S&P Global
Market Intelligence

LOSSSTATS® MODEL

Estimating Ultimate Loss Given Default Of Corporate Company Loans and Bonds Via An Advanced Statistical Model (US and European Countries Model)

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Overview

After experiencing the worst global recession since 1930s[1] that led to one of the longest quantitative easing cycles in US history, the US economy is giving more and more signals of recovery and the Federal Reserve has finally started a progressive interest rate hike. This could have profound implications on the default rates of bank loans and corporate bonds which have been at historical lows for several years, in part due to the accommodative monetary policy of the US Federal Reserve. At the end of 2016Q3 the total amount of outstanding US Corporate bond debt was in excess of $8.5 Trillion, and growing.[2] A similar trend is visible for the European Corporate bond debt, partly driven by the ECB program, that is currently maintaining ultra-low interests rates.[3] Arguably, a surge in interest rates could exacerbate the default risk of bonds and loans as issuers find less opportunity to refinance at low rates, leading to higher default rates of Non-Financial Corporate companies in both the investment grade, and to a greater extent, the non-investment grade space. This confirms the importance of assessing credit risk, looking at "both sides of the coin": *default risk* and *loss given default*.

To assess default risk, analysts can rely upon the credit ratings of an established rating agency or the outputs of a statistical model, either internally developed or distributed by a third party provider: S&P Global Market Intelligence redistributes the credit ratings of S&P Global Ratings and offers multiple quantitative tools, based on company fundamentals or market signals, that estimate the credit risk of a rated or unrated obligor.[4]

To estimate loss given default (LGD) or recovery given default (RGD),[5] financial practitioners traditionally revert to non-robust methods, including:

- A fixed value for loss given default (around 45% for senior unsecured claims and 75% for subordinated claims[6]); on one hand, this penalizes lending areas such as trade finance and project finance where default rates are high, but many factors mitigating risk of losses are in place[7]; on the other hand, it does not reflect the actual distribution of recoveries that features a pronounced bi-modality, with recoveries concentrating around 0% and 100%.

[1] "World Economic Outlook - April 2009: Crisis and Recovery". Box 1.1 (page 11-14). IMF. 24 April 2009 (as of November 28, 2016).
[2] US Bond Market Issuance and Outstanding (xls) - annual, quarterly, or monthly issuance to February 2017 (issuance) and from 1980 to 2016 Q3 (outstanding), updated 03/07/17, from www.sifma.org.
[3] Addressing Market Liquidity: A broader perspective on today's Euro corporate bond market, August 2016, from www.blackrock.com.
[4] For example, the reader can refer to the white papers on PD Model Fundamentals, PD Model Market Signals, and CreditModel™ 2.6, available in http://marketintelligence.spglobal.com/our-thinking/research.html.
[5] Recovery Given Default (RGD) is simply defined as 1 – LGD.
[6] Section III.B, § 23 – 30, of Basel Committee on Banking Supervision (2001), "The Internal Ratings Based Approach". Available at http://www.bis.org/publ/bcbsca05.pdf.
[7] Usually, a combination of collateral, letters of credit, third-party guarantees and insurance.

- A "look-up tables" of averages;[8] this approach is well-suited for small and granular retail exposures, but often not robust for exposures to large-revenue corporate companies, due to the paucity and inconsistency of data collected around low-default asset classes, the peculiarities of legal systems in different countries, the lengthy process (up to several years) before final resolution and the multitude of recovery calculation methods.

S&P Global Market Intelligence's LossStats Model represents the latest addition to the Credit Analytics model suite. This statistical model estimates the distribution of loss given default of bonds and loans issued by corporations, taking into account industry and instrument specific characteristics, and leveraging an extensive recovery database,[9] thus making the estimates robust. This tool is a useful component for risk analysts looking for new business opportunities beyond low default asset classes, or for investment managers seeking to diversify their exposures portfolio; it also helps regulated financial entities calculate more realistic credit risk capital requirements, potentially saving a significant amount of capital, or simply benchmarking their calculations and performing scenario analysis.

This paper summarizes LossStats Model coverage and features, the analytic framework employed, and the overall model performance. We conclude with a case study that highlights the advantage of assessing the recovery of a corporate exposure with several metrics.

Model Coverage and Features

LossStats Model is an automated, statistical tool that facilitates an easy, efficient, and cost-effective evaluation of ultimate recovery[10] for bonds and loans issued in US and Europe by financial and non-financial corporate companies, in case of default.

