

Understanding the China D&B[®] Failure Score

This document is intended to address the following questions:

- What is the Dun and Bradstreet Failure Score?
- What does the Dun and Bradstreet Failure Score predict?
- What is the availability of the Dun and Bradstreet Failure Score?
- How is the Dun and Bradstreet Failure Score calculated?
- How does the Dun and Bradstreet Failure Score perform?
- What is the relationship between the Dun and Bradstreet Failure Score and Failure Rates?

I. INTRODUCTION

The D&B China Failure Score predicts the likelihood that a company will be Revoked or Deregistered in the next 12 months based on information in the Dun & Bradstreet Data Cloud.

To help evaluate risks objectively and consistently, Dun & Bradstreet combines a large amount of business information with expert analysis and statistical techniques to help determine the potential risk associated with a business. The integrity of the information contained in our Dun & Bradstreet Data Cloud is driven by our proprietary DUNSRight™ Quality Process. DUNSRight is our process for collecting and enhancing information

The D&B China Failure Score is designed to predict either revoked or deregistered events on your existing or 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 potential risk and opportunity
- Manage collection resources with prioritized actions for delinquent accounts
- Satisfy regulatory needs for timely, consistent and objective review of decisions at the account level

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

II. CHINA D&B FAILURE SCORE

What does the D&B China Failure Score predict?

The D&B China Failure Score predicts the likelihood that a company will be Revoked or Deregistered in the next 12 months based on information in the Dun & Bradstreet Data Cloud.

A Revoked event is normally triggered by severe irregularities of a business entity. Under such circumstances the local Administration of Market Regulation will revoke the business license and the company will no longer be able to trade.

A company that has been established in China might look for a Deregistration for a number of reasons. One of the main reasons is when the shareholders decide to terminate the company either due to financial stress or if they are finding it difficult to run daily business operations.

Companies that are subject to such legal events will receive a Failure Raw Score of Null, a 1-100 Failure Score of Null and a Risk Indicator of Null.

In this document, the term "BADS" is used to represent businesses that have encountered one of the above legal events and "GOODS" to represent businesses that have not encountered any of the above legal events.

Availability of the Failure Score

The China D&B Failure Score is available on approximately 1.4 million China based businesses. This is known as the Scorable Universe. They represent companies with the highest levels of business activity.

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

- Business data was updated more than two years ago
- Subject is non-enterprise entity, which is not registered in local Administration for market regulation or not an independent legal entity
- Subject is a Branch
- Subject is classified as a sensitive entity
- Subject is Out of Business
- Subject is not registered in mainland China

Note: The Failure Score will not be calculated for Branches. Some products may allow for automatic trade-up to the Headquarters locations for Branches. That is, Branch records will receive the Failure Score of the immediate HQs

To help ensure that the Failure Score is based upon sufficient information, Dun & Bradstreet has put in place a minimum level of data requirements. Therefore, only companies that satisfy the minimum data requirements will be scored.

To be assigned a score, a Chinese business must be active and must have:

- A valid business name

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- A valid province name
- A registered capital amount
- A valid Industry classification
- A valid type of business
- A valid start of business year

A company that doesn't meet the minimum data requirements will be assigned a Failure Raw Score of 1000, a 1-100 Failure 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 businesses based in China are outlined in Appendix C.

Model Development Process

The Failure Score was 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 model on separate out of time samples to help ensure stability over time.

In the scorecard development process, data is extracted from corresponding pairs of time periods, designated as observation dates and performance periods. The observation dates define the sample used in the model and all explanatory variables are collected from time periods related to these dates or prior to them. The predictive variables and any segmentation are defined from these snapshots. The performance windows define the length of time businesses in the sample are tracked to examine their behavior.

The following observation date and performance window used were to develop and test the China Failure Score:

- 31-Jul-2022 with Performance Period from 1-Aug-2022 until 31-Jul-2023

A total of 1,430,358 companies were used in the model development process. Of this population 1,426,112 companies were considered as "GOOD" and 4,246 were considered as "BAD".

Extensive analysis on the data identified those variables that were statistically the most significant factors for predicting failure, and then the appropriate weights were calculated for each of them.

The businesses in the model development sample were monitored for 12 months. Those that failed in that period were classified as BAD, while the remaining were classified as GOOD. Statistical analysis of the data then identified characteristics that were common to GOOD or BAD businesses. These characteristics were weighted by significance to form rules for our statistical scorecard.

