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Understanding the UK D&B® Failure Score

THIS DOCUMENT IS INTENDED TO ADDRESS THE FOLLOWING QUESTIONS:

- What is the D&B Failure Score?
- What does the D&B Failure Score predict?
- What is the availability of the D&B Failure Score?
- How is the D&B Failure Score calculated?
- How does the D&B Failure Score perform?
- What is the Relationship between the D&B Failure Score and Failure Rates?

INTRODUCTION

The D&B® UK Failure Score, also known in some markets as the D&B Financial Stress Score (FSS), predicts the likelihood that a business will seek legal relief from its creditors or cease business operations without paying all its creditors in full in the next 12 months, based on the information in the Dun & Bradstreet Data Cloud. To evaluate risks objectively and consistently, Dun & Bradstreet combines a large amount of business information with expert analysis and statistical techniques to determine the potential risk associated with a business. The integrity of the information contained in our Data Cloud is driven by our proprietary DUNSRight™ Quality Process. DUNSRight™ is our process for collecting and enhancing information. The D&B UK Failure Score is designed to help predict the potential insolvency of your existing and prospective customers. The solution allows you to:

- Automate decisions for increased efficiency
- Process large volumes of transactions more quickly
- Free up resources to look at time-intensive borderline decisions
- Enable more consistent decisions across the entire organization
- Reduce the costs associated with full-scale application and annual risk reviews
- Apply scores across an entire portfolio to quickly identify risk and opportunity
- Manage collection resources with prioritized actions for delinquent accounts
- Satisfy internal regulatory needs for timely, consistent and objective review of decisions at the account level

This document explains in greater detail how the D&B UK Failure Score was developed.

D&B UK FAILURE SCORE

WHAT THE D&B UK FAILURE SCORE PREDICTS

The D&B UK Failure Score predicts the likelihood that a business will seek legal relief from its creditors or cease operations leaving unpaid debts in the next 12 months based on information in the Dun & Bradstreet Data Cloud. Dun & Bradstreet defines a business which seeks legal relief from its creditors or ceases operations without paying all its creditors in full as a Failed Business. The D&B UK Failure Score predicts the likelihood of such Failure. The legal events which constitute failure in the UK include:

- Out of Business Unfavorably (listed below):
  - Liquidator Appointed
  - Creditors Voluntary Liquidation
  - Winding Up Order
  - Compulsory Liquidation
  - Personal Bankruptcy
- Meeting of Creditors
- Winding Up Petition
- Receiver Appointed
- Administrator Appointed
- Company Voluntary Arrangement (CVA)

Note: Voluntary liquidation involving no loss to creditors is not defined as financially stressed.

AVAILABILITY OF THE FAILURE SCORE

The D&B UK Failure Score is available on approximately 5.5 million UK based businesses as of the date of this report. This is known as the Scoreable Universe.

The following are not considered for scoring, and are outside of the Scoreable Universe:

- Businesses which are Out of Business
- Foreign Registered Businesses
- Branches

The headquarter location score will be applied to branch locations.

Businesses with the following legal events registered against them will be assigned a raw score of 1001, a 1 - 100 score of 1 and a risk indicator of 4:

- Meeting of Creditors
- Winding Up Petition
- Receiver Appointed
- Administrator Appointed
- Company Voluntary Arrangement (CVA)

To help ensure that our scores are based on sufficient information, Dun & Bradstreet has put in place a minimum level of data requirement. Only records that satisfy this minimum requirement will have a score published.

To be assigned a score a UK business must have:

- A valid Standard Industry Code (SIC) or
- Trade experiences within 24 months or
- A CCJ or
- A charge or
- A Financial Balance Sheet within 36 months

Cases which do not meet the minimum data requirements will be assigned a Raw Score of 1000, a 1 - 100 Score of Null (blank) and a Risk Indicator of dash ('-')Some conditions are not dealt with by a generic scorecard and in these cases special rules or overrides are applied. The rules applied to UK businesses are listed below.