Exposure-Specific and Macroeconomic Factors

The model utilizes both exposure-specific characteristics (such as collateral type, debt structure/class or seniority) and certain macro-economic factors, at the country and industry level, based on the average default rates at the time of default.

Country Coverage

The LossStats Database includes more than 30 years of recovery data for US instruments, making the LossStats model best suited for analyzing US exposures. For the case of European recoveries, historical confidential data, along with exposure specific information, were provided by S&P Global Ratings in anonymized format for past 14 years (2002-2015).

Instruments Type

The model covers loans and bonds issued by both financial and non-financial corporate companies.

[8] This approach is commonly employed across banks with an Advanced IRB approach.

[9] The historical US recoveries were sourced from LossStats database, available via S&P Global Market Intelligence's CreditPro™; historical European recoveries were provided by S&P Global Ratings in anonymized format.

[10] Since recovery is simply defined as "1 minus loss given default", in the rest of the document, we will use both terms interchangeably. Ultimate recovery refers to the value of the settlement received by holding the instrument through its emergence from default/bankruptcy. In its simplicity, the recovery is based on the amount received in settlement, divided by the principal default amount. Ultimate recoveries are presented in both discounted and nominal terms for the US case.

Primary Model Outputs

The model's primary output is the distribution of ultimate recovery or loss given default, key summary statistics such as expected recovery and standard deviation, along with the minimum (maximum) expected recovery (loss) given default, calculated at pre-defined confidence levels.

The user can switch between discounted and nominal estimates[11] and choose between a "full" and a "lite" version, depending on the availability of inputs.

Scenario Analysis, Stress-Testing, Peer Comparison and Reporting

Consistent with our scoring and Probability of Default (PD) models, clients can calculate the estimated LGD using information around their exposures, change any input factor and perform a 'what-if' analysis or even stress-test the input macro factors.

Through its S&P Capital IQ platform, S&P Global Market Intelligence offers tools that cover both scoring and what-if analysis, as well as batch-scoring – where many companies can be scored simultaneously for a single financial period, or one entity can be scored over multiple financial periods.

Surveillance dashboards allow the user to quickly compare loss given default and creditworthiness at the individual level or in batch mode provided that necessary information is available.

For each analysis, reports can be generated with a comprehensive summary analysis, directly from the S&P Capital IQ desktop, dynamically linking the analysis to PowerPoint via PresCenter™ to efficiently replicate credit memos or senior management presentations.

Integration with other S&P Global Market Intelligence Models

LossStats Model can be used on a standalone basis to generate ultimate loss given default estimates, or in conjunction with other S&P Global Market Intelligence quantitative models to have a more comprehensive view of credit risk. For example, LossStats Model can be used in conjunction with PD Model Market Signals to establish a more thorough credit surveillance framework for publically listed companies; in conjunction with CreditModel™ 2.6,[12] it can help investment and risk managers mitigate high credit risk cases, by selecting exposures with low estimated loss in case of default.

A Statistical Framework To Estimate Loss Given Default of Corporate Loans And Bonds

There are a number of structural problems that commonly plague the estimate of loss given default for loans and bonds issued by corporations. For example:

- Low default frequency of large revenue corporations and, thus, paucity of historical recovery data on corporate exposures;
- Lengthy process for the completion of the recovery, often spanning several years, and affecting the overall discounted recovery;

[11] Only for the US model.
[12] S&P Global Ratings does not contribute to or participate in the creation of credit scores generated by S&P Global Market Intelligence. Low ercase nomenclature is used to differentiate S&P Global Market Intelligence PD credit model scores from the credit ratings issued by S&P Global Ratings.

- Multiple methods to measure actual recoveries on defaulted exposures,[13] often yielding different results;
- Influence of the macroeconomic environment in which the default happens, along with differences in industry sector cycles, affecting the value of the collateral (when present) used to mitigate overall loss on a corporate exposure, in case of default;
- Other uncertainties which may include differences in legal system and in robustness of the recovery process across countries.

Our extensive proprietary recovery database collects ultimate recovery prices going back to 1985 (2002) on more than 4,000 (1,000) US (European) corporate company exposures,[14] both on a nominal and discounted basis (for the US case), over three common measurement methods.

LossStats Model explicitly includes adjustments by industry sector and "regional" macrofactors to account for the differences in industry cycles and the overall economic cycle; for US exposures, the macro factor is derived from default rates of S&P Global Ratings rated US bond and loan issuers; for the European countries, this is based on the Euribor yield spread.[15]

In the next paragraphs, we address the model training and design process in more detail.

