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Case #2

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Part I

Q1: Indicator Selection for Credit Scoring

Which financial indicator should be excluded from the model?

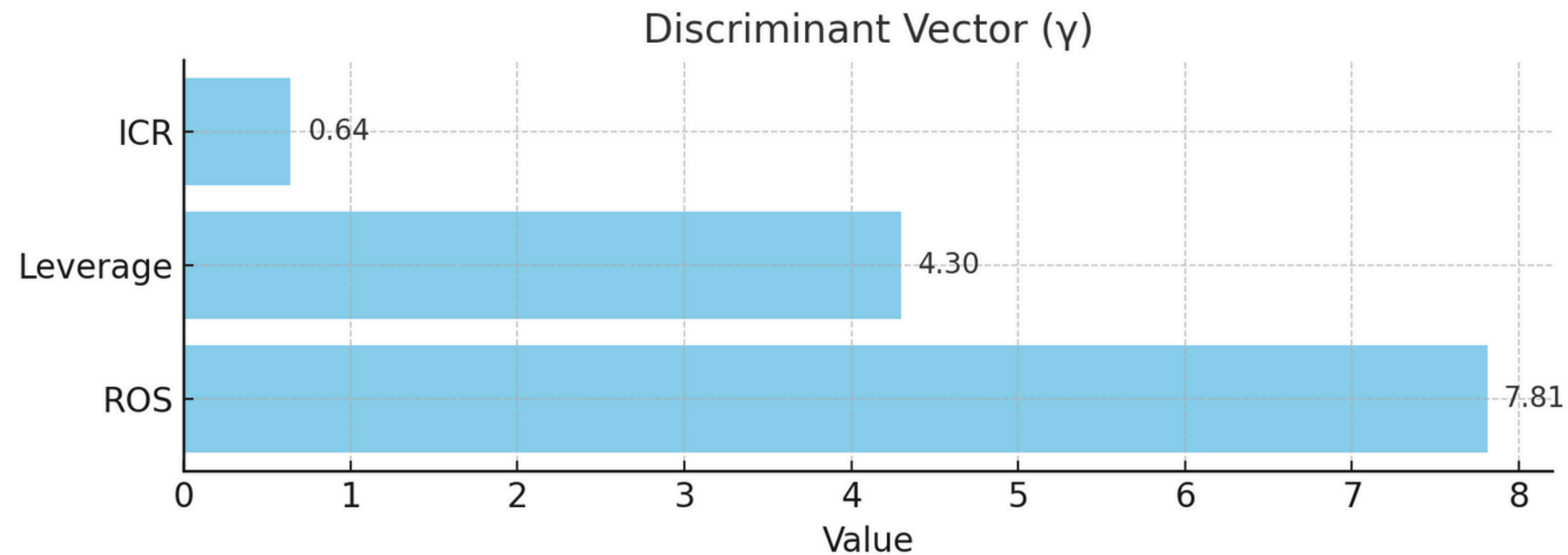
Indicator	SNR
Return on Sales (ROS)	1.34
Leverage (D/V)	0.77
Interest Coverage Ratio (ICR)	0.40
Customer Retention Rate (CRR)	0.09

- to select the 3 most informative financial indicators based on their univariate ability to separate good vs. bad companies, we calculated the Signal-to-Noise Ratio (SNR) for each indicator
- with the lowest SNR, CRR shows poor ability to distinguish between defaulted and good enterprises

Q2: Estimating the Discriminant Vector (γ)

Using discriminant analysis with weighted covariance matrix.

- to separate good vs. bad firms using 3 selected indicators (ROS, Leverage, ICR), the linear discriminant vector γ was computed
- Return on Sales and Leverage contribute most strongly to discrimination



Q3: In-Sample Classification Errors

$$\alpha = (7.80 + 6.06) / 2 = 6.93$$

Type-I and Type-II errors using midpoint cutoff Z-score.

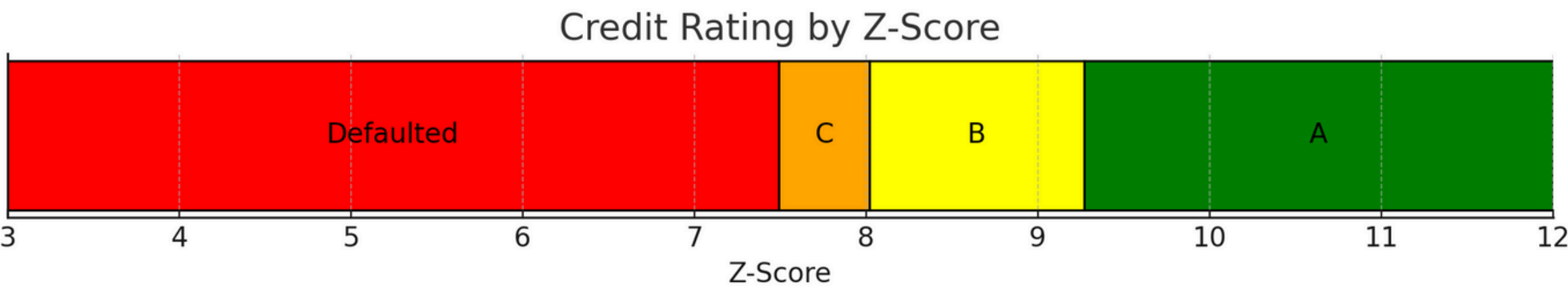


As there is a trade-off, and reducing one error type increases the other, the current cutoff provides a balanced but imperfect separation.

