MODELING METHODOLOGY

Moody's Analytics RiskCalc Transfer Pricing Solution

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Abstract

Tax authorities monitor cross-border, inter-company loan and financing transactions to curb tax avoidance and require arm's length pricing for such transactions. At the core of arm's length pricing is the process of understanding the creditworthiness of a borrower and identifying a typical interest rate charged to borrowers with comparable credit ratings. The Moody's Analytics RiskCalc™ Transfer Pricing Excel Template provides a consistent, analytical solution to the arm's length transfer pricing process. This document explains the methodology behind this tool.

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1. Introduction

Within the global economy, cross-border inter-company loan and financing transactions are growing rapidly. To prevent tax avoidance and double taxation issues, many countries adopt an "arm's length" principle when regulating inter-company loan pricing. Under this principle, cross-border, inter-company loans between related parties should be priced as if the parties are independent and engaged in the same transaction. An arm's length interest rate is determined by referencing comparable transactions under comparable circumstances. Failure to price such transactions at arm's length can cause tremendous penalties and losses for involved parties. In 2010, there was a lawsuit between the Canadian Minister of National Revenue (Minister) and General Electric Capital Canada. The Minister's claim was that this C$136 million exceeded the total amount calculated using the arm's length principle and therefore should have been taxed. While the tax court vacated the Minister's appeal, General Electric Capital Canada would have ended up not being able to deduct C$136 million from the tax, if the outcome of the debate had unfolded differently.

Within the context of cross-border inter-company loan and financing transactions, three primary challenges emerge when calculating transfer price. First, most borrowers in cross-border, inter-company transactions do not have a credit rating assigned by rating agencies such as Moody's Investor Services. Hence, objectively measuring the creditworthiness of these borrowers is the key step in determining an arm's length interest rate. Furthermore, it is important to ensure that the rating estimate considers the local credit environment. A firm operating in emerging markets usually has a different risk profile than a similar firm operating in a developed economy.

Second, a subsidiary in a multinational company typically receives support from the parent, which alters the borrower's credit evaluation on the loan market and, thereby, impacts interest rates for inter-company loans and financing transactions. The complication behind the transfer pricing in situations with group/parental support has been documented, even though the implementation differs by jurisdiction. Barette, et al. (2010) illustrate a complication behind determining whether support from a parent truly benefits the subsidiary on the loan market and, therefore, ask if the transaction is worth a guarantee fee. Therefore, we require a tool that objectively evaluates the borrower's credit rating, on a standalone basis, as well as taking into account group/parental support.

Last, determining the interest rate given the borrower's credit rating is not straightforward. Loans with the same credit rating have different interest rates, and we must identify a rate qualified as the arm's length rate.

Moody's Analytics RiskCalc Transfer Pricing Excel Template overcomes these challenges and derives interest rates for cross-border, inter-company transactions. RiskCalc provides credit risk assessment for private and unrated firms. The RiskCalc Transfer Pricing Template, built upon RiskCalc models, provides a scorecard that considers parental support, as well as a daily, updated feed of typical interest rates used, organized by rating grade.

The remainder of this document discusses the template in more detail:

» Section 2 explains how RiskCalc and its Transfer Pricing Excel Template estimate the credit rating of borrowers.

» Section 3 discusses the derivation of the transfer price from the credit rating.

» Section 4 concludes.

2. Measuring the Borrower's Creditworthiness Using RiskCalc

We believe a good default prediction model includes the following features:

>> Model performance: the model produces higher probability of default (PD) for riskier firms, and the PD level is appropriate.

>> Economic intuition: the model outputs are intuitive and in-line with economic theory.

>> Usability: input variables should be easy to interpret and easy to calculate.

>> Model transparency: the model should clearly present why changing input variables results in output changes

Moody's Analytics developed RiskCalc as a statistical learning model that extracts credit risk measures from financial statements. The RiskCalc EDF™ (Expected Default Frequency) credit measure is given by

$$RiskCalc\ EDF = F\left(\Phi\left(\sum_{i=1}^{N} \beta_i T_i(x_i) + \sum_{j=1}^{K} \gamma_j I_j \right) \right),$$

where Φ is the distribution function of the standard normal random variable, $x_1, \ldots, x_N$ are the input ratios, $I_1, \ldots, I_K$ are indicator variables for each industry classification, and $\beta_1, \ldots, \beta_N, \gamma_1, \ldots, \gamma_K$ are estimated coefficients. Non-parametric transformations, $T_1, \ldots, T_N$, capture the univariate non-linear relationship between each input ratio and the default risk. F, again non-parametric transformation, calibrates the model outputs to the final PD.

The performance of statistical models such as RiskCalc is sensitive to the quality of the underlying data. Data for RiskCalc model development comes from Moody's Analytics Credit Research Database (CRD). As a consortium of more than 75 leading global financial institutions and vendors, the CRD is one of the world's largest and most comprehensive financial statement and default databases. For more details regarding the development of RiskCalc, please refer to RiskCalc modeling methodology papers.

RiskCalc is a suite of country- and industry-specific models. Additionally, we have developed separate models for corporate firms, dealership firms, real estate operation firms, not-for-profit organizations, banks, and insurance companies, because these types of firms differ vastly in their business operations and financial reporting. RiskCalc offers country-specific models for most of the developed economies such as the U.S. and Germany, as well as emerging economies such as China and South Africa. We developed country-specific models, because each country has its own accounting standards and credit culture. The default rate of private firms also differs by country, with higher default rates in emerging economies and lower rates in developed economies.

