The POSOTO Index to find LPI

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POSOTO Formula

Purpose: Predict default risk using weighted factors.

General Form

$$\text{POSOTO} = \sum_{i=1}^{10} a_i \cdot X_i$$

Where:

- X_i = Input feature (e.g., Credit Score, DTI Ratio) (also called sos)

- a_i = Weighted coefficient (also called Pos)

Detailed Formula

$$\begin{aligned}
\text{POSOTO} = & \frac{1}{40}(\text{CreditScore}) + 13(\text{DTIRatio}) + \frac{10}{Income}(\text{Income} - \text{LoanAmount}) \\
& + \frac{1}{18}(\text{MonthsEmployed}) + a_5(\text{HasMortgage}) + a_6(\text{EmploymentType}) \\
& + a_7(\text{HasDependents}) - 0.7(\text{NumCreditLines}) + a_9(\text{Age}) \\
& - \frac{1}{24}(\text{LoanTerm})
\end{aligned}$$

Categorical Variables & Coefficients

Factor	Coefficient (a_i)
HasMortgage (a_5)	Yes = -5, No = 2
EmploymentType (a_6)	Unemployed = -6, Full-time/Self-employed = $+3$
HasDependents (a_7)	Yes = -1, No = $+2$
Age (a_9)	$\begin{cases} -15 & \text{if Age} \leq 10, \\ -10 & \text{if } 10 < \text{Age} \leq 20, \\ 0 & \text{if } 20 < \text{Age} \leq 30, \\ \frac{1}{30} & \text{if } 30 < \text{Age} \leq 40, \\ \vdots & \\ -\frac{1}{75} & \text{if } 80 < \text{Age} \leq 90 \end{cases}$

Formula Observation

- **HigherPOSOTO** implies lower default risk (e.g., high credit score, low DTI).

- **Negative terms** indicate increased risk (e.g., unemployment, many dependents).

- **Age** has a non-linear effect—very young and old applicants are penalized.

Calculations

1. **Loan 1: I38PQUQS96**

$$POSOTO = \frac{520}{40} + 13(0.44) + \frac{10}{85994}(85994 - 50587) + \frac{80}{18} + (-5) + 3 + (-1) - 0.7(4) + \frac{1}{45}(56)$$
$$- \frac{36}{24}$$
$$= 13 + 5.72 + 4.12 + 4.44 - 5 + 3 - 1 - 2.8 + 1.24 - 1.5$$
$$= \boxed{21.22}$$

2. **Loan 2: HPSK72WA7R**

$$POSOTO = \frac{458}{40} + 13(0.68) + \frac{10}{50432}(50432 - 124440) + \frac{15}{18} + 2 + 3 + 2 - 0.7(1) + \frac{1}{55}(69) - \frac{60}{24}$$
$$= 11.45 + 8.84 - 14.68 + 0.83 + 2 + 3 + 2 - 0.7 + 1.25 - 2.5$$
$$= \boxed{12.49}$$

3. **Loan 3: C1OZ6DPJ8Y**

$$POSOTO = \frac{451}{40} + 13(0.31) + \frac{10}{84208}(84208 - 129188) + \frac{26}{18} + (-5) + (-6) + (-1) - 0.7(3) +$$
$$\frac{1}{35}(46) - \frac{24}{24}$$
$$= 11.28 + 4.03 - 5.34 + 1.44 - 5 - 6 - 1 - 2.1 + 1.31 - 1$$
$$= \boxed{-2.38}$$

4. **Loan 4: V2KKSFM3UN**

$$POSOTO = \frac{743}{40} + 13(0.23) + \frac{10}{31713}(31713 - 44799) + \frac{0}{18} + 2 + 3 + 2 - 0.7(3) + \frac{1}{30}(32) - \frac{24}{24}$$
$$= 18.58 + 2.99 - 4.13 + 0 + 2 + 3 + 2 - 2.1 + 1.07 - 1$$
$$= \boxed{22.41}$$

5. **Loan 5: EY08JDHTZP**

$$POSOTO = \frac{633}{40} + 13(0.73) + \frac{10}{20437}(20437 - 9139) + \frac{8}{18} + 2 + (-6) + (-1) - 0.7(4) + \frac{1}{45}(60) - \frac{48}{24}$$
$$= 15.83 + 9.49 + 5.53 + 0.44 + 2 - 6 - 1 - 2.8 + 1.33 - 2$$
$$= \boxed{22.82}$$

