Pricing Model (CAPM)*".

The compensation for the equity-at-risk is estimated then as

$$f^{EaR} = r^* \times EL \tag{3.10}$$

where the rate of return r^* is estimated either based on the CAPM model or using historical ROE data for the tested entity (or its parent group). In some cases, r^* may be estimated based on a sample of comparable companies. The approaches to estimate the return on equity (**ROE**) parameter r^* are summarized as follows:

1. ROE estimate based on historical earnings and equity data, using the following equation: r^* = ROE = (EBIT[26] – Interest Expense) / Equity. Either last fiscal year or average of historical three or five year average is estimated for the ROE calculations. Note that historical data can potentially produce not realistic estimates.[27] Example of Reuters Eikon ROE estimate is illustrated in the exhibit below.

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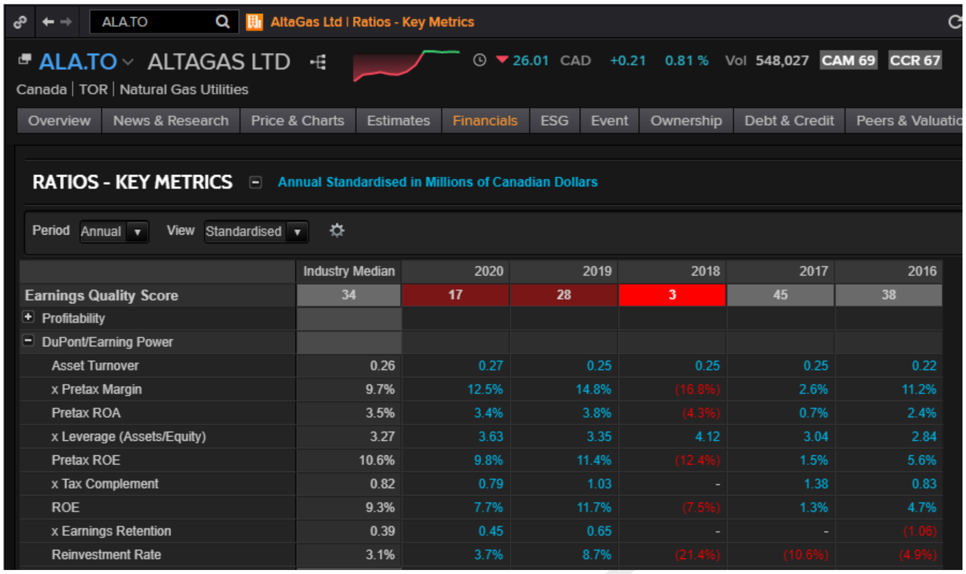
[23] Moody's Analytics, "Equity-at-Risk and Transfer Pricing: Annualised Expected Loss versus Cumulative Expected Loss", October 2018.

[24] In the equation (3.9), the term $Q_{t-1}^0 \times h_t^B$ corresponds to PD, loan principal (normalized to one) corresponds to EAD, and $(1 - R)$ corresponds to LGD. The discounted sum is an extension of the formula to a multi-period model.

[25] If the equity-at-risk would not take the probability of default into consideration, the compensation for the equity-at-risk component would be extremely high. The above definition is applied to produce reasonable from the transfer pricing perspective compensation umbers.

[26] We use EBIT for ROE estimation to exclude unusual and non-recurring costs from the earnings estimation. We also estimate pre-tax income for ROE calculations.

[27] Reuters Eikon database provide information on both company historical ROE pre and after-tax estimates as well as industry average ROE numbers.



	Industry Median	2020	2019	2018	2017	2016
Earnings Quality Score	34	17	28	3	45	38
+ Profitability						
− DuPont/Earning Power						
Asset Turnover	0.26	0.27	0.25	0.25	0.25	0.22
x Pretax Margin	9.7%	12.5%	14.8%	(16.8%)	2.6%	11.2%
Pretax ROA	3.5%	3.4%	3.8%	(4.3%)	0.7%	2.4%
x Leverage (Assets/Equity)	3.27	3.63	3.35	4.12	3.04	2.84
Pretax ROE	10.6%	9.8%	11.4%	(12.4%)	1.5%	5.6%
x Tax Complement	0.82	0.79	1.03	-	1.38	0.83
ROE	9.3%	7.7%	11.7%	(7.5%)	1.3%	4.7%
x Earnings Retention	0.39	0.45	0.65	-	-	(1.06)
Reinvestment Rate	3.1%	3.7%	8.7%	(21.4%)	(10.6%)	(4.9%)

Note that industry-average historical ROE estimates are typically more reasonable as they average out the noise in the ROE estimates of individual companies.

2. ROE estimate based o the CAPM model: $r^* = r^{rf} + \beta \times (r^{mkt} - r^{rf})$. Advantage of the approach is that the ROE estimate is reasonable since it is based on a theoretical framework. However, it can be easily calculated for publicly traded companies for which estimate of beta is available directly through Reuters or Bloomberg database.[28]

The total guarantee fee f is calculated as the sum of the expected cost and equity-at-risk components using the following equation

(3.11) $$f = f^{EC} + f^{EaR}$$

Where f^{EC} is estimated using equation (3.7) and f^{EaR} is estimated using equation (3.10). Because equity-at-risk does not take into account the counterparty risk, it is often material in value and similar to the expected cost component estimated using equation (3.7).

Note that if the credit rating of the guarantor the same as the credit rating of the guaranteed entity, then the benefit from the credit enhancement is zero and the $f^{EC} = 0$ is formally zero. The compensation for the equity-at-risk $f^{EaR} > 0$ is normally always positive so that there is always some non-zero compensation for the guarantee provision.

[28] CAPM-based return on equity can be obtained from Eikon through TR.WACCCostofEquity field. In the above example for AltaGas, the field value was equal to 9.76% (estimated as of 31 Dec 2020).

Section 4 Summary

This section summarizes the approaches and interpretation of the results. Exhibit below shows the similarity and differences between the OECD Guidelines and theoretical models' approaches to financial guarantees.

Exhibit 4.1 Comparing OECD Guidelines and theoretical financial guarantee valuation models

Comparison item	OECD Guidelines	Theoretical models
Degree of formalisation	Broad guidelines, details are expected to be implemented by TP specialist	Precise equations and assumptions, which are applied for guarantee valuation
Valuation approach	Three steps: (i) estimate the yield spread interpreted as the total benefit; (ii) estimate the expected cost to the guarantor; and (iii) identify how to split the benefit between guarantor / guaranteed entity, conditional on estimated expected benefit and cost	Two alternative approaches: (i) Arbitrage pricing approach: yield spread is the arbitrage-free price. No benefit considerations.[29] (ii) Insurance approach based on historical default probabilities and recovery rates
Functional analysis	Credit enhancement function, in which there are three counterparties (lender, borrower, and guarantor) and treasury and hedging functions are entangled. Both guarantor and guaranteed entities are counterparties in a guaranteed loan. No clear interpretation of functions which determine the benefit split. No discussion of the counterparty risk.	Credit enhancement function in which guarantor and lender are counterparties in the transaction (borrower and the loan are reference entity / instrument). Guarantor is compensated for the risk hedging function. Counterparty (guarantor default) risk is a key factor in the guarantee fee pricing.
Results	Split of the yield spread	Consensus (average) guarantee fee based on the (i) arbitrage pricing (in which full yield spread is allocated to the guarantor); and (ii) insurance approach[30]

The comparison of the OECD and theoretical guidelines guarantee fee pricing methods is presented in the exhibit below.

Exhibit 4.2 Comparison between the OECD and theoretical guarantee fee pricing models

Pricing method	OECD Guidelines	Theoretical models
Yield (expected benefit) approach	Guarantee fee is estimated based on a split of the yield spread between the. Interpreted as expected benefit approach	Guarantee fee is equal to the full yield spread is allocated to the guarantor. Interpreted as arbitrage pricing approach
Expected cost (insurance) approach	Guarantee fee is equal to the return on the expected loss. Interpreted as the 'expected cost' to the guarantor	Guarantee fee includes two components: (i) expected cost (adjusted for counterparty risk); and (ii) compensation for equity-at-risk.[31] Second component corresponds to the guarantee fee estimated under the OECD 'expected cost' approach

[29] Applying benefit split of the guarantee fee in the arbitrage pricing approach would be equivalent to reducing the interest rate in the back-to-back loan to account for the 'lender benefit' in the transaction.

[30] In practice, insurance approach would normally produce a lower fee compared to the yield spread approach. Therefore, the average of the two approaches was selected for consistency with the OECD guidelines: (i) guarantee fee under the yield spread approach is interpreted as expected benefit; (ii) guarantee fee under the insurance approach is interpreted as expected cost to the guarantor; and (iii) the average under the two approaches is interpreted as the yield spread split between the guarantor and the guaranteed entity.

[31] Not that the second component of the guarantee fee in the 'Insurance approach' does not have strong theoretical foundations.

Pricing method	OECD Guidelines	Theoretical models
CUP method	Based on search for comparable guarantees of bank loans. Generally comparable transactions are not available	Arbitrage pricing can be interpreted as 'extended' CUP method, which is based on 'indirect' CUPs
Capital support method	Based on direct valuation of capital required for credit enhancement of the borrower	Not presented in this guide. (Note: to review consistency of credit rating and guarantee fee valuation models)

The implementation of the arbitrage-free (yield-spread) valuation approach can be summarized as follows.

(i) Estimate the credit rating of the guarantor and the halo-adjusted credit rating of the guaranteed entity.

(ii) If both ratings are investment grade, apply a guarantee fee in the range between 12.5 – 40bps.

(iii) If both ratings are investment grade, apply a guarantee fee in the range between 25 – 50bps.

(iv) If guarantor has investment grade and guaranteed entity sub-investment grade rating, estimate the range of guarantee fees using MYCA, CNS, or mixed CNS/MYCA approach.

(v) Apply 'Letter of Credit' as a corroborative approach. (Perform 'Letter of Credit' as the primary approach for performance guarantees (if modelling under the insurance approach is not feasible or does not produce robust results).

(vi) Review MYCA yield spreads regardless of estimated credit ratings to verify whether the results can be supported by MYCA numbers.

The yield-spread approach is normally applied as the primary approach and the insurance model is applied to corroborate the results of the yield-spread analysis. Conceptually, the insurance model with risk-neural probabilities should produce the same results as the yield-spread approach. In practice, the insurance model is implemented using historical default probabilities and recovery rates as discussed in Section 3.4. The guarantee fee estimated under the insurance model approach is often lower than the guarantee fee estimated under the yield-spread approach. The consensus market guarantee fee is selected in the range between the guarantee fees estimated under the insurance and yield-spread models. Since the consensus guarantee fee is below the guarantee fee estimated under the yield-spread approach, it can be interpreted as the fee produced by the split between the guarantor and guaranteed entity. As a result, the consensus guarantee fee is consistent with the OECD Guidelines, which recommend to split the expected benefit (measured by the yield spread) but the rationale of the analysis does not have to refer to the 'expected benefit' argument which is difficult to support from the perspective of functional analysis and arbitrage-free pricing.