RULE	RAW SCORE	1 - 100 SCORE	RISK INDICATOR
Ceased to Trade/Dormant	1000	Null	-
Government Organization	1999	100	1
Detrimental Auditors Report	< = 1423	< = 50	> = 3
First Gazette Notice	< = 1280	< = 8	4
High Risk Parent	< = 1310	< = 10	4
New Businesses	= 1463	= 69	> = 2

SCORE DEVELOPMENT PROCESS

The Failure Scorecards were developed using rigorous statistical techniques for all stages of the modeling process. This helps to ensure that the resulting model is stable and robust. Our process of checks and balances also includes validation of the models on separate samples from different time periods to help ensure stability over time.

In the scorecard development process, data is extracted from two time periods designated as an observation point and a performance window. The observation point defines the sample used in the model and all identification and characteristic data are collected from the time period directly prior to that point. The predictive variables and segmentation are defined from this snapshot. The performance window defines the length of time the businesses in the sample are tracked to examine their behavior.

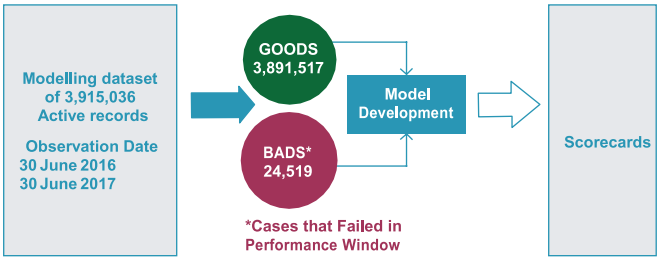
In the development of the D&B UK Failure Score, the observation points were from 30 June 2016 and 30 June 2017. The performance windows were from 01 July 2016 to 30 June 2017, and from 01 July to 30 June 201`8 respectively.

A total of 3,915,036 businesses were used in model development. Of this population, 3,891,517 were considered "GOOD" or non-financially stressed companies in the Dun & Bradstreet Data Cloud and 24,519 were considered "BAD",or financially stressed companies in the Dun & Bradstreet Data Cloud. Sample data elements used in the model include:

- Financial and director information
- Derogatory events such as county court judgments
- Dun & Bradstreet proprietary payment behavior information
- Demographic information such as industry, geographical region, corporate structure and business age.

Appendix A contains a more comprehensive list of data elements which are used in calculating the D&B UK Failure Score.

The following diagram shows the scorecard development steps



A representative sample of active businesses was monitored for 12 months. Businesses which failed in that period were identified as BADS. The remaining businesses were classified as GOODS. Statistical analysis of the data then identified characteristics that were common to GOOD and BAD cases. These characteristics are weighted by significance to form rules for our scorecards.

Dun & Bradstreet's statistical model development process includes the following steps:

- Segmentation analysis for optimal representation of risk behavior of various sub-populations of the scoreable universe
- Selection of optimal attributes (predictors) for each segment. The attributes selected by the statistical tool are also verified by the business specialists to help ensure suitability in the local market conditions
- Optimal binning techniques to leverage data patterns observed in partition of the predictors
- Scoring algorithm calculation selected by the modeling technique used

To help ensure the model's robustness and stability of predictors a train and test approach for model estimation was used. To help ensure stability of the model over time, an additional validation was performed on an out of time sample (observation point 30 June 2018 and a 12 months performance window.)

The scoring algorithm formula calculates the probability of business failure. This predicted probability is then converted to a score using a scorecard which assigns points to each selected level of each predictor.