Calibrated on S&P Global Ratings' US LossStats Database and Confidential European Recovery Data

LossStats model includes two sub-models, applicable to US and European exposures, respectively:

- *United States Module*

  In 2016 we have re-calibrated the US module (originally developed prior to 2005) using more than 30 years of data, extracted from S&P Global Ratings' US LossStats Database,[16] which collects historical recovery data primarily for US corporations. In total, we used more than 4,000 observations, spanning across 13 industry clusters.

Table 1: US Model Development Sample Industry Summary

Industry Clusters	Number of Observations
Aerospace / automotive / capital goods / metal	473
Consumer / service sector	1017
Energy and natural resources	192
Financial Institutions	137
Forest and building products / homebuilders	184
Health care / chemicals	309
High technology / computers / office equipment	245
Insurance	3
Leisure time / media	490

[13] The three most common methods are: trading price of the distressed debt at emergence, settlement price of the new instrument issued to replace the old pre-petition instrument, or final cash value of the new instruments acquired in exchange for the pre-petition instrument ("liquidity event" price).
[14] Bank loans and corporate bonds.
[15] This is calculated as "10 year Government Bond – 3 months Euribor rate".
[16] The user can refer to "LossStats Recovery Rate Methodology", S&P Global Market Intelligence, 2017.

Real estate	156
Telecommunications	466
Transportation	204
Utility	197
Total[17]	**4,073**

Source: S&P Global Market Intelligence (2015 Q3). For illustrative purposes.

The US model was separately calibrated on nominal and discounted recovery prices, using ultimate recoveries. While trading prices are of interest in their own right for investors who trade in distressed debt, our current model recalibration focuses on ultimate recoveries only.

The discounted recovery values were calculated by discounting from the valuation date back to the last date at which a cash payment was made on the pre-petition instrument. The last cash pay date represents the true starting point for interest accrual, and that is why LossStats Database uses this date as the starting point for the discounting rather than the default date of the instrument or the bankruptcy date of the company.

- *European Module*

Between 2016 and 2017, we have extended the model to cover also loans and bonds issued in Europe. The dataset includes more than 1,000 recoveries, spanning more than 12 years, collected (after anonymization) from S&P Global Ratings' confidential recovery information. The values refer to ultimate nominal recoveries for the following list of European countries:

Table 2: Europe Model Development Sample Country Summary

Country	Number of Observations
Belgium	38
Cyprus	8
Czech Republic	2
Finland	10
France	210
Germany	195
Greece	30
Hungary	9
Ireland	16
Italy	52
Lithuania	1
Luxembourg	14
Netherlands	63
Norway	13
Poland	1
Spain	99

[17] Eligible for model training.

Sweden	22
Switzerland	17
United Kingdom	325
Total[18]	**1,125**

Source: S&P Global Market Intelligence (2017). For illustrative purposes.

Systemic Risk Data

As mentioned above, it is important to consider the industry in which the company operates when constructing a loss given default model, as well as the point of the economic cycle: during recessions, the number of defaulting firms may rise and some studies show that the average amount recovered on the bonds of defaulting firms tends to decrease.[19]

To address industry sector cycles, we explicitly include industry factor adjustments, linked to the industry observed default rates at the time of default. To account for the overall economic cycle we include one macro-factor adjustment: the overall US Corporate default rate, for the US model, and the Euribor yield spread for the Europe model.

Variable Selection

Multiple variables were considered during US model development to optimize model performance. Among these, for example, we considered the issuer's debt/asset financial ratio, and the average recovery rate by industry sector. In order to select the final set of inputs and variables we looked at:

- Availability of factors – All factors included in the model should be widely available on a consistent basis over time in our data. Some factors may have a high predictive power but may not be collected or reported for different exposures; while these factors may help boost a model's performance, such a model would be irrelevant for exposures that do not have similar information.
- Representation of expert judgement – In order to capture the variety of factors that may influence the loss given default of a corporate exposure, we also referred to the components that S&P Global Ratings use in their assessment or recovery.

The model comes in two versions ("full" and "lite"), depending on the exposure information available to the user.

For the European module, we decided to leverage the same variables utilized in the US module, with the exception of the regional (European) rated universe default rate, that showed counterintuitive results, and thus we replaced with the Euribor yield spread, after testing few alternatives, such as the FTSE100 Index, the Euro STOXX50 Volatility Index.

Below is the final list of inputs into the LossStats Model, for the "full" and the "lite" version.