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

- Selection of optimal attributes (predictors) for each scorecard segment The attributes selected by the statistical tool are also verified by the business experts 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

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- To help ensure the model’s robustness and stability of predictors out of time validations were also carried out.
- 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 is associated with the highest probability of failure, while 1999 is associated with the lowest probability of failure. This score enables customers to use more granular cutoffs in order to drive their automated decision-making process.
- **A “Risk based Score” of 1 - 100**, where 1 is associated with the highest probability of failure, while 100 is associated with the lowest probability of failure. This score shows you where a business falls among businesses in the D&B information base and is most effectively used by customers to rank order their portfolios from highest to lowest risk of business failure.
- **A “Risk Indicator” of 1 - 4**, which is a segmentation of the scoreable universe into four distinct risk groups where a one (1) is associated with the lowest probability of failure, while four (4) is associated with the highest probability of failure. This risk indicator enables customers to quickly segment their new and existing accounts into various risk groups for high-level analysis and reporting.

Table - Distribution of the D&B China Failure Score

Risk Indicator	Description	Score 1-100	Raw Score	Failure Rate (%)	% of Businesses
1	Minimum Risk	86-100	1539 - 1999	0.05%	15%
2	Lower than Average Risk	46-85	1478 - 1538	0.16%	40%
3	Higher than Average Risk	11-45	1420 - 1477	0.40%	35%
4	High Risk	1-10	1001 - 1419	0.86%	10%

Scorecard Performance

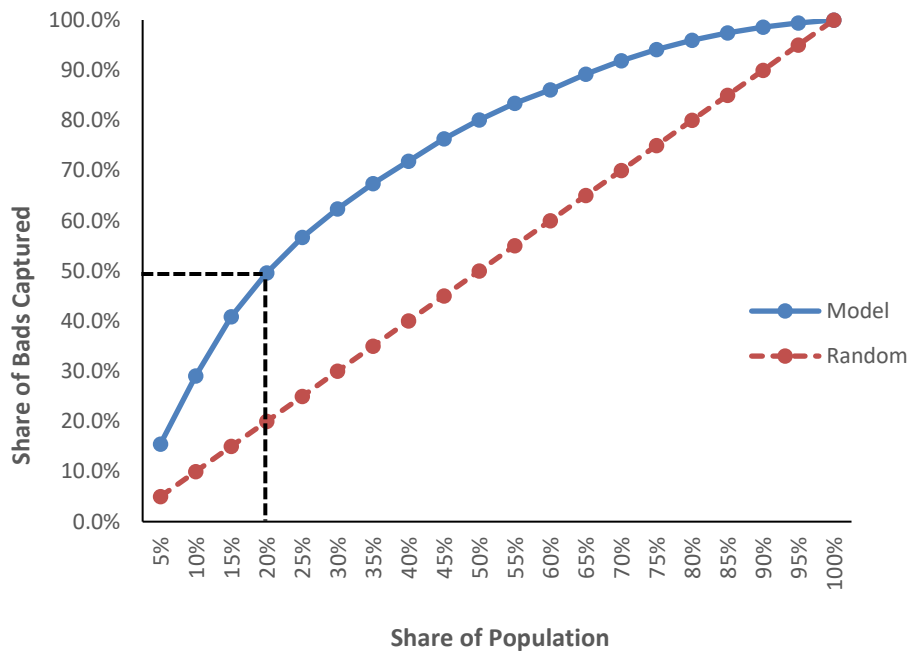
Dun & Bradstreet applies stringent rules to model development and performance standards that are designed to lead to highly accurate scores. Measurements of model performance include an assessment of risk ranking, robustness and discriminatory power. Key metrics used include:

- Ranking accuracy by model decile or vigintile

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- Close match between predicted and actual failure 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 random classifier
- The Gain chart with emphasis on showing the improvement in capturing BADS at the 10% and 20% of worst scoring 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 50% of the BADS versus 20% that would have been captured by a random classifier.



Graph 1 Failure Score capture rate

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 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 Failure Scores to our customers. Regular performance monitoring of our models helps assure continual performance of the Failure Scores in identifying risks related to business failure. Failure Scores that lose predictive power are scheduled for redevelopment or recalibration.

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Appendix A: Sample Data Elements used in the model

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

Category	Data Elements
Demographics	Industry
	Business Age
	Legal Structure
	Geographical Region
	Number of Employees
	Registered Capital
Directors & Shareholders	Percentage of Parent Owned
	Number of Shareholders
Financial Information	Asset-Liability Ratio
	Asset Turnover
	Net Profit
	Revenue Growth
Trade Information	Paydex
	Overdue Amount
	Credit

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Appendix B: Projected Performance Tables

SUMMARY PROJECTED PERFORMANCE TABLE

The following Projected Performance Tables are based on a representative sample and actual performance may vary based on individual customer portfolios.