SCORING OUTPUTS – SCORE VALUES

The Failure Score assigns the following measurements of risk:

- **A Raw Score of 1001 - 1999** is the initial output (sum of assigned points) where 1001 represents businesses that have the highest probability of failure and 1999 which represents businesses with the lowest probability of failure. This score provides a direct relationship between the score and the probability of failure. The marginal odds of being GOOD doubles for each 40-point increase. For example, a raw score of 1200, on a marginal basis, represents twice the probability of failure as a score of 1240. This score enables a customer to use more granular cutoffs to drive their automated decision-making process.

- **A Failure Score of 1 - 100** that it is based on BAD rates, where 1 represents businesses that have the highest probability of failure, and 100 which represents businesses with the lowest probability of failure.

- **A Risk Indicator of 1 - 4** which is a segmentation of the scoreable universe into four distinct risk groups where a one (1) represents businesses that have the lowest probability of failure, and four (4) represents businesses with the highest probability of failure. This Risk Indicator (RI) enables a customer to quickly segment their new and existing accounts into various risk groups for high-level analysis and reporting.

Table 1 shows the distribution of the Failure Risk Indicator in the UK D&B Business Universe. In addition, this table also displays the associated 1 - 100 Score and Raw Score.

Table 1: Distribution of Failure Risk Indicator in the Dun & Bradstreet Data Cloud

RISK INDICATOR	% OF BUSINESSES WITHIN THIS RISK INDICATOR	FAILURE 1 - 100 SCORE	FAILURE RAW SCORE
1	21%	86 - 100	1505 - 1999
2	45%	51 - 85	1424 - 1504
3	30%	11 - 50	1311 - 1423
4	5%	1 - 10	1001 - 1310

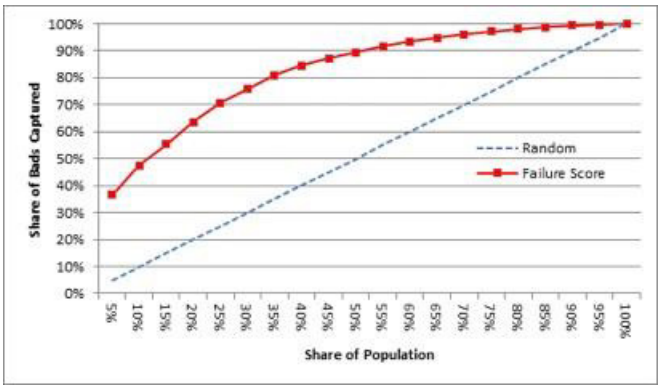
SCORECARD PERFORMANCE

Dun & Bradstreet applies stringent rules to model performance designed to maintain the high-performance standards we have set for our scores. Measurements of model performance include an assessment of risk ranking, robustness and discriminate power. Metrics used are:

- Ranking accuracy by model decile or vigintile
- Close match between predicted and actual BAD rates
- The Kolmogorov-Smirnoff (K-S) statistic distance between cumulated distribution of GOOD and BAD cases as rank ordered by the model
- Predictive Index (Gini Index) assessment of model gains compared to a perfect classifier
- The Gain chart with emphasis on showing the improvement in capturing BADS at the 10th and 20th share of the population

The Gain chart in Graph 1 illustrates the effectiveness of the Failure Score by identifying the failed businesses captured within population groups. For example, at 20% of the population, the Failure Score identified approximately 65% of the "BADS".

Graph 1: Failure Score Performance across all size segments



Scorecards are developed assuming that the relationships observed between past business characteristics and subsequent performance will hold true on future businesses. Because of this assumption, model development statistics should be viewed as estimates, and not precise forecasts of future performance at a given score.

SCORE PERFORMANCE MONITORING

Dun & Bradstreet is committed to delivering the highest quality scores to our customers. Regular performance monitoring of the scorecards assures continual performance of the scores in identifying risk. Scores that lose their predictive power are scheduled for redevelopment or recalibration.

RELATIONSHIP BETWEEN THE D&B UK FAILURE SCORE AND ACTUAL FAILURE RATES.

The national average failure rate, based on the model development sample failure statistics within Dun & Bradstreet's Data Cloud, is 0.63%.