[18] Eligible for model training.
[19] See, for example, "What do we know about loss given default", Wharton Financial Institutions Center – T. Schuermann (2004).

Table 3: Inputs of US LossStats Model

Input	Full / Lite Version	Rationale
Debt Type	L	Usually, senior secured loans have priority for repayment and thus larger chances of better recovery rates.
Debt Above Class	F	A high debt contractually superior to the debt class of the instrument considered has a negative impact on recoveries.
Debt Below Class	F	A high debt cushion usually suggests better chances of recovery for the exposure above them.
Collateral Type	F	The type of collateral used to guarantee the debt can limit losses.
***US:* Regional Default Rate** ***Europe:* Euribor Yield Spread**	F/L	During a recession, the US loss given default tends to increase with the regional default rate; the opposite happens for the Euribor yield spread.
Industry Factor	F/L	The business cycles of different industries are not always synchronized, and the impact of a recession may be different for each industry.

Source: S&P Global Market Intelligence (2017). For illustrative purposes.

Methodology

Some of the statistical models available in the market employ simple linear regression techniques to estimate recoveries; this approach, when calibrated appropriately, ensures the model is *correct on average* for the population as a whole, as well as for any subgroup that is represented by an indicator variable, but suffers from several drawbacks:

- it generates the expected outcome, rather than a probability distribution of potential outcomes for an exposure;
- it is not sufficient to capture other characteristics of the recovery of each individual exposure, especially when the realization of the recovery can be random given a set of fixed input

At S&P Global Market Intelligence,[20] we employ an advanced generalization of the logistic regressions, based on the family of Exponential Density Functions within a Maximum Expected Utility (MEU) framework.[21] This approach is more flexible, because it allows:

- generation of an instrument-specific probability distribution, which can be used to estimate the volatility of LGD values for given characteristics, for valuation or risk management purposes;

[20] The original methodology and development of LossStats Model was introduced by Friedman & Sandow. See "Ultimate Recoveries", Risk, 2003.
[21] In terms of traditional statistical inference, this model is calibrated by maximizing the log-likelihood of the sample dataset based on the model.

- accounting for the asymmetric, bi-modal characteristics of recovery observed in the actual recovery data; at the same time our model is also capable of providing standard quantities such as expected recovery for each individual exposure, and we check in how many cases this statistically matches the observed recovery for each individual exposure (see Table 5).

In addition, the MEU framework naturally optimizes the model training process to help the model exhibit stable out-of-time performance. No monotonicity constraints are applied on the selected variables, but the relationship between each input variable and the output is checked to ensure that the model follows economic intuition.

Mass Points – One of the challenges faced when modelling loss given default is that, besides the characteristic bi-modal distribution of the recovery, there are also non-zero mass probabilities that concentrate at 0% and/or 100%. Our methodology allows us to accommodate for this empirical observation by adding dedicated point probabilities at these values, when applicable. This improves model consistency with observation.

Model Benchmarking, Calibration and Performance

As mentioned, US LossStats model was originally developed prior to 2005. Several alternative approaches were considered and tested to ensure the robustness of the analytic framework. In a traditional statistical sense, LossStats model aims to maximize the log-likelihood, a measure to describe the occurrence of the actual observations in terms of probability (density), based on our data set. Table 3 shows the log-likelihood gain of alternative models vs a non-informative measure during original model specification and development. This demonstrates that the chosen approach yields optimal gain vs rival models considered.