Appendix A OECD Guidelines

The appendix provides a summary of OECD guidelines on the valuation of guarantee transactions, description of step-by-step procedures, which implement alternative guarantee valuation methods, and derives formally the equations applied in the analysis of guarantee transaction.

In this section, we summarize the OECD guidelines for the transfer pricing analysis and documentation of guaranteed loans summarized in “BEPS Actions 8 – 10, Financial Transactions”, a draft published in July – September 2018 for the purposes of public discussion. Guarantees are covered in section D of the guidelines. The primary focus of the guidelines is on financial guarantees.[32]

A.1 Excerpts from OECD Guidelines

Informal definition of a guarantee transaction is described in the guidelines as follows. “**138.** In general, a financial guarantee provides for the guarantor to meet specified financial obligations in the event of a failure to do so by the guaranteed party. There are various terms in use for different types of credit support and from one member of an MNE group to another in particular, at one end of the spectrum is the formal written guarantee and at the other is the implied support attributable solely to membership in the MNE group. In the context of this section, a guarantee is a legally binding commitment on the part of the guarantor to assume a specified obligation of the guaranteed debtor if the debtor defaults on that obligation. The situation likely to be encountered most frequently in a transfer pricing context is that in which a related party guarantor provides a guarantee on a loan taken out by an associated enterprise from an unrelated lender”.

The function of the guarantee is to provide credit support to the borrower (**credit enhancement**). In the presence of the loan guarantee, the **guarantor becomes effectively the borrower** in the loan transaction. “**79.** A guarantee from another party may be used to support the borrower's credit. A lender placing reliance on a guarantee or guarantees would need to evaluate the guarantor(s) in a similar way to that in which it evaluates the original borrower. For the lender to take a guarantee into account in setting or adjusting the terms and conditions of a loan, it would need to be reasonably satisfied that the guarantor(s) would be able to meet any shortfall resulting from the borrower being unable to meet its obligations in full in the event of a default”.

“**139**. From the perspective of a lender, the consequence of one or more explicit guarantees is that the guarantor(s) are legally committed; the lender’s risk would be expected to be reduced by having access to the assets of the guarantor(s) in the event of the borrower’s default. Effectively, this may mean that the guarantee allows the borrower to borrow on the terms that would be applicable if it had the credit rating of the guarantor rather than the terms it could obtain based on its own, non-guaranteed, rating”.

Another function of a guarantee is to **increase borrowing capacity** of the borrowing entity. “**140**. Where the effect of a guarantee is to permit a borrower to borrow a greater amount of debt that it could in the absence of the guarantee, the guarantee is not simply supporting the credit rating of the borrower but could be acting both to increase the borrowing capacity and to reduce the interest rate on any existing borrowing capacity of the borrower. In such a situation there may be two issues – whether a portion of the loan from the lender to the borrower is accurately delineated as a loan from the lender to the guarantor (followed by

[32] Another type of a guarantee transaction is a performance guarantee. While performance guarantees are not as frequent in transfer pricing analysis, they can also be observed in the context of intercompany transactions.

an equity contribution from the guarantor to the borrower), and whether the guarantee fee paid with respect to the portion of the loan that is respected as a loan from the lender to the borrower is arm's length".

The guidelines recognize the **halo adjustment** to account for the group implicit support in the guarantee analysis. "In considering the borrower's overall financial position as a result of the guarantee, its cost of borrowing with the guarantee would be measured against its non-guaranteed cost of borrowing, as adjusted for any implicit support, and the cost of the guarantee (including any associated costs of arranging the guarantee)".

The guidelines also emphasize that the functions performed by guarantor in the intercompany may generally be different from the functions performed by an independent guarantor. In particular the independent guarantor may be subject to satisfying regulatory requirements and may incur additional costs related to raising the capital.[33] "However, it must be borne in mind that an independent guarantor's charges will in part reflect costs incurred in the process of raising capital and in satisfying regulatory requirements. Those are costs which associated enterprises might not incur".

OECD guidelines on **CUP method**.

"**146**. The comparable uncontrolled price (CUP) method could be used where there are external or internal comparables; independent guarantors providing guarantees in respect of comparable loans to other borrowers or where the same borrower has other comparable loans which are independently guaranteed".

"**147**. In considering whether controlled and uncontrolled transactions are comparable, regard should be had to all the factors which may affect the guarantee fee including: the risk profile of the borrower, terms and conditions of the guarantee, term and conditions of the underlying loan (amount, currency, maturity, seniority etc.), credit rating differential between guarantor and guaranteed party, market conditions, etc. When available, comparable guarantees are the most reliable method to determine arm's length guarantee fees".

"**148**. The difficulty with using the CUP method is that a sufficiently similar credit enhancing guarantee is unlikely to be found between unrelated parties given that unrelated party guarantees of bank loans are uncommon".

OECD guidelines on the **Yield method** (which is also traditionally referred to as "**Expected Benefit**" method).

"**149**. This approach quantifies the benefit that the guaranteed party receives from the guarantee in terms of lower interest rates. The method calculates the spread between the interest rate that would have been payable by the borrower without the guarantee and the interest rate payable with the guarantee. The first step is to determine the interest rate that would have been payable by the borrower on its own merits, taking into account the impact of implicit support as a result of its group membership. See Section C.1.7 Pricing approaches to determining an arm's length interest rate".

"**150**. The next step would be to determine, by a similar process, the interest rate payable if the borrower had the credit rating of the guarantor. The interest spread can be used in quantifying the benefit gained by the borrower as a result of the guarantee. In determining the extent of the benefit provided by the guarantee,

[33] See related discussion in Section "3.2.2 Equity at Risk".

it is important to distinguish the impact of an explicit guarantee from the effects of any implicit support as a result of group membership".

"**152**. The result of this analysis sets a maximum fee for the guarantee (the maximum amount that the recipient of the guarantee will be willing to pay), namely, the difference between the interest rate with the guarantee and the interest rate without the guarantee but with the benefit of implicit support (and taking into account any costs). The borrower would have no incentive to enter into the guarantee arrangement if, in total, it pays the same to the bank in interest and to the guarantor in fees as it would have paid to the bank in interest without the guarantee. Therefore it does not of itself necessarily reflect the outcome of a bargain made at arm's length but represents the maximum that the borrower would be prepared to pay".

OECD guidelines on the **Cost method**.

"**153**. This method aims to quantify the additional risk borne by the guarantor by estimating the value of the expected loss that the guarantor incurs by providing the guarantee (loss given default). Alternatively the expected cost could be determined by reference to the capital required to support the risks assumed by the guarantor. There are a number of possible models for estimating the expected loss and capital requirement.

Popular pricing models for this approach work on the premise that financial guarantees are equivalent to another financial instrument and pricing the alternative, for example, treating the guarantee as a put option and using option pricing models, credit default swap pricing models, etc. Pricing under each model will be sensitive to the assumptions made in the modelling process. Whatever valuation model is used, the evaluation of cost method sets a minimum fee for the guarantee (the minimum amount that the provider of the guarantee will be willing to accept) and does not of itself necessarily reflect the outcome of a bargain made at arm's length. The arm's length amount should be derived from a consideration of the perspectives (taking into account options realistically available) of the borrower and guarantor".

OECD guidelines on the **Expected Loss method** (which is also traditionally referred to as "**Expected Cost**" method).

"**154**. The valuation of expected loss method would estimate the value of a guarantee on the basis of calculating the probability of default and making adjustments to account for the expected recovery rate in the event of default. This would then be applied to the nominal amount guaranteed to arrive at a cost of providing the guarantee. The guarantee could then be priced based on an expected return on this amount of capital based on commercial pricing models such as the Capital Asset Pricing Model (CAPM)".

OECD guidelines on the **Capital Support method**.

"**155**. The capital support method may be suitable where the difference between the guarantor and borrower's risk profiles could be addressed by introducing more capital to the borrower's balance sheet. It would be first necessary to determine the credit rating for the borrower without the guarantee (but with implicit support) and then to identify the amount of additional notional capital required to bring the borrower up to the credit rating of the guarantor. The guarantee could then be priced based on an expected return on this amount of capital to the extent that the expected return so used appropriately reflects only the results or consequences of the provision of the guarantee rather than the overall activities of the guarantor-enterprise".

Loan guarantee example.

"**157**. Company M, the parent company of an MNE group, maintains an AAA credit rating based on the strength of the group's consolidated balance sheet. Company D, a member of the same MNE group, has a credit rating of only BBB on a stand-alone basis, and needs to borrow EUR 10 million from an independent lender".

158. Assume that the accurate delineation of the actual transaction shows that the effect of passive association raises Company D's credit standing from BBB to A, and that the provision of the explicit guarantee additionally enhances the credit standing of Company D to AAA. Assume further that independent lenders charge an interest rate of 8% to entities with a credit rating of A, and of 6% to entities with a credit rating of AAA".

Example assumes that the arm's length guarantee fee is in the range from 1% to 1.5% (or 50% to 75% share allocated to the guarantor from the 2% (= 8% - 6%) expected benefit from the guarantee).

A.2 Summary of OECD Guidelines

Below is the summary of our OECD guidelines interpretation.

- **Functions** performed in a guarantee transaction: (i) credit enhancement (and respective reduction in borrowing costs) and (ii) increase in borrowing capacity.
- **Halo adjustment**. Group implicit support should generally be taken into account in the valuation of a guarantee transaction.
- **CUP method**. The guidelines assume that CUP method can be used when direct arm's length comparable guarantee transactions are available. The guidelines do not view the methods based on arbitrage pricing as a CUP method. Guidelines recognize that sufficiently similar credit enhancing guarantees are typically not available.
- **Yield method**. Under the yield approach, the yield spread between the non-guaranteed and guaranteed loans is estimated. The yield spread is interpreted as the benefit to the guaranteed entity. The benefit is split then between the guarantor and the guaranteed entity. The exact share of the benefit allocated to the guarantor and the guaranteed entity depends on the results of the bargaining process between the two entities.
- **Cost approach**. The cost approach measures the additional risk exposure of the guarantor and therefore estimates the minimum guarantee fee for the guarantor. Therefore, the cost approach should be performed as part of Yield approach to estimate the bargaining set for the guarantor and the borrower. Note that if a guarantee transaction is interpreted as a pure risk-transfer transaction as discussed in Section 2, then the yield spread equals exactly the costs from the default risk exposure that is transferred from the guaranteed entity to the guarantor. Therefore, under the arbitrage valuation approach, the incremental cost to the guarantor equals exactly to the yield spread. Under the arbitrage approach, the yield spread is used as the guarantee fee estimate for both the Yield and the Cost methods.
- **Expected Loss approach**. Expected Loss approach is based on direct calculation of PD and LGD values and respective loss of the guarantor in the event of default. The approach corresponds to the insurance approach discussed in these notes. The OECD discussion does not however provide any discussion on the counter-party risk adjustment in the Expected Loss approach.
- **Capital Support approach**. I have not observed application and documentation of the method in practice.