Table 2 provides the national average failure rates and cumulative percent of failures identified, based in information in Dun & Bradstreet's Data Cloud, for each Failure Risk Indicator.

Table 2: National Average Failure Rate by Risk Indicator

RISK INDICATOR	% OF DUN & BRADSTREET FILE REPRESENTED	ACTUAL FAILURE RATE WITHIN RISK INDICATOR	ACTUAL CUMULATIVE % OF FAILURES ELIMINATED
1	21%	0.06%	97.95%
2	45%	0.24%	80.61%
3	30%	0.93%	36.80%
4	5%	4.52%	0.00%

Each Failure Risk Indicator has a failure rate that can be compared with the national average of failure. For example, the table above shows that 4.52% of all businesses scoring a Risk Indicator of 4 at 30 June 2016 failed in the following 12 months. What this means is that businesses scoring in the Risk Indicator 4 are 7 times more likely to fail than the national average.

Table 3 provides the national average failure rates, based on information in Dun & Bradstreet's Data Cloud, by major industry group.

Table 3: National Average Failure Rate by Industry

INDUSTRY GROUP	ACTUAL FAILURE RATE
Accommodation and Food Service Activities	2.96%
Activities of Households	0.38%
Administrative and Support Service Activities	1.90%
Agriculture	0.87%
Arts, Entertainment and Recreation	0.76%
Construction	1.56%
Education	0.44%
Electricity	1.18%
Financial and Insurance Activities	0.57%
Health/Social Work Activities	0.47%
Information and Communication	0.54%
Manufacturing	1.46%
Mining	1.08%
Other Service Activities	0.83%
Professional, Scientific and Technical Activities	0.54%
Public Administration	1.81%
Real Estate	0.62%
Transport	2.55%
Water	1.47%
Wholesale Trade and Retail Trade	1.34%

APPENDIX A

EXAMPLES OF DATA ELEMENTS ANALYZED WHEN DEVELOPING THE D&B UK FAILURE SCORE MODEL

Following is a list of some of the data elements used to evaluate the risk of failure on a subject.

Demographic/Public Records Information

FACTOR
Industry
Geographical Region
Business Age
Strength of the Parent Company based on its Net Assets
Directors Experience
Directors Change
Mortgages and Charges
County Court Judgements

Financial Information

FACTOR
Age of Accounts
Overdue Indicator
Ratios and Trends from the Balance Sheet
Ratios from the P&L Account
Auditor's Comments

Payment Information

FACTOR
Paydex®
Paydex® Comparison to Industry Norms
Percentage of Late Payment Experiences

APPENDIX B

The following Summary and Detailed Projected Performance Tables are based on the model development data sample. Actual performance for a customer portfolio may vary based on the account selection within that portfolio.

SUMMARY PROJECTED PERFORMANCE TABLES

CUMULATIVE FAILURE SCORE PERFORMANCE						
RISK INDICATOR	SCORE RANGE	PERCENTILE RANGE	% OF BUSINESSES (APPROX.)	FAILURE RATE	% OF FAILURES ELIMINATED	GOOD-BAD RATIO
1	1505 - 1999	86 - 100	21%	0.06%	97.95%	1612
2	1424 - 1999	51 - 100	65%	0.19%	80.61%	537
3	1311 - 1999	11 - 100	95%	0.42%	36.80%	239
4	1001 - 1999	1 - 100	100%	0.63%	0.00%	159

FAILURE SCORE PERFORMANCE WITHIN RANGE				
SCORE RANGE	PERCENTILE RANGE	% WITHIN RANGE (APPROX.)	FAILURE RATE	% OF FAILURES ELIMINATED
1505 - 1999	86 - 100	21%	0.06%	2.05%
1424 - 1504	51 - 85	45%	0.24%	17.35%
1311 - 1423	11 - 50	30%	0.93%	43.80%
1001 - 1310	1 - 10	5%	4.52%	36.80%

EXPLANATIONS

CUMULATIVE FAILURE SCORE PERFORMANCE

- **% of Businesses:** To set an approval rate, select the appropriate score range that yields the desired approval rate. For example, to develop a credit policy that approves 95% of all applications requires accepting businesses scoring at or above Raw Score 1311. Businesses scoring below the cut off Raw Score of 1311 are reviewed or declined, etc.