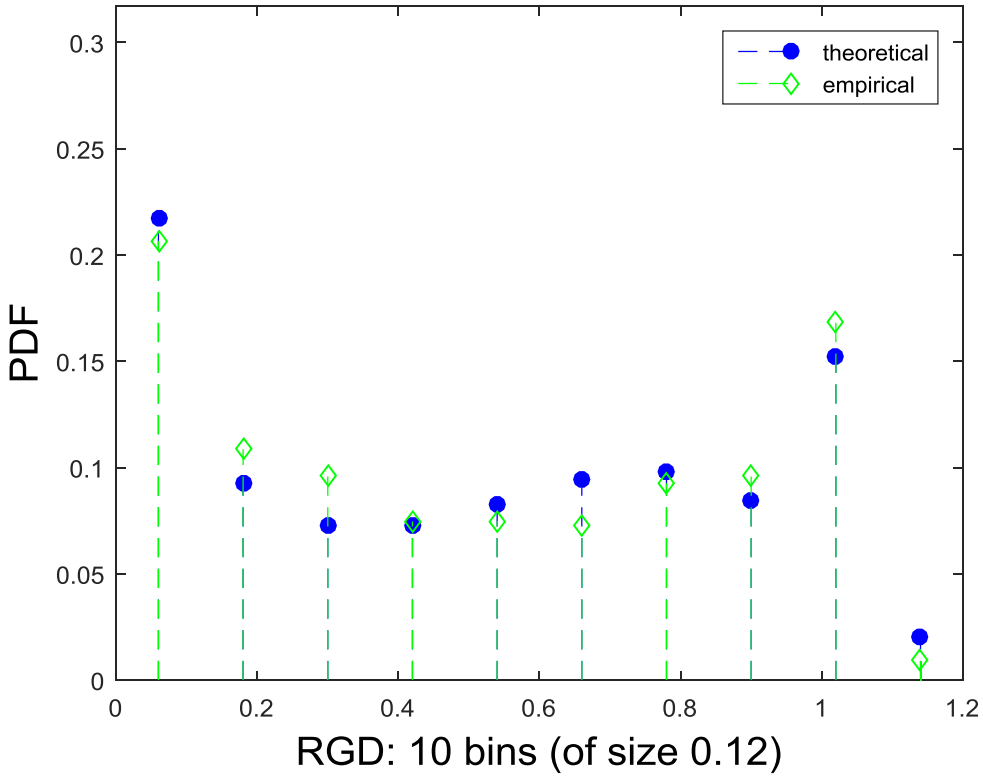
Table 4: Pick-up in log-likelihood (expected utility) as compared to benchmark models

Model	Log-Likelihood Gain vs a non-informative measure
Simple Beta Model	+0.07
Generalized Beta Model	+0.50
LossStats Model (Exponential Density Model)	**+0.68**

Source: S&P Global Market Intelligence (2005). For illustrative purposes.

In 2016, we performed a full model recalibration, by adding over 30% more observations since 2005 to re-optimize the model performance. Figure 1 compares the empirical and the averaged theoretical probability distribution of ultimate discounted recoveries calculated via the "full" version model.

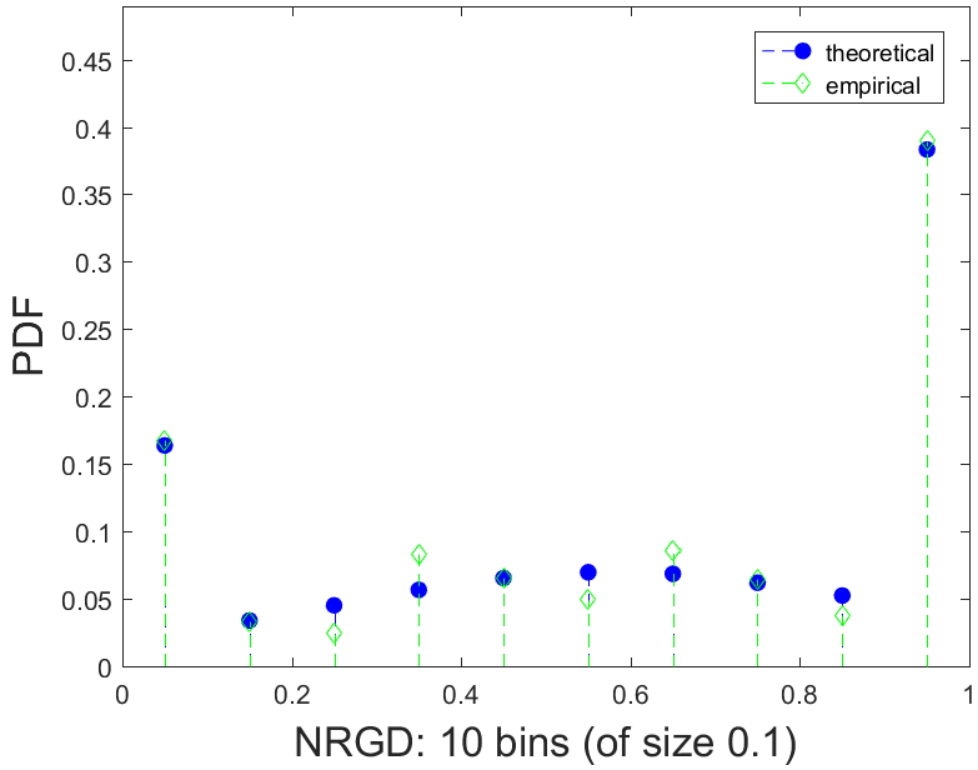
Figure 1: Aggregated empirical probability distribution function (PDF) and averaged theoretical probability distribution for discounted recovery given default (RGD) sub-model.