6. **Loan 6: A9S62RQ7US**

$$POSOTO = \frac{720}{40} + 13(0.1) + \frac{10}{90298}(90298 - 90448) + \frac{18}{18} + (-5) + (-6) + 2 - 0.7(2) + 0(25) - \frac{24}{24}$$
$$= 18 + 1.3 - 0.02 + 1 - 5 - 6 + 2 - 1.4 + 0 - 1$$
$$= \boxed{8.88}$$

7. **Loan 7: H8GXPAOS71**

$$POSOTO = \frac{429}{40} + 13(0.16) + \frac{10}{111188}(111188 - 177025) + \frac{80}{18} + (-5) + (-6) + 2 - 0.7(1) + \frac{1}{30}(38)$$
$$= 10.73 + 2.08 - 5.92 + 4.44 - 5 - 6 + 2 - 0.7 + 1.27 - 0.5$$
$$= \boxed{2.40}$$

8. **Loan 8: 0HGZQKJ36W**

$$POSOTO = \frac{531}{40} + 13(0.43) + \frac{10}{126802}(126802 - 155511) + \frac{67}{18} + 2 + 3 + 2 - 0.7(4) + \frac{1}{45}(56) - \frac{60}{24}$$
$$= 13.28 + 5.59 - 2.26 + 3.72 + 2 + 3 + 2 - 2.8 + 1.24 - 2.5$$
$$= \boxed{23.27}$$

9. **Loan 9: 1R0N3LGNRJ**

$$POSOTO = \frac{827}{40} + 13(0.2) + \frac{10}{42053}(42053 - 92357) + \frac{83}{18} + (-5) + 3 + 2 - 0.7(1) + \frac{1}{30}(36) - \frac{48}{24}$$
$$= 20.68 + 2.6 - 11.96 + 4.61 - 5 + 3 + 2 - 0.7 + 1.2 - 2$$
$$= \boxed{14.43}$$

10. **Loan 10: CM9L1GTT2P**

$$POSOTO = \frac{480}{40} + 13(0.33) + \frac{10}{132784}(132784 - 228510) + \frac{114}{18} + (-5) + 3 + 2 - 0.7(4) + \frac{1}{35}(40) -$$
$$= 12 + 4.29 - 7.21 + 6.33 - 5 + 3 + 2 - 2.8 + 1.14 - 2$$
$$= \boxed{11.75}$$

Summary ofPOSOTO Values

Loan ID	POSOTO
I38PQUQS96	21.22
HPSK72WA7R	12.49
C1OZ6DPJ8Y	-2.38
V2KKSFM3UN	22.41
EY08JDHTZP	22.82
A9S62RQ7US	8.88
H8GXPAOS71	2.40
0HGZQKJ36W	23.27
1R0N3LGNRJ	14.43
CM9L1GTT2P	11.75

Note: NegativePOSOTO (e.g., Loan 3) indicates higher risk due to unfavorable factors like unemployment, mortgage, and dependents. Higher positive values (e.g., Loan 8) suggest better loan performance.

Calculations (Loans 11-20)

11. **Loan 11: IA35XVH6ZO**

$$POSOTO = \frac{652}{40} + 13(0.23) + \frac{10}{140466}(140466 - 163781) + \frac{94}{18} + 2 + (-6) + 2 - 0.7(2) + 0(28) - \frac{48}{24}$$
$$= 16.3 + 2.99 - 1.66 + 5.22 + 2 - 6 + 2 - 1.4 + 0 - 2$$
$$= \boxed{17.45}$$

12. **Loan 12: Y8UETC3LSG**

$$POSOTO = \frac{375}{40} + 13(0.8) + \frac{10}{149227}(149227 - 139759) + \frac{56}{18} + 2 + 3 + 2 - 0.7(3) + 0(28) - \frac{36}{24}$$
$$= 9.38 + 10.4 + 0.63 + 3.11 + 2 + 3 + 2 - 2.1 + 0 - 1.5$$
$$= \boxed{26.92}$$