A.3 Reconciling OECD Guidelines and this guide

There are some conceptual differences between the guarantee fee analysis presented in this guide and the described above OECD guidelines. In this section, we summarize the differences and discuss how to present the analysis so that to emphasize consistency in the approaches and mitigate the differences.

A.3.1 Presentation of arbitrage (yield) approach

As discussed in Section 3.1, the arbitrage is based on the “law of one price” and therefore is similar to the transfer pricing CUP method. However, the OECD guidelines view a transaction as a CUP transaction only if it is structured in the same way. For example, only third-party guarantees are viewed CUPs for a guarantee transaction. The underlying debt transactions, which can be used to replicate the payout structure in a guarantee transaction are not viewed as CUPs. Therefore, for consistency with the OECD guidelines the arbitrage method can be referred to as ‘Yield-based arbitrage’ method, which is reasonably similar to the ‘Yield’ method reference in the OECD guidelines.

The ‘Yield’ method in the OECD guidelines estimates two components: (i) expected benefit equal to the yield spread and (ii) cost interpreted as increase in the guarantor due to the exposure in the loan transaction. The guarantee fee is estimated as a result of bargaining between the guarantor and the borrower, where the minimum and maximum fees of the bargaining set consist of the guarantor cost and the expected benefit values. In the description of the arbitrage approach, we recommend to remove any references to the bargaining process as (i) we want to preserve consistency between the description of the guarantees and CDS valuation methods and (ii) due to the fact that the borrower does not perform any functions in the guarantee transaction and can effectively be viewed only as a reference entity for the purposes of guarantee valuation. Therefore, no share of the expected benefit shall be allocated to the borrower since the borrower is either not present in the bargaining process or does not have any bargaining power.

Note that the OECD guidelines on the valuation methodology of the cost component in the ‘Yield’ method are very generic. There is no assurance that alternative cost valuation approaches are consistent with each other and with the yield spread value, which is the upper bound for the cost value. OECD guidelines specifically say that different alternative approaches can be applied to estimate the cost component in the ‘Yield’ method and that the results are sensitive to the underlying assumptions.

To be consistent with the OECD guidelines, the yield-based arbitrage approach can be viewed as a method that estimates both the expected benefit and the cost components and the two components are exactly equal to each other. The cost component represents the risk premium transferred from the guaranteed entity to the guarantor and is exactly equal to the total benefit allocated to the guarantor’s corporate group and specifically to the guarantor. Therefore, when we describe the arbitrage valuation method, we can preserve the OECD ‘expected benefit’ and ‘cost’ language used to describe the ‘Yield’ method. The key observation that we make in the method description is that under the arbitrage approach the ‘expected benefit’ component is equal to the ‘cost’ component. Since the OECD guidelines do not provide formal details on the ‘cost’ estimation methods and do not require that the ‘cost’ component is strictly below the ‘expected benefit’ component, the arbitrage approach can be viewed as to be consistent with the OECD guidelines for the ‘Yield’ method.

An alternative option is to treat the Insurance approach as the method to estimate the guarantor’s cost in the guarantee transaction. Technically the OECD guidelines distinguish between the ‘Cost’ approach and the ‘Expected Loss’ (Insurance) approach but in practice the Insurance approach is used in transfer pricing to estimate the lower bound for the guarantee fee and is often referred to as the ‘Expected Cost’ approach.

In practice, there is no guarantee that the Insurance approach will produce the guarantee fee estimate that is lower than the guarantee fee estimated as the yield spread. Therefore, two cases shall be considered when comparing the Insurance and the Arbitrage approaches and comparing the results.

1. Guarantee fee estimated under the Insurance approach is larger than the estimated yield spread. In this case the OECD guidelines provide a specific example which concludes that the borrowing entity will never agree to the guarantee fee which exceeds the yield spread.[34] Therefore the estimated guarantee fee equals exactly the yield spread.
2. Guarantee fee estimated under the Insurance approach is smaller than the estimated yield spread. In this case, to be consistent with the OECD guidelines, the yield spread can be interpreted as the expected benefit, fee estimated under the Insurance approach is interpreted as expected guarantor's cost, and the consensus guarantee fee is estimated as the average of the two values.

A.3.2 Presentation of the insurance (Expected Loss) approach

The OECD guidelines on the implementation of the Expected Loss approach are very brief and are summarized in item 154 of the guidelines. The guidelines describe the approach as the method that models explicitly the PD values, recovery rates and respective LGD values. Therefore, the model described in Section 3.4 of this guide can be viewed as a formal implementation of the Expected Loss approach. With the exception of the difference in the method name (Insurance method vs. Expected Loss method) the other difference is that the OECD guidelines recommend including the profit component to the fees allocated to the guarantor. The expected loss is used as the nominal base for the profit calculations and the profit margin is calculated using the return on equity value (estimated using for example CAPM model). The profit component can be added to the Insurance model described in this guide.

[34] **158**. Assume that the accurate delineation of the actual transaction shows that the effect of passive association raises Company D's credit standing from BBB to A, and that the provision of the explicit guarantee additionally enhances the credit standing of Company D to AAA. Assume further that independent lenders charge an interest rate of 8% to entities with a credit rating of A, and of 6% to entities with a credit rating of AAA. Assume further that Company M charges Company D a fee of 3% for the provision of the guarantee so the guarantee fee completely offsets the benefit of Company D's enhanced credit standing derived from the provision of such guarantee.

159. In that situation, the analysis under Chapter I may indicate that an independent enterprise borrowing under the same conditions as Company D would not be expected to pay a guarantee fee of 3% to Company M for the provision of the explicit guarantee since Company D is better off in the absence of the guarantee.

Appendix B Implementation of Arbitrage Valuation Approach

This section presents a step-by-step algorithm to implement each guarantee valuation method.

B.1 Overview

This section provides an overview of approaches to perform the guarantee fee analysis based on equations (4.2) and (4.3). The first three sub-sections describe alternative implementations of the yield-based arbitrage approach, which estimate the guarantee fee based on equation (4.2):

$$f = y^B - y^G$$

Under the yield-based arbitrage approach, the guarantee valuation problem is reduced to the interest benchmarking analysis of a back-to-back loan. Therefore, alternative guarantee valuation approaches are effectively reduced to alternative interest benchmarking methods. In this section we consider three alternative interest benchmarking methods: (i) market yield curve analysis (**MYCA**), corporate note search (**CNS**) analysis, and (iii) subordinated debt search analysis.

3. Search for loans with rating-based price grids. Under the approach, the loans are identified, which price is specified as a grid that relates the applicable interest rate margin to the borrower's credit rating. The key advantage of the approach is that it controls for the entity-specific variation in the yields. The downside of the approach is that loans with rating-based price grids are not easy to identify and the samples are usually relatively small. However, the approach produces robust results and is recommended as one of the primary approaches.
4. Under the MYCA approach, the yield rates y^B and y^G are estimated using generic market yield curves estimated and reported by Bloomberg or Reuters. The approach is easy to implement. A potential problem with the approach is that the yield spreads reported for credit ratings within the same credit rating group (for example (B) or (BB) group) are often very small. An illustration of the potential problem with the approach is provided in Appendix B.3.
5. Under an alternative CNS approach, the yield rates y^B and y^G are estimated using samples of comparable note transactions with the terms matching the terms of the debt issued by the borrower and the parent group. The approach can potentially suffer from the same problem as the MYCA approach and is more difficult to implement. However, since the samples applied for yield estimation are controlled by the analyst (and are not fixed samples used by Bloomberg for yield series estimation), the approach provides much higher flexibility and control over the results.
6. Mixed CNS / MYCA approach. The approach is an extension of the CNS approach. The key difference from the CNS approach, is that under the mixed approach the yield series are estimated internally as part of the analysis.[35] The approach implementation is more complex compared to the CNS approach as it requires an additional step to estimate the market yield series. However, it provided additional flexibility in the guarantee fee modelling.[36]
7. Letter of credit approach. The approach is based on the search for the fees charged in the letter of credit transactions. The advantage of the approach is that a letter of credit can be interpreted as a comparable for a guarantee transaction. Due to the fact, the letter of credit approach is often applied

[35] Under the CNS approach, Bloomberg yield series are applied for the interest rate adjustments.

[36] For example, it can be assumed under the approach that the slope and curvature are constant for the yield series with different credit ratings and the only parameter that is different across different yield series is the constant parameter (which models rating-specific risk, which is constant for each maturity term).

more broadly not only for the financial but also for the performance guarantees.[37] The downside of the approach is that it does not account for the counterparty risk and therefore the approach potentially overestimates the guarantee fee.

Other two approaches include

1. Under the junior debt search approach, the search is performed for the corporate notes or loans with different credit ratings issued by the same entity. In practice the difference in the notes' / loans' credit ratings is typically due to different ranking of the notes: a subordinated note will be rated below a senior note issued by the same entity. To identify such debt structures with different notes' ranking, we search for subordinated notes as they are typically issued in addition to already existing senior notes.
2. Under the CDS-based approach the guarantee fee is estimated based on the equation (3.3):

$$f = s^B - s^G$$

The CDS-based approach is typically not applied due to the difficulty to identify a sufficient sample of comparable CDS spreads and a resulting problem to construct a robust sample of CDS spreads. However, the step-by-step procedure to perform the CDS-based guarantee fee analysis is still summarized in Section 4.2.4.

The practice of applying the last two approaches did not produce robust results and normally are not considered for the guarantee fee valuation.

B.2 Search for loans with rating-based price grid

The key rationale of performing the search for the loans with the rating-based price grid, is that the price information fully controls for any price variation that is entity-specific. Basically, the rating-based price grid can be directly interpreted as the credit enhancement price grid (compensation to the guarantor for the credit enhancement).

A potential challenge in the approach is to implement the search strategy and identify a reasonably good sample of comparable loans. The section provides an example of strategy implementation and shows the sample of identified loans with rating-based grid pricing.

At first, we attempted to perform the search on Bloomberg, but we could not identify an efficient search strategy. Alternatively, we performed a search in EDGAR database[38], which proved to be a much more flexible option for these purposes. EDGAR allows to search files within a specific period using a set of keywords. The following search strategy was implemented to identify loans with rating-based price grids (we searched for the price grids which include B1 rating).