Cumulative Failure Score Performance							Performance Within Range				
Risk Indicator	Raw Score Range	1-100 Score Range	% of Businesses	Failure Rate	% of Failures Eliminated	Good-Bad Ratio	Raw Score Range	1-100 Score Range	% of Businesses	Failure Rate	% of Failures Identified
1	1539-1999	86-100	15.09%	0.05%	97.41%	1961	1539-1999	86-100	15.09%	0.05%	2.59%
2	1478-1999	46-100	55.40%	0.13%	75.93%	774	1478-1538	46-85	40.31%	0.16%	21.48%
3	1420-1999	11-100	90.06%	0.23%	28.85%	425	1420-1477	11-45	34.66%	0.40%	47.08%
4	1001-1999	1-100	100%	0.30%	0.00%	336	1001-1419	1-10	9.94%	0.86%	28.85%

Explanations:

Cumulative Failure Score Performance:

- % of Businesses:** To set an approval rate, select the appropriate percentile range that yields the desired approval rate. For example, to develop a credit policy that approves 90% of all applicants requires accepting businesses scoring at or above Raw Score of 1420. Businesses scoring below the cutoff Raw Score of 1420 are either reviewed for further decisioning or declined.
- Failure Rate:** The failure rate represents those businesses that score between the lowest value in the score range (or percentile) and 1999 (or 100 percentile). For example, the failure rate for a credit policy which approves all businesses with a Raw Score at or above 1420 (or 11-100 percentile) is expected to be 0.23%.
- % 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 1420 (or 11-100 percentile) is expected to eliminate 28.85% 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 percentile). For example, a credit policy that approves all businesses scoring at or above 1420 (or 11-100 percentiles) should result in a portfolio with 425 "GOOD" businesses for every "BAD" business in the portfolio.

Failure Score Performance Within Range:

- Failure Rate:** The failure rate for those businesses that score within the score range. For example, the failure rate for businesses scoring between 1001-1419 (or 1-10 percentile) is expected to be 0.86%.
- % Of Failures Identified:** The percentage of total failed businesses within the score range. For example, 28.85% of failed businesses are expected to score between 1001-1419 (or 1-10 percentile).

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DETAILED PROJECTED PERFORMANCE TABLE

Cumulative Failure Score Performance						Performance Within Range				
Raw Score Range	1-100 Score Range	% of Businesses	Failure Rate	% of Failures Eliminated	Good-Bad Ratio	Raw Score Range	1-100 Score Range	% of Businesses	Failure Rate	% of Failures Identified
1571-1999	96-100	5.16%	0.03%	99.43%	3077	1571-1999	96-100	5.16%	0.03%	0.57%
1552-1999	91-100	10.11%	0.04%	98.59%	2409	1552-1570	91-95	4.94%	0.05%	0.85%
1539-1999	86-100	15.09%	0.05%	97.41%	1961	1539-1551	86-90	4.98%	0.07%	1.18%
1528-1999	81-100	20.46%	0.06%	95.88%	1671	1528-1538	81-85	5.37%	0.08%	1.53%
1519-1999	76-100	25.48%	0.07%	93.83%	1390	1519-1527	76-80	5.02%	0.12%	2.05%
1511-1999	71-100	30.36%	0.08%	91.78%	1243	1511-1518	71-75	4.88%	0.12%	2.05%
1504-1999	66-100	35.04%	0.09%	89.17%	1089	1504-1510	66-70	4.68%	0.17%	2.61%
1497-1999	61-100	40.26%	0.10%	85.77%	952	1497-1503	61-65	5.22%	0.19%	3.39%
1491-1999	56-100	45.04%	0.11%	83.42%	914	1491-1496	56-60	4.78%	0.15%	2.36%
1484-1999	51-100	50.75%	0.12%	79.49%	832	1484-1490	51-55	5.71%	0.20%	3.93%
1478-1999	46-100	55.40%	0.13%	75.93%	774	1478-1483	46-50	4.65%	0.23%	3.56%
1471-1999	41-100	60.59%	0.14%	71.27%	709	1471-1477	41-45	5.19%	0.27%	4.66%
1465-1999	36-100	65.08%	0.15%	67.24%	668	1465-1470	36-40	4.50%	0.27%	4.03%
1458-1999	31-100	70.42%	0.16%	61.73%	619	1458-1464	31-35	5.34%	0.31%	5.51%
1451-1999	26-100	75.28%	0.17%	56.31%	579	1451-1457	26-30	4.86%	0.33%	5.42%
1443-1999	21-100	80.39%	0.19%	49.25%	533	1443-1450	21-25	5.11%	0.41%	7.07%
1433-1999	16-100	85.19%	0.21%	40.39%	480	1433-1442	16-20	4.80%	0.55%	8.86%
1420-1999	11-100	90.06%	0.23%	28.85%	425	1420-1432	11-15	4.87%	0.70%	11.54%
1402-1999	6-100	95.14%	0.27%	14.93%	376	1402-1419	6-10	5.09%	0.81%	13.92%
1001-1999	1-100	100.00%	0.30%	0.00%	336	1001-1401	1-5	4.86%	0.91%	14.93%