Q4: Internal Credit Rating System

Designing and justifying a custom rating framework.

- Thresholds based on empirical distribution of Z-scores.
- Allows for finer granularity in the mid-risk spectrum.
- Reflects realistic market skew: more firms are low-rated, while top-rated firms are rare



Rating Category	Z-Score Range	Percentile Range
Defaulted	$Z < 7.50$	below 58th
C-rated	$7.50 \leq Z < 8.02$	58th-65th
B-rated	$8.02 \leq Z < 10.28$	65th-90th
Above B	$Z \geq 10.28$	top 10%

Loan Approval Decision

Which firm receives the loan, and what is its internal rating?

Metric	ABC	XYZ
Z-Score	14.99	5.96
Internal Rating	A	Default
2-Year PD (S&P Estimate)	0.03%	35.92%
Asset Value (Merton)	\$6,522	\$3,215
Asset Volatility	0.22	0.31
Face Value of Debt	\$3,700	\$2,100

Decision:  Loan Approved for ABC

- Strong credit score and highest internal rating.
- Negligible default probability over 2 years.
- Solid market fundamentals and asset cushion.

Rejection of XYZ Justified By:

- High default risk (35.92% 2Y PD).
- Weak Z-score and speculative-grade rating.
- Insufficient asset buffer.

Part II

Q1: Default Probabilities from S&P Data

One- and two-year default estimates based on historical ratings.

Table 24

Global corporate average cumulative default rates, 1981-2024															
--Time horizon--															
(%)	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15
AAA	0.00	0.03	0.13	0.23	0.34	0.44	0.49	0.57	0.62	0.67	0.70	0.73	0.75	0.81	0.86
AA	0.02	0.05	0.11	0.19	0.28	0.37	0.45	0.52	0.59	0.65	0.71	0.76	0.81	0.86	0.90
A	0.05	0.11	0.19	0.29	0.39	0.51	0.65	0.78	0.90	1.03	1.14	1.25	1.35	1.45	1.56
BBB	0.14	0.38	0.67	1.01	1.36	1.71	2.00	2.30	2.58	2.86	3.13	3.35	3.56	3.78	4.07
BB	0.56	1.76	3.12	4.48	5.75	6.93	7.94	8.86	9.68	10.44	11.06	11.65	12.17	12.60	13.00
B	2.93	6.93	10.46	13.31	15.60	17.45	18.90	20.06	21.08	22.02	22.82	23.43	24.02	24.57	25.10
CCC/C	26.12	35.92	41.32	44.35	46.53	47.57	48.61	49.29	49.89	50.43	50.85	51.32	51.86	52.26	52.66
Investment grade	0.08	0.21	0.37	0.57	0.77	0.98	1.17	1.34	1.52	1.69	1.85	1.98	2.11	2.24	2.38
Speculative grade	3.54	6.78	9.55	11.79	13.64	15.15	16.39	17.41	18.32	19.15	19.85	20.44	20.99	21.47	21.90
All rated	1.50	2.91	4.13	5.15	6.00	6.72	7.31	7.81	8.26	8.67	9.02	9.31	9.58	9.83	10.00

Sources: S&P Global Market Intelligence's CreditPro and S&P Global Ratings Credit Research & Insights.

ABC qualifies for favorable lending terms, while XYZ poses substantial credit risk under this methodology.