- **Failure Rate:** The failure rate represents those businesses that score between the lowest value in the score range (or score) and 1999(or 100 score). For example, the failure rate for a credit policy which approves all businesses with a Raw Score at or above 1311 (or 11 - 100 score) is expected to be 0.42%.

- **% of Failures Eliminated:** The percentage of total failed businesses that score between 1001 and the cutoff point for the approval rate. For example, approving businesses with a Raw Score at or above 1311 (or 11 - 100 Score) is expected to eliminate 36.8% of the "BAD" businesses.

- **Good-Bad Ratio (Odds):** The ratio of "GOOD" businesses to "BAD" businesses among those businesses that score between the lowest value in the score range and 1999 (or 100 score). For example, a credit policy that approves all businesses scoring at or above 1311 (or 11 - 100 Score) should result in a portfolio with 239 "GOOD" businesses for every "BAD" business in the portfolio.

FAILURE SCORE PERFORMANCE WITHIN RANGE:

- **Failure Rate within Range:** The failure rate for those businesses that score within the score range. For example, the failure rate for businesses scoring between 1001-1310 (or 1 - 10 score) is expected to be 4.52%.

- **% Of Failures Eliminated:** The percentage of total failed businesses within the score range. For example, 36.8% of failed businesses are expected to score between 1001 - 1310 (or 1 - 10 score).

DETAILED PROJECTED PERFORMANCE TABLE

CUMULATIVE FAILURE SCORE PERFORMANCE						FAILURE SCORE PERFORMANCE WITHIN RANGE			
SCORE RANGE	SCORE RANGE	% OF BUSINESSES (APPROX.)	BAD RATE	% OF BADS ELIMINATED	GOOD-BADS RATIO	SCORE RANGE	SCORE RANGE (APPROX.)	BAD RATE	% OF BADS ELIMINATED
1557 - 1999	97 - 100	5%	0.04%	99.68%	2487	1557 - 1999	97 - 100	0.04%	0.32%
1536 - 1999	93 - 100	10%	0.04%	99.34%	2431	1536 - 1556	93 - 97	0.04%	0.33%
1520 - 1999	90 - 100	15%	0.05%	98.78%	1955	1520 - 1535	90 - 93	0.07%	0.56%
1507 - 1999	86 - 100	20%	0.06%	98.05%	1631	1507 - 1519	86 - 90	0.09%	0.73%
1496 - 1999	83 - 100	25%	0.07%	97.15%	1393	1496-1506	83 - 86	0.11%	0.91%
1486 - 1999	79 - 100	30%	0.08%	96.04%	1215	1486 - 1495	79 - 83	0.13%	1.11%
1477 - 1999	76 - 100	35%	0.09%	94.71%	1061	1477 - 1485	76 - 79	0.17%	1.33%
1469 - 1999	72 - 100	40%	0.10%	93.45%	970	1469 - 1476	72 - 75	0.17%	1.25%
1460 - 1999	67 - 100	45%	0.12%	91.52%	849	1460 - 1468	67 - 72	0.23%	1.93%
1451 - 1999	64 - 100	50%	0.13%	89.38%	750	1451 - 1459	64 - 67	0.28%	2.14%
1443 - 1999	59 - 100	55%	0.15%	87.05%	680	1443 - 1450	59 - 63	0.27%	2.32%
1435 - 1999	55 - 100	60%	0.16%	84.56%	619	1435 - 1442	55 - 58	0.33%	2.49%
1425 - 1999	51 - 100	65%	0.18%	81.00%	544	1425 - 1434	51 - 55	0.45%	3.56%
1413 - 1999	45 - 100	70%	0.22%	75.83%	463	1413 - 1424	45 - 51	0.60%	5.17%
1401 - 1999	38 - 100	75%	0.25%	70.61%	406	1401 - 1412	38 - 44	0.69%	5.22%
1384 - 1999	30 - 100	80%	0.28%	63.65%	351	1384 - 1400	30 - 38	0.85%	6.96%
1363 - 1999	23 - 100	85%	0.33%	55.23%	302	1363 - 1383	23 - 30	1.06%	8.42%
1342 - 1999	17 - 100	90%	0.36%	47.53%	273	1342 - 1362	17 - 23	0.97%	7.70%
1310 - 1999	10 - 100	95%	0.42%	36.51%	238	1310 - 1341	10 - 17	1.39%	11.01%
1001 - 1999	1 - 100	100%	0.63%	0.00%	159	1001 - 1309	1 - 10	4.56%	36.51%