1. Period: one year
2. Keywords: Rating AND B1

[37] It is generally preferable to apply a direct Insurance approach for a performance guarantee valuation. However, in actual projects the data is often not sufficient for a direct performance guarantee modelling. A letter of credit approach can be viewed as a generic alternative to estimate the performance guarantee fee ranges.

[38] EDGAR, the Electronic Data Gathering, Analysis, and Retrieval system, performs automated collection, validation, indexing, acceptance, and forwarding of submissions by companies and others who are required by law to file forms with the U.S. Securities and Exchange Commission (the "SEC"). The database contains a wealth of information about the Commission and the securities industry which is freely available to the public via the Internet (https://www.sec.gov/edgar/search).

3. Form: 8-K[39]
4. Exhibit: EX-10.x

The search (performed in February 2021) identified a sample of 11 amended credit agreements and one indenture.[40] The search results are shown in the exhibit below.

Exhibit B.1 Sample of loans with rating-based price grid

#	Issuer	Issue date	Maturity date	Tenor	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B
1	Dell International LLC[41]	9-Apr-20	9-Apr-21	1.00				0.25%	0.50%	0.75%	1.00%	
2	DPL Inc	1-Jun-20	19-Jun-23	3.05			1.75%	2.00%	2.25%	2.50%	2.75%	
3	Elanco Animal Health Corp.	1-Apr-20	1-Aug-27	7.34				1.50%	1.75%	2.00%	2.25%	
4	EQM Midstream Partners L.P.	30-Mar-20		≥3	1.13%	1.25%	1.38%	1.75%	2.00%	2.38%	2.75%	
5	Freeport-McMoran Inc.	3-Jun-20				2.13%	2.45%	2.75%	3.00%	3.50%	4.00%	
6	International Game Technology PLC	3-May-20				1.00%	1.40%	1.80%	2.20%	2.75%	3.25%	
7	Kontoor Brands, Inc.	5-May-20	5-May-27	7.00			1.375%	1.50%	1.75%	2.00%	2.25%	
8	Lindblad Expiditions, LLC	10-Dec-20	27-Mar-25	4.30							3.25%	3.50%
9	NMI Holdings Inc.	20-Mar-20	22-Feb-23	2.93		1.38%	1.50%	1.75%	2.00%	2.50%	2.88%	
10	Nustar Logistics L.P.	6-Mar-20	6-Mar-25	5.00		1.35%	1.60%	1.85%	2.25%	2.50%	2.75%	
11	PG&E Corp	26-May-20	26-May-23	3.00				3.00%	3.25%	3.50%	3.75%	4.00%
12	Spirit Aerosystems Holdings Inc.	31-Jul-20	12-Jul-23	2.95	3.13%	3.25%	3.38%	3.63%	3.88%	4.13%	4.50%	4.88%

The interest rate spreads for each credit rating one-notch difference are shown in the exhibit below.

Exhibit B.2 Sample of interest rate differentials

#	Issuer	Issue date	Maturity date	Tenor	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B
1	Dell International LLC	9-Apr-20	9-Apr-21	1.00					0.25%	0.25%	0.25%	
2	DPL Inc	1-Jun-20	19-Jun-23	3.05				0.25%	0.25%	0.25%	0.25%	
3	Elanco Animal Health Corp.	1-Apr-20	1-Aug-27	7.34					0.25%	0.25%	0.25%	
4	EQM Midstream Partners L.P.	30-Mar-20		≥3		0.13%	0.125%	0.38%	0.25%	0.38%	0.38%	
5	Freeport-McMoran Inc.	3-Jun-20					0.325%	0.30%	0.25%	0.50%	0.50%	

[39] Most of the amendments to credit agreements were filed using 8-K forms and 10.x exhibits (however, a few exceptions were observed).

[40] Indentures usually match exhibits with 4.x numbers. We did not reviewed in detail the indentures since most of them were issued significantly earlier than within one-year period.

[41] This transaction is the only indenture in the sample and the pricing numbers represent the increments to the indenture with rate. For all other transactions, the pricing numbers represent the applicable margin on the amended credit agreement floating interest rate.

#	Issuer	Issue date	Maturity date	Tenor	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B
6	International Game Technology PLC	3-May-20					0.40%	0.40%	0.40%	0.55%	0.50%	
7	Kontoor Brands, Inc.	5-May-20	5-May-27	7.00				0.13%	0.25%	0.25%	0.25%	
8	Lindblad Expiditions, LLC	10-Dec-20	27-Mar-25	4.30								0.25%
9	NMI Holdings Inc.	20-Mar-20	22-Feb-23	2.93			0.13%	0.25%	0.25%	0.50%	0.38%	
10	Nustar Logistics L.P.	6-Mar-20	6-Mar-25	5.00			0.25%	0.25%	0.40%	0.25%	0.25%	
11	PG&E Corp	26-May-20	26-May-23	3.00					0.25%	0.25%	0.25%	0.25%
12	Spirit Aerosystems Holdings Inc.	31-Jul-20	12-Jul-23	2.95		0.13%	0.13%	0.25%	0.25%	0.25%	0.38%	0.38%
	Minimum					0.13%	0.13%	0.13%	0.25%	0.25%	0.25%	0.25%
	Lower Quartile					0.13%	0.13%	0.25%	0.25%	0.25%	0.25%	0.25%
	Median					0.13%	0.19%	0.25%	0.25%	0.25%	0.25%	0.25%
	Upper Quartile					0.13%	0.31%	0.32%	0.25%	0.44%	0.38%	0.31%
	Maximum					0.13%	0.40%	0.40%	0.40%	0.55%	0.50%	0.38%

An illustration of rating-based price grid (as it is presented in a loan agreement identified in EDGAR) is shown below.[42]

Pricing Grid for Initial Revolving Loans

	Applicable Margin	
Moody's / S&P Rating	**ABR Loans**	**Eurocurrency Loans**
Ba1 / BB+ (stable / stable) or higher	0.50%	1.50%
Ba2 / BB (stable / stable)	0.75%	1.75%
Ba3 / BB- (stable / stable)	1.00%	2.00%
B1 / B+ or lower	1.25%	2.25%

Based on the results presented above, the following conclusions can be made:

1. Only a relatively small sample of loans with rating-based price grid could be identified.
2. The pricing grids in the identified loan sample are very consistent:
   - In the range between 12.5 – 40 bps for the investment grade ratings; and
   - In the range between 25 – 50 bps for the sub-investment grade ratings.
3. The pricing grids do not depend significantly on the maturity term, valuation date, industry sector of the issuer, or other parameters.
4. Stability in the interest rate spreads can be interpreted as that the banks apply certain standardized average spreads to determine the price grid and are not trying to capture markets day-to-day volatility.
5. In out experience, the spreads applied by banks are reasonable when both the guarantor and guaranteed entity have investment or sub-investment credit ratings. However, when the guarantor has investment credit rating and the guaranteed entity has a sub-investment credit rating, the spreads presented in the above samples may often underestimate the actual spread observed in

[42] The pricing grid is illustrated for the credit agreement amendment issued by Elanco Animal Health Corp.

the market. Typically, the largest increase in interest rates is observed when the credit rating moves from investment to sub-investment grade. [43]

B.3 MYCA approach

The steps of the guarantee fee estimation approach under the MYCA approach are summarized below.

1. Summarize the terms of the guaranteed loan and the guarantee agreements. Select the valuation date for the purpose of the guarantee fee analysis.[44]
2. Estimate the credit rating of the parent group and the borrower including.
   - Stand-alone issue credit rating of the borrower.
   - If necessary, halo-adjusted issuer credit rating of the borrower.
   - Transaction-specific credit rating of the loan (assuming the loan is not guaranteed by the parent).
   - Transaction-specific credit rating of the loan guaranteed by the parent.
3. Perform MYCA analysis to estimate the yield rate y^B on the loan (assuming the loan is not guaranteed by the parent). The yield series (obtained from Bloomberg or Reuter's databases) applied in the MYCA analysis must have the credit rating and maturity term matching the credit rating and maturity term of the loan and must have and industry sector matching the broad industry sector in which borrowing entity operates.[45]
4. Perform MYCA analysis to estimate the yield rate y^G on the loan guaranteed by the parent. The selected yield series must match respectively the terms of the guaranteed loan.
5. Estimate the guarantee fee as the yield spread, $f = y^B - y^G$.
6. Perform the above analysis for a range of dates preceding (and including) the valuation date of the guarantee fee analysis. Construct the full and interquartile ranges of guarantee fees based on constructed samples $f_t = y_t^B - y_t^G$.

A potential problem with the approach is that the yield spreads reported for credit ratings within the same credit rating group (for example (B) or (BB) group) are often very small. For example, the spread between the yields with neighbor credit ratings can be reported by Bloomberg at 2 bps for extended periods of time (as illustrated in the diagram below).[46,47]

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[43] Liquidity of the traded debt transactions is typically also affected negatively when the credit rating moves into sub-investment category.

[44] A standard choice is to select the valuation date as a date which is two business days prior to the guarantee agreement effective date.

[45] The yield series are constructed by Bloomberg or Reuter's for broad industry sectors such as Industrial, Financial, Banking or Utilities.

[46] This problem to produce the yield estimates that consistently increase with the decrease in the credit rating is often present in the yield series estimation problem. For example, to produce a consistent spread between different credit ratings, Reuter's was estimating the yield series for the group ratings (such as (B) group which includes B-, B, and B+ ratings and (BB) group which includes BB-, BB, and BB+ ratings). The yield series for notch-specific credit ratings were then estimated by linearly interpolating group yield series. For example, the yield series for the B+ rating would be estimated as 1/3 of (BB) group yield series and 2/3 of the (B) group yield series.

[47] The exhibit was produced on Bloomberg using HS (spread analysis) function for BB and BB+ rated 5-year Industrial yield series.

Exhibit B.3 Example of Bloomberg yield series with 2 bps spread between neighbor credit ratings

B.4 CNS approach

The steps of the guarantee fee estimation approach under the CNS approach are summarized below.

1. Same as in MYCA approach.
2. Same as in MYCA approach.
3. Perform CNS analysis to estimate the yield rate on the loan (assuming the loan is not guaranteed by the parent). The search parameters in the CNS approach are selected so that to identify publicly traded corporate notes with the terms comparable to the terms of the loan. On Bloomberg terminal the search is performed using SRCH function. The details of the CNS analysis are provided in the respective interest benchmarking guide. Construct the sample of fully adjusted yield rates $\{y_i^B\}$ for the non-guaranteed loan.
4. Perform CNS analysis to estimate the yield rate on the loan guaranteed by the parent. Construct the sample of fully adjusted yield rates $\{y_j^G\}$ for the guaranteed loan.
5. Estimate the median guarantee fee as the yield spread, $f = y^B - y^G$, where y^B and y^G are respectively the medians of the $\{y_i^B\}$ and $\{y_j^G\}$ samples.
6. The distribution and respective ranges of guarantee fees can be constructed by applying the bootstrap method to the constructed $\{y_i^B\}$ and $\{y_j^G\}$ yield samples.