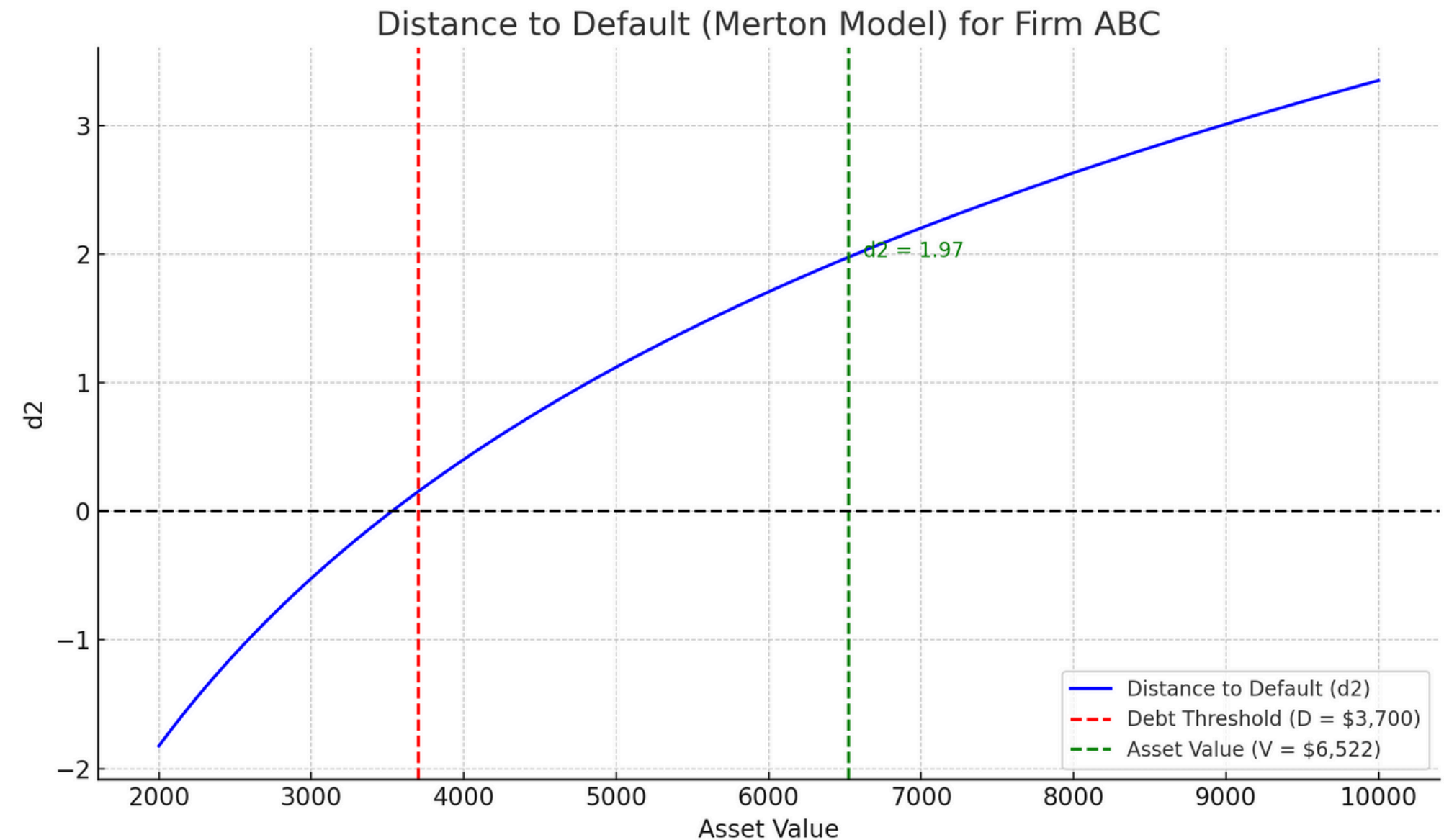
Firm	Internal Rating	Y1 PD (%)	Y2 PD (%)
ABC	AAA	0.00	0.03
XYZ	CCC	26.12	35.92

Q2: Merton Model Application

Market-based probability of default, spread, and coupon.

for Firm ABC:

- 2-Year Probability of Default: 2.41%
- Credit Spread: 0.13%
- Implied Coupon at Maturity: \$ 4,927,722.44



A higher d_2 such as $d_2 \approx 1.86$ reflects a low default risk over the 2-year horizon. Minimal spread indicates market confidence and low compensation for risk.

Q3: Bond-Based Market Comparison

Comparable firm selection and bond yield benchmarking.

Company: Tapestry Inc. (similar sector and credit characteristics)

Bond Characteristics:

- Maturity: July 15, 2027
- Coupon Rate: 2.00%
- Price: 98.63
- Yield to Maturity (YTM): 4.80%
- Option-Adjusted Spread (OAS): 4.13%
- Seniority: Senior unsecured

Loan Terms Derived:

- Implied Credit Spread: 4.13%
- Total 2-Year Coupon (USD): \$5,800,000

Comparability justification:

- Same industry and region
- Bond is actively traded (reflects current market)

Q4: Comparing Risk Assessment Methods

Strengths and weaknesses of S&P, Merton, and bond approaches.

Bond approach

Pros	Cons
Market-based and current	Subjectivity (requires picking comparable firms, which could be hard to do)
Flexibility	Prices may reflect liquidity of current market situation, unrelated to credit risk

Merton

Pros	Cons
Forward-looking	Complex and assumption-heavy (log-normal asset value and constant volatility.)
Firm-specific	Data sensitivity (if input estimates are off, this screws results)

S&P

Pros	Cons
Simple and fast	Backward-looking
Objective and consistent	Static (does not take current market data into consideration)

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Thank
You!

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