Source: S&P Global Market Intelligence (2017). For illustrative purposes.

In 2017, we performed a calibration for Europe LossStats Model. Figure 2 compares the empirical and the averaged theoretical probability distribution of ultimate Nominal recoveries calculated via the "full" version model.

Figure 2: Aggregated empirical probability distribution function (PDF) and averaged theoretical probability distribution for nominal recovery given default (NRGD) sub-model.



Source: S&P Global Market Intelligence (2017). For illustrative purposes.

The empirical data highlight the typical bi-modal nature of the recovery distribution that usually poses major modelling challenges, as well as the existence of recoveries above 100%. Overall, our model well represents this feature; the closeness of the average theoretical and aggregated empirical distribution confirms the robustness of the recalibration.[22]

Some simple and intuitive statistics can be established by computing the agreement between the predicted mean recovery, and the actual observed recovery, split into buckets. These (uneven) buckets are defined by splitting the recovery range into several intervals, as commonly used in other recovery analysis by S&P Global Ratings.[23] For each defaulted instrument, we compute the percentage of times that the modelled mean RGD and the actual observed RGD fall in the same buckets, or within +/- 1,2,… bucket(s).

[22] The empirical discounted recoveries can exceed 100%, e.g. due to the inclusion of interests.
[23] S&P Global Ratings typically adopts the following 6 buckets: 0-10%, 10-30%, 30-50%, 50-70%, 70-90%, 90-100%. Values beyond 100% are bucketed within 90%-100%.

Table 5: LossStats Statistical Match Between Mean RGD and Actual RGD.

US (discounted)	Bucket Agreement
Exact Match	17%
Within +/-1 bucket	62%
Within +/-2 buckets	91%
Within +/-3 buckets	98%
Within +/-4 buckets	100%

Europe (nominal)	Bucket Agreement
Exact Match	15%
Within +/-1 bucket	60%
Within +/-2 buckets	89%
Within +/-3 buckets	97%
Within +/-4 buckets	100%

Source: S&P Global Market Intelligence (2017). For illustrative purposes.

Additional performance measures are available in the technical reference guide.[24]

Case Study

Delta Petroleum Company (DPC), Inc. provides blending, packaging, and logistics solutions for oil and specialty chemical companies across the globe. It also offers various customer on-site offerings, such as logistics management, filling/packaging, and loading/shipping. The company was founded in 1946 and is headquartered in Saint Rose (Louisiana). Since September 22, 2006, Delta Petroleum Company, Inc. operates as a subsidiary of Greif, Inc.

On June 28 2011, DPC raised $18M debt via a line of credit extended by Macquaire Bank Limited, providing a senior revolving credit facility with a 6-months maturity; DPC defaulted on this instrument on December 15, 2011, bearing a total debt in excess of $300M, and filed for bankruptcy.

The $18M tranche of the total debt was secured via most company assets,[25] benefited from a debt cushion of $265M and had no debt class above. The company emerged from default on August 30, 2012 and all (or most) of the $18m debt was recovered.

Using the full version of the model, in the nominal and discounted case, we obtain the following model outputs:

Table 5: Comparison of US LossStats Model Outputs for Delta Petroleum Company.

Recovery	Nominal	Discounted
Actual	**100%**	**94%**
Expected (modelled)	*100%*	*92%*
Standard Deviation	*24%*	*19%*
min @ 50% confidence	100%	100%
min @ 75% confidence	90%	89%
min @ 90% confidence	74%	69%
min @ 95% confidence	59%	53%
min @ 99% confidence	6%	8%

Source: S&P Global Market Intelligence (2017). For illustrative purposes.

[24] See S&P Global Market Intelligence's "US LossStats Model – technical reference guide" (February, 2017).
[25] This happens when part of the company assets are used as collateral for other exposures.

The actual recovered amount is different in the nominal and discounted case, due to the length of time needed to complete the recovery process, and the effect of the interest rate applied for the discounting.