B.5 Mixed CNS / MYCA approach

The steps of the guarantee fee estimation approach under the mixed CNS/MYCA approach are summarized below.

1. Same as in MYCA approach.
2. Same as in MYCA approach.
3. Search for a sample of comparable notes (similar to the search performed under the CNS approach).

4. Estimate yield series based on the sample of identified comparable notes.
5. Estimate the guarantee fee as the yield spread, $f = y^B - y^G$, based on the estimated yield curves.

B.6 Letter of Credit approach

A letter of credit (**LoC**), or "credit letter" is a letter from a bank guaranteeing that a buyer's payment to a seller will be received on time and for the correct amount. In the event that the buyer is unable to make a payment on the purchase, the bank will be required to cover the full or remaining amount of the purchase. It may be offered as a facility.[48]

A credit letter can be viewed as a comparable of a guarantee and the fee charged by the bank in a credit letter can be interpreted as a guarantee fee.[49] Therefore, the guarantee fee is estimated based on a search of comparable credit letters and respective LoC fees. Some standard types of LoCs include

- Commercial Letter of Credit (or Trade Letter of Credit). This is a direct payment method in which the issuing bank makes the payments to the beneficiary.[50]
- Standby letter of credit is a secondary payment method in which the bank pays the beneficiary only when the holder cannot make a payment. Under the normal circumstances, the amount available in a standby letter of credit is not expected to be drawn.
- Revolving Letter of Credit. This kind of letter allows a customer to make any number of draws within a certain limit during a specific time period.

Letters of credit are typically issued as part of larger credit agreement deals (which may also include term loans and revolving loan facilities).

B.6.1 Overview of the approach

The steps of the guarantee fee estimation approach under the LoC approach are summarized below.

1. Same as in MYCA approach.
2. Same as in MYCA approach (with the exception that the credit rating is estimated for the borrowing entity only).
3. Search for a sample of letters of credits with the terms comparable to the terms of the tested transaction.
4. Estimating the ranges of guarantee fees based on the ranges of the fees observed in the LoC sample.

The letter of credit fee, applied for the guarantee fee estimation, is defined as follows (based on the actual agreement language).

[48] https://www.investopedia.com/terms/l/letterofcredit.asp.

[49] A letter of credit can be compared to a CDS as the purpose of both transactions is to hedge against the credit risk.

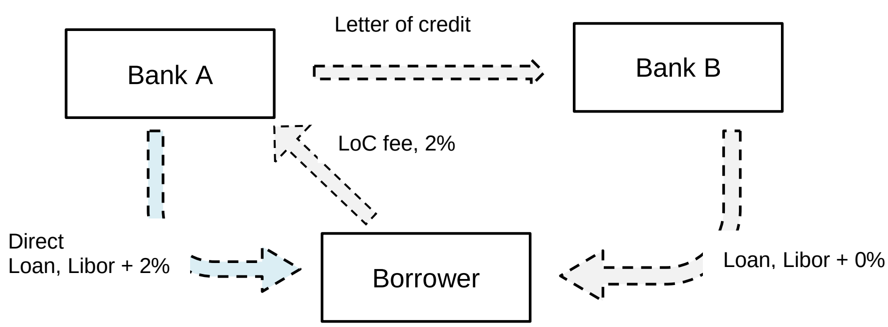
[50] As an Example of a Letter of Credit, Citibank offers letters of credit for buyers in Latin America, Africa, Eastern Europe, Asia, and the Middle East who may have difficulty obtaining international credit on their own. Citibank's letters of credit help exporters minimize the importer's country risk and the issuing bank's commercial credit risk.

Letter of Credit Fee: for each standby Letter of Credit, the fee is equal to the Applicable Rate times the daily amount available to be drawn under such Letter of Credit. The loan grid includes the applicable rate for the letter of credit fee as part of the agreement.

For the financial guarantees, the LoC is usually applied only as a corroborative approach. The key downside of the approach is that it does not adjust for the counterparty risk.[51] The guarantors in the LoC transactions are banks, which credit ratings are in most cases higher than guarantors credit ratings in intercompany loans. As a result, the ranges estimated under the LoC approach are often biased upward.[52] However, if the guarantors credit rating is high and counterpart risk is respectively low, the LoC approach provides a good approximation to the market ranges.

B.6.2 Arbitrage pricing under the LoC approach

The arbitrage pricing argument can be illustrated in the LoC approach as follows. Suppose that the Borrower has a letter of credit from Bank A. The Borrower can issue a loan with Bank B and use the letter of credit as a guarantee to repay the borrowed amount. Since the borrowed funds are guaranteed by another Bank A, the effective interest rate on the loan will be set equal to the Libor rate. The Libor rate can be supported by an arbitrage argument as follows: Bank B can lend money directly to Bank A at the Libor rate, and Bank A will loan the funds to the Borrower at the Libor + margin, where the margin on the loan is the same as the letter of credit fee. The arbitrage argument is illustrated by the following diagram.



The arbitrage pricing is supported by empirical evidence: the letter of credit fee is always set equal to the loan margin (whenever the letter of credit is issued as part of the credit agreement which also includes term loans or revolving facilities). In practice, Bank A and Bank B are always the same entity (the same bank issues both the letter of credit and makes a loan to the borrower within the same loan deal agreement). Illustration of the equivalence between the letter of credit fee and the loan margin is illustrated in the diagram below.[53]

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[51] Note that the LoC fee is effectively equal to the loan applicable margin, or equivalently, the spread between the loan interest rate and the Libor rate (where the Libor rate can be viewed as the rate applicable to the bank that issues the letters of credit).

[52] Median of the ranges estimated under the LoC approach for the guaranteed entities with sub-investment credit rating can often exceed 1%. This is significantly higher compared for example with the guarantee fees estimated using a search for loans with rating based price grid (which is discussed in Appendix B.2.

[53] The price grid is taken from the loan deal issued by Avnet Holding Europe BVBA on 4 August 2020, which agreement was obtained from the EDGAR database.

Debt Ratings S&P /Moody's/Fitch	Facility Fee	Eurocurrency Rate + Letter of Credit Fee
BBB+/Baa1/BBB+ or better	0.125%	1.000%
BBB/Baa2/BBB	0.150%	1.100%
BBB-/Baa3/BBB-	0.200%	1.175%
BB+/Ba1/BB+	0.250%	1.375%
BB/Ba2/BB or worse	0.350%	1.525%

The exhibit above illustrates that the letter of credit fee and the margin on the loan are typically quoted under the same column in a loan agreement.

B.7 Other approaches

For general reference, we also include a description of other approaches that potentially can be applied for guarantee fee valuation. However, implementation of the approaches in actual projects did not produce robust numbers and therefore they were not normally considered to be applied.

B.7.1 Junior debt search approach

The steps of the guarantee fee estimation approach based on subordinated debt search analysis are summarized below.

1. Same as in MYCA approach.
2. Same as in MYCA approach.
3. Perform the search for the comparable entities, which have both senior and subordinated debt outstanding as of the valuation date of the analysis. The credit rating of subordinated debt is below the credit rating of senior debt and the yield on subordinated debt is respectively higher than the yield on senior debt (conditional on maturity and other adjustments). Construct the samples of fully adjusted yields on senior and subordinated debt denoted respectively as $\{y_i^{Sr}\}$ and $\{y_i^{Sub}\}$. Construct the sample of yield spreads: $f_i = y_i^{Sub} - y_i^{Sr}$.
4. There are three alternative approaches to design a search strategy.
   - Search for the **1st lien secured loans**. The companies which issued such loans may often have senior unsecured notes as part of the financing structure. The 1st lien secured loans will typically be rated one-two notches above the senior unsecured notes.
   - Search for the **2nd lien secured loans**. The 2nd lien loans are typically rated significantly lower (three notches and above) than the 1st lien loans. The premium on 2nd lien loans is usually also very high (400bps or above). A potential problem with the approach is that 2nd lien loans are rated at CCC+ or lower. It is typically not possible to find 2nd lien loans with higher ratings.
   - Search for **subordinated notes**. Subordinated notes (senior and junior) are often issued by financial companies and banks and they are part of a large financing portfolio. Due to their lower ranking, subordinated notes are viewed as similar to preferred shares. Majority of the debt transactions are long-term (or in some cases may be perpetuals). Another potential problem with the subordinated notes search approach is that the yield differentials within a company may be stronger effected by the order in which the notes are being repaid than by the actual subordination ranking and respective ratings. [**To be tested**]
5. Construct the following regression model:
   - The vector of endogenous variables is equal to f_i.

- ► The matrix of exogenous variables X is constructed as follows.
  - (i) Construct ordered set of senior and subordinated notes' credit ratings $\mathcal{C}$. Columns in matrix X corresponds to credit ratings in the constructed ratings' set $\mathcal{C}$.
  - (ii) For each entity i, construct the set of ratings that belong to the set $\mathcal{C}$ and which are greater or equal to the credit rating of subordinated note and less or equal to the credit rating of the senior note. Denote the constructed set as $\mathcal{C}^{(i)}$.
  - (iii) Set the coefficients of row $X^{(i)}$ to one for the credit ratings in the set $\mathcal{C}^{(i)}$ and to zero otherwise.
- ► The linear regression model is described as follows: $f = X \times \beta + \varepsilon$. The regression coefficients β estimate each notch-specific credit spread differential.
- ► Estimate the linear regression model parameters $\hat{\beta}$. Construct the set $\mathcal{C}^*$ of credit ratings that belong to the set $\mathcal{C}$ and which are greater or equal than the credit rating of non-guaranteed loan and less or equal than the credit rating of the guaranteed loan. Construct vector X^*, which has one at the elements with indices such that the corresponding credit ratings belong to the set $\mathcal{C}^*$ and zero otherwise. Estimate the guarantee fee as $f^* = X^* \times \hat{\beta}$.

Under the subordinated debt search approach, the entity-specific error term in the yields of the notes issued by the same entity will generally be strongly correlated for the yields on senior and subordinated notes. Therefore, the yield spread is not affected strongly by the entity-specific yield error term as it would be under the MYCA or CNS approach. As a result, the approach is less likely to produce the yield spread that is immaterial or negative. In practice it is generally difficult to identify debt structures issued by an entity with credit ratings matching exactly the credit ratings of the borrower and the group. Therefore, a broader search must be performed, and adjustment must be made to produce an estimate of the $y^B - y^G$ spread.

B.7.2 CDS search approach

The steps of the CDS-based guarantee fee estimation approach are summarized below.