EXPLANATIONS

CUMULATIVE FAILURE SCORE PERFORMANCE

- **Approval Rate: To use, select the appropriate projected score or score cut off that yields the desired approval rate. Approved businesses are companies scoring between the lowest value in the score range (or score) and 1999 (or 100 score). For example, a credit policy that approves 70% of all businesses may require accepting businesses between 1413 - 1999 (or 45-100 score). Businesses scoring below the cut off (1001 - 1413) are reviewed, declined, etc.**

- **Failure Rate:** Represents those businesses that score between the lowest value in the score range and 1999. For example, the failure rate for a credit policy which approves all businesses with a Raw Score at or above 1413 (or 45 - 100 Score) is expected to be 0.22%.

- **% of Failures Eliminated:** The percentage of total failed businesses that score between 1001 and the cutoff point for the approval rate. For example, approving businesses with a Raw Score at or above 1413 (or 45 - 100) score is expected to eliminate 75.83% of the "BAD" businesses.

- **Good-Bad Ratio (Odds):** The ratio of "GOOD" businesses to "BAD" businesses among those businesses that score between the lowest value in the score range and 1999 (or 100 score). For example, a credit policy which approves all businesses scoring a t or above 1413 (or 45 - 100 score) should result in a portfolio with 463 "GOOD" businesses for every "BAD" business in the portfolio.

FAILURE SCORE PERFORMANCE WITHIN RANGE:

- **Failure Rate:** The incidence of failure for those businesses that score within the score range. For example, the failure rate for companies scoring between 1401 - 1412 (or 38 - 44 Score) is expected to be 0.69%.

- **% of Failures Eliminated:** The percentage of total failed businesses within the score range. For example, 5.22% of all failed companies are expected to score between 1401 - 1412 (or 38 - 44 Score).

APPENDIX C

GLOSSARY OF SCORING TERMS

TERM	EXPLANATION
D&B Failure Score	A Failure score build to Dun & Bradstreet Standards and also known as the D&B Financial Stress
Raw Score	Score with a direct relationship with level of Financial Stress
1 - 100 Score	Score which has been ranked within the local market Data Cloud with a value between 1 and 100 where 1 is the highest probability of Financial Stress
Risk Indicator	Segmentation of the 1 - 100 score into 4 different segments where 1 is lowest probability of risk
Scoreable Universe	Segment of the Data Cloud which is presented to be assigned a score
Scored Universe	All cases which have a score
Observation Window	Date at which the data sample of active businesses is extracted
Performance Window	Period where the data sample is monitored to identify businesses which hit the BAD definition
Financial Stress BAD Definition	Events that are defined as businesses having failed
Out of Business	Business is no longer trading and active
GOOD	A Business which does not have any information listed within the BAD definition
BAD	A business which has an event classified within the BAD definition of the scorecard

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