The model outputs several statistics, including the expected recovery value,[26] the standard deviation and the minimum recovery at specific confidence levels along the probability distribution of all recovery outcomes:

- In this case, the (modelled) expected recovery is very close to the actual value in both discounted and nominal recoveries, and very different from the flat/fixed level normally applied by financial practitioners. It is important to remind the reader that in general the modelled and actual recovery will not always be so close (c.f. Table 4), because the recovery process is very complicated and may not be adequately captured by a model; thus, it is important to look also at the distribution of potential outcomes, and their dispersion.
- The standard deviation gives a measure of the level of variability of the recovery outcome; the value is smaller in the discounted case, due to discounting effects.
- For different confidence levels, the model reports the minimum recovery a creditor can expect to realize; the probability distribution of recoveries is modelled based on the historical experience on exposures with similar characteristics. These metrics are very useful, from an instrument valuation standpoint, and allow users to take into account the recovery distribution and potentially embed a level of conservatism.[27]

Conclusion

Credit risk assessment of large-revenue corporations is challenging due to the inherent low default characteristic of this asset class. Things could become even more complicated when risk managers at financial or non-financial corporations try to assess the recovery rate of corporate bonds or bank loans, in case of default. Scarcity of data, lack of standardization of reported recoveries, multiple measures, lengthy time to recovery, correlation to economic cycle, differences in industry sectors, often force risk managers to assume fixed levels by asset class.

The need for reliable and quickly accessible recovery estimates, however, is significant and growing in step with the introduction of new accounting standards, such as IFRS9 and CECL,[28] for the calculation of credit expected losses.

LossStats Model is a unique statistical automated tool, trained on our extensive historical recovery database comprising loans and bonds of US and European companies; the model captures several important drivers of recovery rates, and allows users to estimate the specific distribution of ultimate recovery values for an exposure, along with its expected value and volatility. Properly accounting for recoveries allows corporations to broaden the spectrum of business counterparties, by selecting those that promise better recovery rates, despite low creditworthiness profile.

[26] The model can output the loss given default value, depending on the user preference.
[27] The attentive reader may have noticed that the minimum recovery at the 99% confidence level is smaller for the nominal than for the discounted case: this is simply due to the presence of dedicated mass points at the 0% recovery level, that have a different impact for the nominal and discounted model.
[28] IFRS9 is the new accounting standard for publicly listed companies operating in countries adopting the International Financial Requirement Standards (IFRS); CECL is the Calculation of Expected Credit Losses introduced by the Financial Accounting Standards Board (FASB) in US, and applies to US financial institutions.

APPENDIX A

LossStats Supported Industries (as of 2017).

Industry Classification Code	Industry Classification Name	PICs[29] Classification Code	PICs Description
1	Utility	55101010	Electric Utilities
		55102010	Gas Utilities
		55103010	Multi-Utilities
		55104010	Water Utilities
		55105010	Independent Power Producers & Energy Traders
		55105020	Renewable Electricity
2	Insurance	35102030	Managed Health Care
		40301010	Insurance Brokers
		40301020	Life & Health Insurance
		40301030	Multi-line Insurance
		40301040	Property & Casualty Insurance
		40301050	Reinsurance
3	Telecommunications	50101010	Alternative Carriers
		50101020	Integrated Telecommunication Services
		50102010	Wireless Telecommunication Services
4	Transportation	20301010	Air Freight & Logistics
		20302010	Airlines
		20303010	Marine
		20304010	Railroads
		20304020	Trucking
		20305010	Airport Services
		20305020	Highways & Railtracks
		20305030	Marine Ports & Services
5	Financial Institutions	40101010	Diversified Banks
		40101015	Regional Banks
		40102010	Thrifts & Mortgage Finance
		40201020	Other Diversified Financial Services
		40201030	Multi-Sector Holdings
		40201040	Specialized Finance

[29] PICs stand for Primary Industry Classifications, and is produced within the S&P Capital IQ platform. The LossStats model operates with PICs.

Industry Classification Code	Industry Classification Name	PICs[29] Classification Code	PICs Description
		40202010	Consumer Finance
		40203010	Asset Management & Custody Banks
		40203020	Investment Banking & Brokerage
		40203030	Diversified Capital Markets
		40203040	Financial Exchanges & Data
6	Health Care/Chemicals	15101010	Commodity Chemicals
		15101020	Diversified Chemicals
		15101030	Fertilizers & Agricultural Chemicals
		15101040	Industrial Gases
		15101050	Specialty Chemicals
		35101010	Health Care Equipment
		35101020	Health Care Supplies
		35102010	Health Care Distributors
		35102015	Health Care Services
		35102020	Health Care Facilities
		35201010	Biotechnology
		35202010	Pharmaceuticals
		35203010	Life Sciences Tools & Services
7	High Tech/Computers/Office Equipment	20201080	Security & Alarm services
		35103010	Health Care Technology
		45101010	Internet Software & Services
		45102010	IT Consulting & Other Services
		45102020	Data Processing & Outsourced Services
		45103010	Application Software
		45103020	Systems Software
		45201020	Communications Equipment
		45202030	Technology Hardware, Storage & Peripherals
		45203010	Electronic Equipment & Instruments
		45203015	Electronic Components
		45203020	Electronic Manufacturing Services
		45203030	Technology Distributors
		45301010	Semiconductor Equipment
		45301020	Semiconductors