1. Same as in MYCA approach.
2. Same as in MYCA approach.
3. Perform CDS spread analysis to estimate the CDS spreads applicable to the non-guaranteed loan. The CDS search parameters are selected so that to identify CDS transactions with the terms comparable to the terms of the loan.[54] On Bloomberg terminal the search is performed using GDS function. Construct the sample of fully-adjusted CDS spreads $\{s_i^B\}$ for the non-guaranteed loan.
4. Perform CDS search to estimate the CDS spread applicable to the guaranteed loan. Construct the sample of fully-adjusted CDS spreads $\{s_j^G\}$ for the guaranteed loan.
5. Estimate the median guarantee fee as the yield spread, $f = s^B - s^G$, where s^B and s^G are respectively the medians of the $\{s_i^B\}$ and $\{s_j^G\}$ samples.
6. The distribution and respective ranges of guarantee fees can be constructed by applying the bootstrap method to the constructed $\{s_i^B\}$ and $\{s_j^G\}$ yield samples

The approach may potentially suffer from the same problem as the MYCA approach: there is no guarantee that the spread between the estimated yield rates estimated for the borrower and the group is material (or even positive). A design of a search strategy for the comparable notes typically faces a trade-off: a broader search strategy may include companies from sectors with sector premium, which results in a biased

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[54] The search parameters typically include (i) loan credit rating, (ii) loan maturity term, (iii) borrower's industry sector, (iv) borrower's region of domicile.

estimate of the y^B and y^G yield rates and respective yield spread. A narrower search strategy may result in small samples and respective small sample bias. The error terms present in each individual yield observation will result in a non-robust estimate of the yield spread $y^B - y^G$.

B.8 Summary

There are two potential problems with the implementation of the guarantee fee approaches in practice.

1. Large noise in the estimate due to the significant impact of entity-specific risk. The problem is typically present in MYCA and CNS approaches which compare the yields using two non-overlapping samples of transactions. The guarantee fees are often within 15-100bps ranges while the yield variation within a sample can be 100bps or higher. Therefore, large samples of comparable transactions are required to mitigate the entity-specific risk and produce a robust estimate of yield spreads.[55]
2. Market liquidity considerations and a potential problem to identify a good sample of comparable transactions. The search for loans with the rating-based price grid addresses the problem related to the entity-specific yield volatility. However, the approach normally allows to identify only small samples of such loans and generally the produced sample has only limited comparability with respect to the maturity term, valuation date, industry sector, or other parameters. On the other hand, the produced results are robust and demonstrate that the estimated guarantee fee ranges do not depend materially on the above comparability factors.

A recommended implementation of the valuation approach, which balances the potential issues described above and produces a robust estimate of the guarantee fee ranges, can be summarized as follows.

(i) Estimate the credit rating of the guarantor and the halo-adjusted credit rating of the guaranteed entity.

(ii) If both ratings are investment grade, apply a guarantee fee in the range between 12.5 – 40bps.

(iii) If both ratings are investment grade, apply a guarantee fee in the range between 25 – 50bps.

(iv) If guarantor has investment grade and guaranteed entity sub-investment grade rating, estimate the range of guarantee fees using MYCA or CNS approach.

(v) Review MYCA yield spreads regardless of estimated credit ratings to verify whether the results can be supported by MYCA numbers.

[55] Basically, the source of the problem can be presented in a simple form as follows: it is difficult to estimate robustly yield spreads (which are often quite small), when the errors in yield estimated are high. The problem was illustrated in the MYCA approach discussion.

Appendix C Insurance Model

In this section we formally derive the equations for the guarantee fee and describe a step-by-step procedure to implement the guarantee fee analysis based on the Insurance model.

C.1 Model description

Suppose that in each period the default process can be in one of four states: 0 – neither guarantor nor borrower defaulted; 1 – guarantor defaulted, subsidiary (borrower) did not default; 2 – subsidiary defaulted, guarantor did not default; and 3 – both guarantor and subsidiary defaulted. The process probability transition matrix is described as follows:

(C.1)
$$
\begin{array}{cccccc}
 & none & Grp & Sub & both & - \\
Q = & \left(\begin{array}{c} 1-q^B \\ 0 \\ q^B - q^G \\ q^G \end{array} \right. & \begin{array}{c} 0 \\ 1 \\ 0 \\ 0 \end{array} & \begin{array}{c} 0 \\ 0 \\ 1-q^G \\ q^G \end{array} & \left. \begin{array}{c} 0 \\ 0 \\ 0 \\ 1 \end{array} \right) & \begin{bmatrix} none \\ Grp \\ Sub \\ both \end{bmatrix}
\end{array}
$$

where q^G is the probability that both the borrower and the guarantor default and q^B is the probability that subsidiary defaults. The matrix structure assumes that default of the group automatically results in the default of the borrower. The assumption implies that the probability that the borrower defaults and the group does not default equals to $q^{B\backslash G} = q^B - q^G \geq 0$. The matrix structure also assumes that default of the group q^G does not depend on the condition whether the borrower is in default state or not. The last assumption is applied to ensure that the parameters of the matrix can be calibrated using the subsidiary and group yield curves.[56]

Without loss of generality we can assume that the Markov process has only three states: $\{none, Sub, both\}$. The initial state of the default process is $[none, Sub, both]_{t=0} = [1, 0, 0]$.

The NPV equation for the guarantee fee is described as follows. Suppose that Q_t^0, Q_t^B, and Q_t^G are probabilities of states $\{none, Sub, both\}$ in period $t-1$. Then NPV of annual guarantee fees equals to the NPV of the default cost

(C.2)
$$f \times \sum_{t=1,\dots,T} D_t^* \times Q_t^0 = (1-R) \times \sum_{t=1,\dots,T} D_t^* \times Q_{t-1}^0 \times (q_t^B - q_t^G)$$

where R is the recovery rate on the defaulted loan.

The equation is interpreted as follows. The right-hand side of the equation describes expected payout made by the guarantor under the guarantee agreement. The guarantor makes the payout under the guarantee agreement whenever the above Markov process moves from the state *none* into the state *Sub* (default by the subsidiary but not the group). The marginal probability that the event occurs in period t equals to $Q_{t-1}^0 \times (q_t^B - q_t^G)$ (probability that neither group nor subsidiary defaulted prior to period t times conditional probability that subsidiary defaulted in period t and the guarantor did not default.). The LGD in the guarantee

[56] Suppose that the default probability of the group depends on the default state of the borrower and $q^{G|B}$ represent the probability of group default conditional on the borrower being in default state. The model estimation requires to calibrate parameter $q^{G|B}$ which is generally not feasible since the data with the borrower being in default state and group being in non-default state is generally not observable.

transaction equals to $1 - R$. The guarantee expected is calculated as the NPV of the expected payouts made by the guarantor under the guarantee contract.

The left-hand side of the equation describes expected compensation to the guarantor under the guarantee agreement. The guarantor receives compensation f in each period t such that the subsidiary is in a non-default state. The probability of the event is Q_t^0. The expected compensation under the guarantee agreement is calculated as the NPV of the expected fees paid to the guarantor.

C.2 Parameter calibration

The default probabilities can be estimated explicitly for the matrix Q with the structure described above. The default probabilities Q_t^0, Q_t^S, and Q_t^G are calculated sequentially as follows:

(C.3)
$$\begin{cases} Q_t^0 = Q_{t-1}^0 \times (1 - q^B) \\ Q_t^S = 1 - Q_t^0 - Q_t^G \\ Q_t^G = Q_{t-1}^0 \times q^G + Q_{t-1}^S \times q^G + Q_{t-1}^G \end{cases}$$

The last equation can be simplified as follows

$$Q_t^G = (Q_{t-1}^0 + Q_{t-1}^S) \times q^G + Q_{t-1}^G = (1 - Q_{t-1}^G) \times q^G + Q_{t-1}^G$$

The equation can be used directly to calibrate the q^G parameter as follows

(C.4)
$$q^G = \frac{Q_t^G - Q_{t-1}^G}{1 - Q_{t-1}^G} = h_t^G$$

which represents the group's default hazard rate and can be estimated using the cumulative and marginal probability of default data estimated for the group credit rating.

The probability $Q_t^B = 1 - Q_t^0$ represent the probability that either the subsidiary alone or both the subsidiary and the group are in the default state. If we substitute Q_t^B in the first equation of the system of equations (c.3), then Q_t^B is described by the following equation

$$1 - Q_t^B = (1 - Q_{t-1}^B) \times (1 - q^B)$$

or, equivalently,

$$Q_t^B = Q_{t-1}^B + (1 - Q_{t-1}^B) \times q^B$$

Therefore

(C.5)
$$q^B = \frac{Q_t^B - Q_{t-1}^B}{1 - Q_{t-1}^B} = h_t^B$$

which represents the borrower's default hazard rate and can be estimated using the cumulative and marginal probability of default data estimated for the borrower's credit rating. The Q_t^B and respectively Q_t^0 probabilities can be estimated using the cumulative probability of default data estimated for the borrower's credit rating.

The guarantee fee NPV equation is described as follows:

$$f \times \sum_{t=1,\ldots,T} D_t^* \times Q_t^0 = (1-R) \times \sum_{t=1,\ldots,T} D_t^* \times Q_{t-1}^0 \times \left(h_t^B - h_t^{\prime G}\right)$$

Since the values $D_t^* \times Q_t^0$ are close to one, the equation can be approximated using the following simplified formula

(C.6) $$f = (1-R) \times avg\left(h_t^B - h_t^{\prime G}\right)$$

where $avg\left(h_t^B - h_t^{\prime G}\right)$ is the average spread between the borrower and the group default hazard rates.

C.3 Validation of the Insurance Model using arbitrage approach

C.4 Model summary

Under the Insurance approach the guarantee fee is estimated using the following equation

$$f \times \sum_{t=1,\ldots,T} D_t^* \times Q_t^0 = (1-R) \times \sum_{t=1,\ldots,T} D_t^* \times Q_{t-1}^0 \times \left(h_t^B - h_t^{\prime G}\right)$$

where

- ► $h_t^{\prime G}$ represents the group's default hazard rate, which is estimated using the Moody's cumulative and marginal probability of default data estimated for the group credit rating;
- ► $h_t^{\prime B}$ represents the borrower's default hazard rate, which is estimated using the Moody's cumulative and marginal probability of default data estimated for the borrower credit rating;
- ► Q_t^0 is the probability that neither the borrower nor the group is in default state, which is estimated using the Moody's cumulative probability of default data estimated for the borrower credit rating;
- ► R is the recovery rate, which estimated using Moody's recovery rate data;
- ► D_t^* is the risk-free discount factor that is estimated using for example Libor swap curve.[57]

C.5 Model implementation

The steps of the guarantee fee estimation approach based on insurance model are summarized below.