In addition, we use two regional models for large private firms: the RiskCalc North American Large Firm Model and the RiskCalc European Large Firm Model. Compared to small firms, large private firms tend to have more operations across country and across industry. They also have more access to the capital markets. In Europe, large firms are more likely to adopt IFRS, whereas, small firms tend to follow local accounting standards. In North America and Europe, we pool together enough data to build models specific for large firms.

The other two regional models are the Emerging Markets and Global Banking models. The Emerging Markets Model covers all emerging markets where a country-specific model is not yet available. We developed this model using data from 24 different emerging markets. The Global Banking Model covers all banks outside the U.S.

Note, EDF measures from different RiskCalc models are intended to be comparable. For example, an EDF value of 1% from the RiskCalc Germany Model is commensurate to the same EDF value from the RiskCalc Russia Model. Such comparability makes RiskCalc an ideal rating tool in pricing cross-border loans.

Term Structure of EDF Measures
RiskCalc provides the EDF term structure. This important feature makes RiskCalc applicable to transfer pricing, because loans are associated with various tenors. In particular, RiskCalc generates one-year and five-year EDF measures, from which, shorter than five-year term EDF measures are interpolated and beyond five-year term EDF measures are extrapolated. We refer readers to RiskCalc modeling methodology papers for the interpolation and to Zhao and Yang (2016) for the extrapolation.

RiskCalc EDF-Implied Rating
RiskCalc further maps the EDF measure output to an agency rating scale. The mapping table, derived from the global observed default rate by rating grades during the past 30 years, applies to all RiskCalc models. The mapping table intends to provide consistent meaning across industries and different geographies throughout the world. It is reasonably consistent with the observed default rates of bond ratings (Ou, et al., 2016).

Parent/Group Support Framework (PGSF) Overlay

With support from a parent/group, we expect an upgrade to a borrower's effective credit rating from its standalone rating, unless the parent/group has a lower rating. We use a scorecard to measure the degree and the likelihood of the support and then revise the borrower's credit rating accordingly. We base the scorecard on the following key elements of the parent/group support:

>> Existence of explicit (legally enforceable) support

>> Likelihood of support

>> Economic contribution to a parent/group

>> Degree of parent/group support

>> Degree of association between a parent/group and a subsidiary

3. Identifying Comparable Interest Rates

Given a borrower's credit rating, how can we ascertain a comparable interest rate? A common approach finds a typical interest rate for each credit rating and applies this rate as the price of inter-company loans with the same rating. Powered by Moody's Market Implied Rating (MIR) research, the RiskCalc Transfer Pricing Excel Template follows exactly this process. In particular, the Excel template features a daily-updated table of median bond credit spreads in each credit rating bucket with different tenors. Credit Spread is the difference between yield to maturity and reference rate. In the Excel template, this table can be extended to a 15- year tenor, and it can facilitate the U.S. treasury rate as a reference rate. Table 1 illustrates the credit spread table for up to 5 years. See Kim, et al. (2016) for details regarding MIR research and the derivation of the credit spread table.

The spread table is based on a dataset of globally-collected Moody's rated bonds. This dataset contains 25,000 bonds filtered by rigorous bond inclusion criteria. Each spread in the table is a typical spread for the corresponding tenor and rating bucket. Integrating globally-collected bonds into a single framework is possible, because Moody's ratings boast a global consistency, in the sense that, the probability of default range associated with each rating bucket remains consistent from one country to another. We change each bond's denomination to USD to construct the credit spread table.

Using the credit spread table and the credit rating, we can derive a comparable interest rate for an inter-company loan/financing transaction. The resulting rate is USD denominated. We use several techniques, such as a currency swap calculation, to convert the USD denominated interest rate into a local currency denominated rate.

Table 1

Median Credit Spreads in bps by Rating and Tenor as of 4/11/2017

Rating	1-Year	2-Year	3-Year	4-Year	5-Year
Aaa	-65.27	-18.85	-9.82	3.15	8.50
Aa1	-50.83	-2.08	8.47	22.60	28.89
Aa2	-43.61	6.31	17.62	32.33	39.09
Aa3	-39.09	12.72	25.39	41.20	48.89
A1	-33.93	20.20	34.58	51.79	60.68
A2	-28.05	28.93	45.46	64.44	74.87
A3	-23.03	37.38	56.61	77.89	90.35
Baa1	-17.50	46.99	69.53	93.66	108.68
Baa2	-11.38	57.95	84.50	112.17	130.39
Baa3	14.47	88.77	118.34	148.13	167.93
Ba1	50.66	130.14	162.65	194.39	215.58
Ba2	101.33	185.66	220.66	253.90	276.05
Ba3	120.79	206.15	241.53	274.91	297.07
B1	166.35	253.09	288.74	321.00	343.85
B2	266.53	348.88	380.49	410.12	428.70
B3	319.68	391.60	418.37	444.20	459.61
Caa/C	407.06	466.97	483.80	502.22	511.70

4. Summary

Tax authorities scrutinize transfer pricing practices in cross-country, inter-company financial transactions in order to reduce double taxation or tax avoidance. At the core of a transfer pricing practice is whether or not the interest rates are calculated at arm's length. Pricing cross-country inter-company loan and financial transactions at arm's length is challenging, because parties' creditworthiness is often unknown, and it is almost impossible to find highly comparable pricing transactions. Designed to be an intuitive and robust statistical learning model for credit risk measurement, Moody's Analytics RiskCalc objectively evaluates creditworthiness based financial statements. RiskCalc produces a probability of default measure and maps it to an implied agency rating. The RiskCalc Transfer Pricing Excel Template provides a scorecard that incorporates parent or group support factors. The Excel tool also grants users access to typical interest rates for each credit rating category, updated daily, based on a large pool of bonds from throughout the world.

References

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