Explanations:

Cumulative Failure Score Performance:

- Approval Rate:** To use, select the appropriate Raw or Percentile Score cutoff that yields the desired approval rate. Approved businesses are companies scoring between the lowest value in the score range (or percentile) and 1999 (or 100 percentile). For example, a credit policy that approves 75% of all businesses requires accepting businesses between 1451-1999 (or 26-100 percentile). Businesses scoring below the cutoff (1001-1450) are either reviewed for further decisioning or declined.
- 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 1451 (or 26-100 percentile) is expected to be 0.17%.
- % 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 1451 (26-100 percentile) is expected to eliminate 56.31% 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 percentile). For example, a credit policy which approves all businesses scoring at or above 1451 (or 26-100

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percentile) should result in a portfolio with 579 "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 1443-1450 (or 21-25 percentile) is expected to be 0.41%
- **% of Failures Identified:** The percentage of total failed businesses within the score range. For example, 7.06% of all failed companies are expected to score between 1443-1450 (or 21-25 percentile).

Appendix C: Score Overrides

Some conditions are not dealt with by a generic scorecard and in these cases special rules or overrides are applied. The rules applied to businesses based in China are outlined in the below table.

Override	Conditions	Raw Score	Percentile Score	Risk Indicator
Litigation	There is a litigation against subject within 24 months	1001	1	4
	- Cause of action regarding bankruptcy	1001	1	4
	- A criminal case	1001	1	4
	There is litigation against subject's management within 24 months	1420	11	3
	- A criminal case (including bribery)	1420	11	3
Administrative Penalties	Administrative penalties	1420 or 1001	11 or 1	3 or 4
	- Confiscation of illegal gains and property	1420	11	3
	- Business suspension	1001	1	4
	- License suspended temporarily or revoked	1001	1	4
	- Administrative detention	1001	1	4

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Appendix D: Scoring Commentaries

Following are a few examples of commentaries associated with the Failure Score on businesses based in China.

- Business belongs to a relatively high risk province, industry, type of business
- Limited business history available
- Scale of business is small
- Number of employees not available
- Number of shareholders is limited or not available
- Shareholder structure is incomplete or not available
- Limited control from parent
- No parent or parent information not available
- No recent interview date or annual report date
- Limited Investment and financing funding information available
- No interview date or annual report date
- No phone number available
- No recent investment and financing information is available
- No recent history changes available
- Poor payment performance; slow payment experiences present
- Poor Paydex
- Limited payment records present
- Poor financial performance
- Few financial indicators obtained
- Diversified negative information detected
- There is serious litigation(s) against subject within 24 months
- There is serious litigation(s) against subject's management within 24 months
- There is serious administrative penalties against subject within 24 months
- Business data was updated more than two years ago
- No business name available
- No province data available
- Registered capital data unavailable
- Industry classification unavailable
- Type of business data unavailable
- Subject is non-enterprise entity, which is not registered in local Administration For Market Regulation or not an independent legal entity
- Start year data unavailable
- Subject is a branch
- Subject is classified as a sensitive entity
- Subject is not registered in mainland China
- Subject is out of business

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Appendix E: Scoring terms glossary

Following is a list of some Scoring Terms used in this documentation.

Term	Explanation
Dun and Bradstreet Failure Score	Dun and Bradstreet Standard Risk Score predicting likelihood of Failure and/or financial distress, also known as the Dun and Bradstreet Failure Score
Raw Score	Score with a direct relationship to Probability of Default (Failure). The Failure Score form of the raw score is a 4-digit score
1-100 Score	Lesser granularity of the Failure Score: values between 1 and 100 where 1 is the highest probability of default (failure)
Risk Indicator	Lowest granularity of Failure Score: segmentation of the Failure Score into 4 risk segments where 1 is lowest probability of default (failure)
Scoreable Universe	All records in the database which meet criteria for score assignment. Examples of records excluded from the Scoreable Universe include Out of Business records, etc.
Observation Point	Date at which the data sample of active businesses is extracted and data elements observed at that point evaluated as potential predictors
Performance Window	Period where the data sample is monitored to classify businesses as GOOD and BAD
Financial Stress BAD definition	List of Legal Events that define targeted risk behavior
BAD	A business which meets the BAD definition. i.e. a business which has been subject to one or more of the events defined as failure
GOOD	A business which does not have any information listed within the BAD definition, i.e. a business which has not been subject to any of the events defined as failure.
Out of Business	Business is no longer trading

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