1. Same as in MYCA approach.
2. Same as in MYCA approach.

[57] Alternative approaches to estimate risk-free discount factors are estimated in the 'NPV Analysis' guide.

Appendix D AC.finance.CDS

This section describes the implementation of the guarantee fee valuation model in the AC.finance.CDS tool. The tool is part of the framework, which was developed to perform valuation of financial instruments in the context of transfer pricing analysis.

Appendix E Examples

This section illustrates application of the guarantee fee valuation approaches with several examples. It also includes examples, which test consistency of market data with the theoretical models described in this guide.

E.1 Credit enhancement estimation

E.2 Yield-based loan guarantee valuation

The three yield-based approaches described below were estimated or the following example.

- Parent credit rating: BBB
- Borrower credit rating: BBB-
- Industry sector: Mining
- Region: US and Canada
- Maturity term: 5 years
- Valuation date: the analysis was performed for each business day of 2018.

E.2.1 MYCA approach

E.2.2 CNS approach

E.2.3 Mixed CNS / MYCA approach

E.3 Insurance approach

E.4 Letter of Credit approach

The section describes an example of LoC approach application to guarantee fee estimation. Suppose that the tested transaction was issued between a US and a Canadian entity, was rated at BB credit rating and had 15-year maturity term. The search was performed for the loan transactions (which included LoC as part of the agreement) with the following parameters.

1. Loan format: credit agreement which include letters of credit as part of the agreement.
2. Issue date: within one-year period (February 2020 to February 2021).
3. Maturity: no restriction.
4. Issuer rating: BB

The search, which was performed on EDGAR database,[58] identified the following sample of letter of credit fees:

Exhibit E.1 Sample of LoC transactions

#	Issuer	Issue date	Maturity date	Tenor	BBB+	BBB	BBB-	BB+	BB
1	Avnet Holding Europe BVBA	4-Aug-20			1.000%	1.100%	1.175%	1.375%	1.525%
2	DPL Inc.	1-Jun-20	19-Jun-23	3.05			1.750%	2.000%	2.250%
3	Hexcel Corp.	28-Jan-21	20-Jun-24	3.39			2.000%	2.250%	2.500%
4	Hexcel Corp.	28-Jan-21	20-Jun-24	3.39	1.000%	1.125%	1.250%	1.500%	
5	Spirit Aerosystems Inc.	31-Jul-20	12-Jul-23	2.95	1.125%	1.250%	1.375%	1.625%	1.875%
6	Spirit Aerosystems Inc.	31-Jul-20	12-Jul-23	2.95	1.625%	1.750%	1.875%	2.125%	2.375%
7	Spirit Aerosystems Inc.	31-Jul-20	12-Jul-23	2.95	3.125%	3.250%	3.375%	3.625%	3.875%
8	Spirit Aerosystems Inc.	31-Jul-20	12-Jul-23	2.95	2.625%	2.750%	2.875%	3.125%	3.375%
9	Vontier Corp.	29-Sep-20	29-Sep-23	3.00	1.250%	1.350%	1.425%	1.625%	1.675%
	Minimum					1.25%	1.38%	1.63%	1.68%
	Lower Quartile					1.35%	1.43%	1.63%	1.88%
	Median					1.75%	1.88%	2.13%	2.38%
	Upper Quartile					2.75%	2.88%	3.13%	3.38%
	Maximum					3.25%	3.38%	3.63%	3.88%

Based on the identified sample, the IQR was estimated at [1.875, 3.127]. Note that the LoC approach does not account for the counterparty risk. The LoC are issued by banks to which the Libor rate would apply (which would represent the bank credit risk). The rating of a bank is in most cases significantly higher than the rating of the guarantor in the tested transaction.

E.5 Empirical testing of the CDS arbitrage valuation model

In this section we test empirically whether the CDS valuation equation (3.1).

$$s = y - y^{rf}$$

is consistent with the empirical market data. The equation is tested based on the CDS spread and corporate notes yield data of Barrick Gold Corporation (BGC), one of the world largest mining companies. Both the CDS spread and notes yield data are available through Bloomberg database. The CDS bid and ask spreads are available for maturities ranging from 6 months to 30 years. CDS spreads data for the BGC group is illustrated in the exhibit below. Both bid and ask CDS spread data is available for each maturity term so that a range of CDS spreads can be estimated.

[58] The search was performed using the following keywords: 'letter of credit fee AND L/C AND rating AND Ba2'. Only a part of the sample is presented in the exhibit.

R	Reference Name	CDS Ticker	Bond Ticker	Te...↑	Curr	Rank	Sector	Ticker	Bid Price	Ask Price	PCS
			ABXCN								
1)	Barrick Gold Corp	ABXCN	ABXCN	0M	USD	SNR	Basic Materials	CY127276			CMAN
2)	Barrick Gold Corp	ABXCN	ABXCN	3M	USD	SNR	Basic Materials	CT675874			CMAN
3)	Barrick Gold Corp	ABXCN	ABXCN	6M	USD	SNR	Basic Materials	CT675878	2.66	11.07	CMAN
4)	Barrick Gold Corp	ABXCN	ABXCN	9M	USD	SNR	Basic Materials	CY151691			CMAN
5)	Barrick Gold Corp	ABXCN	ABXCN	1Y	USD	SNR	Basic Materials	CT382932	5.10	15.10	CMAN
6)	Barrick Gold Corp	ABXCN	ABXCN	2Y	USD	SNR	Basic Materials	CT382936	13.01	23.01	CMAN
7)	Barrick Gold Corp	ABXCN	ABXCN	3Y	USD	SNR	Basic Materials	CT382940	24.28	34.25	CMAN
8)	Barrick Gold Corp	ABXCN	ABXCN	4Y	USD	SNR	Basic Materials	CT382944	41.58	51.53	CMAN
9)	Barrick Gold Corp	ABXCN	ABXCN	5Y	USD	SNR	Basic Materials	CABX1U5	62.71	70.90	CMAN
10)	Barrick Gold Corp	ABXCN	ABXCN	6Y	USD	SNR	Basic Materials	CT382948	80.96	93.32	CMAN
11)	Barrick Gold Corp	ABXCN	ABXCN	7Y	USD	SNR	Basic Materials	CT382952	93.85	109.14	CMAN
12)	Barrick Gold Corp	ABXCN	ABXCN	8Y	USD	SNR	Basic Materials	CT382956	101.54	121.77	CMAN
13)	Barrick Gold Corp	ABXCN	ABXCN	9Y	USD	SNR	Basic Materials	CT382960	107.67	131.71	CMAN
14)	Barrick Gold Corp	ABXCN	ABXCN	10Y	USD	SNR	Basic Materials	CT382928	112.85	139.92	CMAN
15)	Barrick Gold Corp	ABXCN	ABXCN	11Y	USD	SNR	Basic Materials	CT675882			CMAN
16)	Barrick Gold Corp	ABXCN	ABXCN	12Y	USD	SNR	Basic Materials	CT675886			CMAN
17)	Barrick Gold Corp	ABXCN	ABXCN	15Y	USD	SNR	Basic Materials	CT675890	128.48	168.43	CMAN
18)	Barrick Gold Corp	ABXCN	ABXCN	20Y	USD	SNR	Basic Materials	CT675894	136.31	183.14	CMAN
19)	Barrick Gold Corp	ABXCN	ABXCN	30Y	USD	SNR	Basic Materials	CT675898	143.28	196.20	CMAN

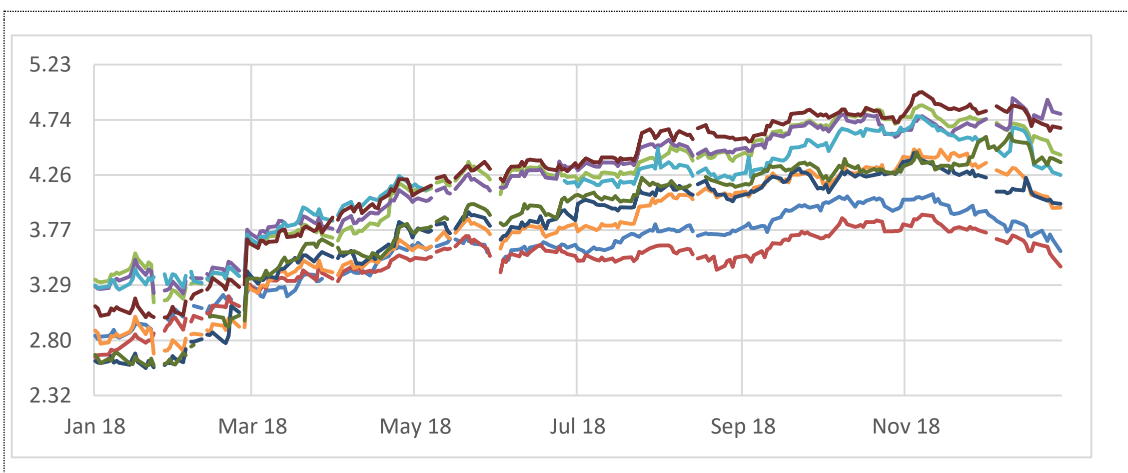
The search for the BGC group corporate notes that were outstanding during the 1 Jan 2018 to 31 Dec 2018 period identified