Industry Classification Code	Industry Classification Name	PICs[29] Classification Code	PICs Description
8	Aerospace/Automotive/Capital Goods/Metal	15103010	Metal & Glass Containers
		15104010	Aluminum
		15104020	Diversified Metals & Mining
		15104025	Copper
		15104030	Gold
		15104040	Precious Metals & Minerals
		15104045	Silver
		15104050	Steel
		20101010	Aerospace & Defense
		20103010	Construction & Engineering
		20104010	Electrical Components & Equipment
		20104020	Heavy Electrical Equipment
		20105010	Industrial Conglomerates
		20106010	Construction Machinery & Heavy Trucks
		20106015	Agricultural & Farm Machinery
		20106020	Industrial Machinery
		20107010	Trading Companies & Distributors
		25101010	Auto Parts & Equipment
		25101020	Tires & Rubber
		25102010	Automobile Manufacturers
		25102020	Motorcycle Manufacturers
9	Forest & Building Products/Homebuilders	15102010	Construction Materials
		15103020	Paper Packaging
		15105010	Forest Products
		15105020	Paper Products
		20102010	Building Products
		25201030	Homebuilding
10	Consumer/Service Sector	20201050	Environmental & Facilities Services
		20201060	Office Services & Supplies
		20201070	Diversified Support Services
		20202010	Human Resource & Employment Services
		20202020	Research & Consulting Services

Industry Classification Code	Industry Classification Name	PICs[29] Classification Code	PICs Description
		25201010	Consumer Electronics
		25201020	Home Furnishings
		25201040	Household Appliances
		25201050	Housewares & Specialties
		25203010	Apparel, Accessories & Luxury Goods
		25203020	Footwear
		25203030	Textiles
		25301040	Restaurants
		25302010	Education Services
		25302020	Specialized Consumer Services
		25501010	Distributors
		25502010	Catalog Retail (Discontinued as of 08/31/2016)
		25502020	Internet & Direct Marketing Retail
		25503010	Department Stores
		25503020	General Merchandise Stores
		25504010	Apparel Retail
		25504020	Computer & Electronics Retail
		25504030	Home Improvement Retail
		25504040	Specialty Stores
		25504050	Automotive Retail
		25504060	Homefurnishing Retail
		30101010	Drug Retail
		30101020	Food Distributors
		30101030	Food Retail
		30101040	Hypermarkets & Super Centers
		30201010	Brewers
		30201020	Distillers & Vintners
		30201030	Soft Drinks
		30202010	Agricultural Products
		30202030	Packaged Foods & Meats
		30203010	Tobacco
		30301010	Household Products
		30302010	Personal Products
11	Leisure Time/Media	20201010	Commercial Printing
		25202010	Leisure Products

Industry Classification Code	Industry Classification Name	PICs[29] Classification Code	PICs Description
		25301010	Casinos & Gaming
		25301020	Hotels, Resorts & Cruise Lines
		25301030	Leisure Facilities
		25401010	Advertising
		25401020	Broadcasting
		25401025	Cable & Satellite
		25401030	Movies & Entertainment
		25401040	Publishing
		45103030	Home Entertainment Software
12	Energy and Natural Resources	10101010	Oil & Gas Drilling
		10101020	Oil & Gas Equipment & Services
		10102010	Integrated Oil & Gas
		10102020	Oil & Gas Exploration & Production
		10102030	Oil & Gas Refining & Marketing
		10102040	Oil & Gas Storage & Transportation
		10102050	Coal & Consumable Fuels
13	Real Estate	40204010	Mortgage REITs
		60101010	Diversified REITs
		60101020	Industrial REITs
		60101030	Hotel & Resort REITs
		60101040	Office REITs
		60101050	Health Care REITs
		60101060	Residential REITs
		60101070	Retail REITs
		60101080	Specialized REITs
		60102010	Diversified Real Estate Activities
		60102020	Real Estate Operating Companies
		60102030	Real Estate Development
		60102040	Real Estate Services

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