R	Issuer Name	Ticker	Maturi...↑	Yld to...	Amount Is...	Amt Out	BB...	Curr	BICS Level 2	Cntr...	BICS Lev...	Collateral Type	Maturity Type
	Average		15.8	4.964	518.70MM	263.25MM							
1)	Barrick PD Australia Finance Pty Ltd	ABXCN	1	3.106	400.00MM	248.47MM	BBB	USD	Metals & Mining	AU	Materials	COMPANY GUAR...	AT MATURITY
2)	Barrick Gold Corp	ABXCN	2.1	4.353	7.00MM	7.00MM	NR	USD	Metals & Mining	CA	Materials	SR UNSECURED	AT MATURITY
3)	Barrick Gold Corp	ABXCN	3.2	3.346	1.25MMM	337.22MM	BBB	USD	Metals & Mining	CA	Materials	SR UNSECURED	AT MATURITY
4)	Barrick Gold Corp	ABXCN	6.8	4.813	6.50MM	6.50MM	NR	USD	Metals & Mining	CA	Materials	SR UNSECURED	AT MATURITY
5)	Barrick Gold Corp	ABXCN	6.8	4.859	5.00MM	5.00MM	NR	USD	Metals & Mining	CA	Materials	SR UNSECURED	AT MATURITY
6)	Barrick Gold Corp	ABXCN	7.4	4.772	15.00MM	15.00MM	NR	USD	Metals & Mining	CA	Materials	SR UNSECURED	AT MATURITY
7)	Barrick Gold Corp	ABXCN	7.4	4.752	32.00MM	32.00MM	NR	USD	Metals & Mining	CA	Materials	SR UNSECURED	PUTABLE
8)	Barrick Gold Corp	ABXCN	14.2	5.214	200.00MM	200.00MM	BBB	USD	Metals & Mining	CA	Materials	SR UNSECURED	AT MATURITY
9)	Barrick Gold Finance Co	ABXCN	15.9	5.121	200.00MM	200.00MM	BBB	USD	Metals & Mining	CA	Materials	COMPANY GUAR...	AT MATURITY
10)	Barrick Gold Corp	ABXCN	15.9	5.646	200.00MM	200.00MM	BBB	USD	Metals & Mining	CA	Materials	SR UNSECURED	AT MATURITY
11)	Barrick Gold Corp	ABXCN	16.8	4.877	300.00MM	300.00MM	BBB	USD	Metals & Mining	CA	Materials	SR UNSECURED	AT MATURITY
12)	Barrick International Barbados Corp	ABXCN	17.8	4.940	600.00MM	600.00MM	BBB	USD	Metals & Mining	BB	Materials	COMPANY GUAR...	AT MATURITY
13)	Barrick International Barbados Corp	ABXCN	17.8	4.940	600.00MM	600.00MM	BBB	USD	Metals & Mining	BB	Materials	COMPANY GUAR...	AT MATURITY
14)	Barrick North America Finance LLC	ABXCN	19.7	5.618	250.00MM	250.00MM	BBB	USD	Metals & Mining	US	Materials	COMPANY GUAR...	AT MATURITY
15)	Barrick PD Australia Finance Pty Ltd	ABXCN	20.8	5.371	834.00MM	834.00MM	BBB	USD	Metals & Mining	AU	Materials	COMPANY GUAR...	AT MATURITY
16)	Barrick PD Australia Finance Pty Ltd	ABXCN	20.8	5.362	850.00MM	16.00MM	BBB	USD	Metals & Mining	AU	Materials	COMPANY GUAR...	AT MATURITY
17)	Barrick PD Australia Finance Pty Ltd	ABXCN	20.8	5.362	850.00MM	16.00MM	BBB	USD	Metals & Mining	AU	Materials	COMPANY GUAR...	AT MATURITY
18)	Barrick North America Finance LLC	ABXCN	22.4	5.244	850.00MM	30.00M	BBB	USD	Metals & Mining	US	Materials	COMPANY GUAR...	AT MATURITY
19)	Barrick North America Finance LLC	ABXCN	22.4	5.244	850.00MM	30.00M	BBB	USD	Metals & Mining	US	Materials	COMPANY GUAR...	AT MATURITY
20)	Barrick North America Finance LLC	ABXCN	22.4	5.238	849.97MM	849.97MM	BBB	USD	Metals & Mining	US	Materials	COMPANY GUAR...	AT MATURITY
21)	Barrick Gold Corp	ABXCN	23.2	5.201	750.00MM	750.00MM	BBB	USD	Metals & Mining	CA	Materials	SR UNSECURED	AT MATURITY
22)	Barrick North America Finance LLC	ABXCN	24.3	5.195	849.33MM	849.33MM	BBB	USD	Metals & Mining	US	Materials	COMPANY GUAR...	AT MATURITY
23)	Barrick North America Finance LLC	ABXCN	24.3	5.278	850.00MM	673.00M	BBB	USD	Metals & Mining	US	Materials	COMPANY GUAR...	AT MATURITY
24)	Barrick North America Finance LLC	ABXCN	24.3	5.278	850.00MM	673.00M	BBB	USD	Metals & Mining	US	Materials	COMPANY GUAR...	AT MATURITY

We retained only the first 15 notes (with maturities ranging from 1 year to 20 years. We removed duplicates of multiple identical issuances and removed notes with outstanding balances less than 50 million.[59] The final sample contained nine corporate notes.

Based on the sample of BGC group corporate notes, the yield rates for the 5-year maturities were estimated. The results of the interest benchmarking analysis are illustrated in the exhibit below.

Exhibit E.2 Yield rates on the BGC notes in the final sample, adjusted for five-year maturity term



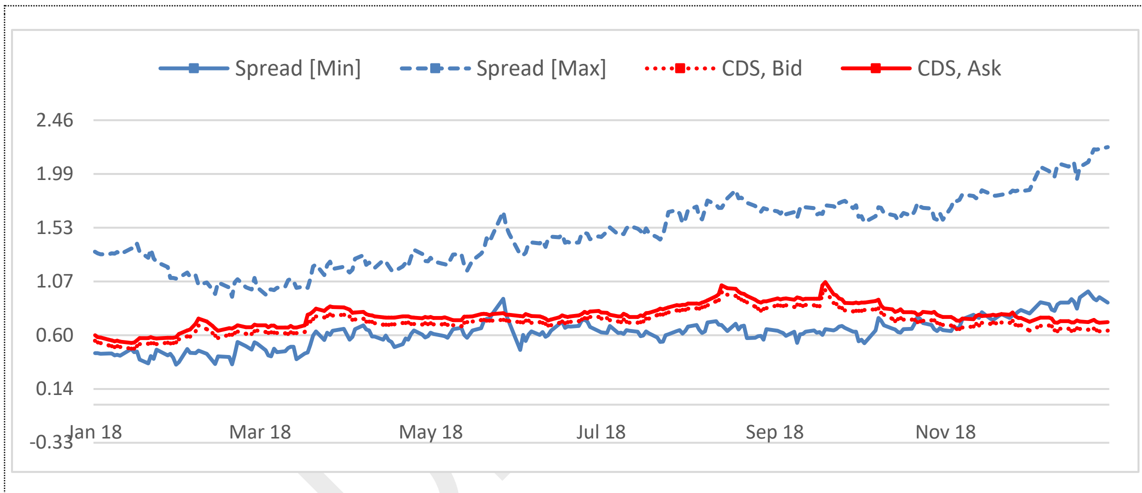
[59] Bloomberg prices at premium the issuances with small outstanding balances.

The exhibit shows that the yields on the notes generate a relatively wide range after adjustment to 5-year maturity term. The minimum of the range is generated by two notes with short remaining maturity. The remaining seven notes have remaining maturity ranging between 14 to 21 years. The structural break in the yield series is due to the fact that BGC was upgraded from BBB- to BBB in March 2018. To remove the structural break, we assume that the market valuation was adjusted prior to the rating upgrade was published. We assume that BGC was rated at BBB throughout 2018.

The risk free rate was estimated based on the Bloomberg USSW swap curve, which has US$ 3-month Libor rate on the first leg (quarterly payments, Actual/360 day count) and US$ fixed rate on the second leg (semi-annual payments, 30/360 day count).[60] The spread between the BGC median yield rates and the risk-free rates are presented in the exhibit below.

The spread described by equation (3.1) was calculated based on the minimum and the maximum adjusted yield y estimated for the notes in the final sample.

Exhibit E.3 Actual CDS spreads (bid and ask) and CDS spreads estimated based on equation (4.1), 5-year term

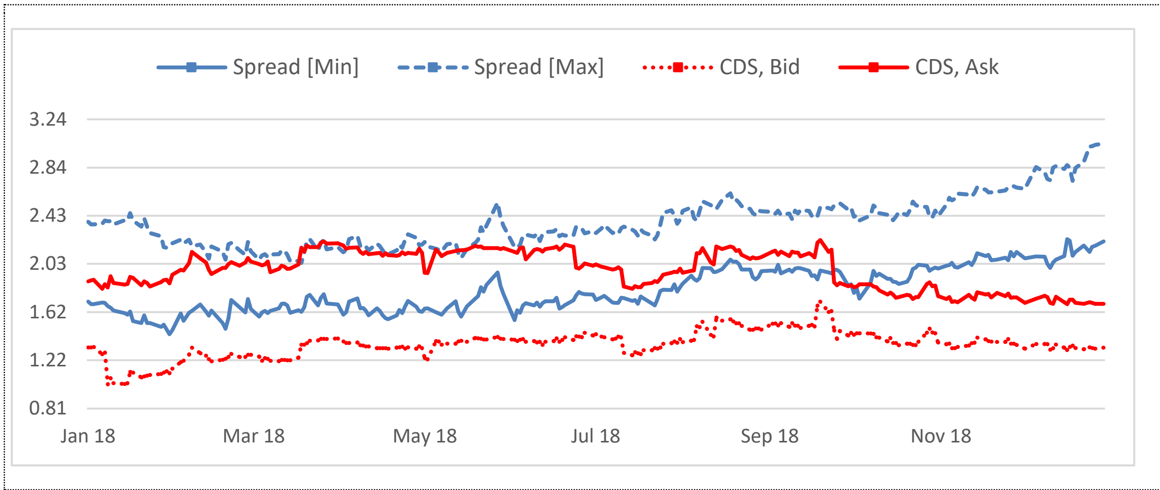


The CDS spreads based on the minimum yields of the sample approximate the actual CDS spreads relatively close for the 2018 period.

Similarly, we removed two short-term notes from the sample and estimated the 15-year spreads based on seven notes with the remaining maturity ranging between 14 and 20 years. The results are illustrated in the exhibit below.

[60] The risk-free rate estimated based on the swap curve is very close to the risk-free rate estimated based on the US$ Treasury rates.

Exhibit E.4 Actual CDS spreads (bid and ask) and CDS spreads estimated based on equation (4.1), 15-year term



The CDS spreads based on the minimum yields of the sample are consistent with the actual CDS spreads with the exception of the period starting from the end of September 2018 when the 15-year CDS spreads start to decrease, which is inconsistent with the increased premium on BGC long-term yields (the same pattern was observed for the 5-year maturity term).

The example illustrates that the CDS spread estimated using equation (4.1) does not produce a very accurate match to the actual CDS spread reported by Bloomberg. In certain periods the behavior of the derived and actual CDS spreads are not consistent with each other. However, there is also no consistent bias observed in the example between the derived and actual CDS spreads. In addition, both the CDS bid-ask spread and the range of estimated yield rates can be large so that a wide range of both derived and actual CDS spreads can be supported. The two ranges overlap for the majority of the days during the 2018 period.

Appendix F References

List of references used in the guide is provided below.

[1] Base Erosion and Profit Shifting (BEPS), Public Discussion Draft, BEPS Actions 8 - 10, Financial Transactions, 3 July - 7 September 2018;

[2] John Hull, Alan White “Valuing Credit Default Swaps I: No Counterparty Default Risk”;

[3] Darrell Duffie “Credit Swap Valuation”, *Financial Analyst Journal*, pp73-87, 1999;

[4] “Moody's Investor's Service Annual Default Study: Corporate Default and Recovery Rates, 1920 – 2017”, Moody’s, Data Report,15 February 2018

[5] “Transfer Pricing Guidance on Financial Transactions, INCLUSIVE FRAMEWORK ON BEPS: ACTIONS 4, 8-10”, February 2020, OECD