13. **Loan 13: RM6QSRHIYP**

$$POSOTO = \frac{829}{40} + 13(0.45) + \frac{10}{23265}(23265 - 63527) + \frac{87}{18} + (-5) + 3 + 2 - 0.7(4) + \frac{1}{35}(41) - \frac{60}{24}$$
$$= 20.73 + 5.85 - 17.31 + 4.83 - 5 + 3 + 2 - 2.8 + 1.17 - 2.5$$
$$= \boxed{9.97}$$

14. **Loan 14: GX5YQOGROM**

$$POSOTO = \frac{395}{40} + 13(0.73) + \frac{10}{117550}(117550 - 95744) + \frac{112}{18} + 2 + (-6) + 2 - 0.7(4) + \frac{1}{45}(53) - \frac{2}{2}$$
$$= 9.88 + 9.49 + 1.85 + 6.22 + 2 - 6 + 2 - 2.8 + 1.18 - 1$$
$$= \boxed{22.82}$$

15. **Loan 15: X0BVPZLDC0**

$$POSOTO = \frac{635}{40} + 13(0.2) + \frac{10}{139699}(139699 - 88143) + \frac{112}{18} + 2 + (-6) + 2 - 0.7(4) + \frac{1}{45}(57) - \frac{48}{24}$$
$$= 15.88 + 2.6 + 3.69 + 6.22 + 2 - 6 + 2 - 2.8 + 1.27 - 2$$
$$= \boxed{22.86}$$

16. **Loan 16: O5DM5MPPNA**

$$POSOTO = \frac{432}{40} + 13(0.89) + \frac{10}{74064}(74064 - 230883) + \frac{31}{18} + (-5) + (-6) + 2 - 0.7(2) + \frac{1}{35}(41) -$$
$$= 10.8 + 11.57 - 21.15 + 1.72 - 5 - 6 + 2 - 1.4 + 1.17 - 2.5$$
$$= \boxed{-8.79}$$

17. **Loan 17: 9V0FJW7QPB**

$$POSOTO = \frac{811}{40} + 13(0.66) + \frac{10}{33015}(33015 - 10889) + \frac{106}{18} + (-5) + 3 + 2 - 0.7(2) + \frac{1}{30}(39) - \frac{60}{24}$$
$$= 20.28 + 8.58 + 6.7 + 5.89 - 5 + 3 + 2 - 1.4 + 1.3 - 2.5$$
$$= \boxed{38.85}$$

18. **Loan 18: ZDDRGVTEXS**

$$POSOTO = \frac{313}{40} + 13(0.28) + \frac{10}{119704}(119704 - 25697) + \frac{49}{18} + (-5) + (-6) + 2 - 0.7(1) + (-10)(2)$$
$$= 7.83 + 3.64 + 7.85 + 2.72 - 5 - 6 + 2 - 0.7 - 200 - 1$$
$$= \boxed{-188.66}$$

19. **Loan 19: O1IKKLC69B**

$$POSOTO = \frac{319}{40} + 13(0.17) + \frac{10}{40718}(40718 - 78515) + \frac{119}{18} + (-5) + 3 + 2 - 0.7(2) + (-10)(19) -$$
$$= 7.98 + 2.21 - 9.29 + 6.61 - 5 + 3 + 2 - 1.4 - 190 - 1$$
$$= \boxed{-184.89}$$

20. **Loan 20: F7487UU2BF**

$$POSOTO = \frac{376}{40} + 13(0.39) + \frac{10}{123419}(123419 - 161146) + \frac{65}{18} + (-5) + 3 + 2 - 0.7(4) + \frac{1}{35}(41) - \frac{6}{2}$$
$$= 9.4 + 5.07 - 3.06 + 3.61 - 5 + 3 + 2 - 2.8 + 1.17 - 2.5$$
$$= \boxed{10.89}$$

Summary ofPOSOTO Values (Loans 11-20)

Loan ID	POSOTO
IA35XVH6ZO	17.45
Y8UETC3LSG	26.92
RM6QSRHIYP	9.97
GX5YQOGROM	22.82
X0BVPZLDC0	22.86
O5DM5MPPNA	-8.79
9V0FJW7QPB	38.85
ZDDRGVTEXS	-188.66
O1IKKLC69B	-184.89
F7487UU2BF	10.89

Key Observations

- **HighestPOSOTO:** `9V0FJW7QPB` (38.85) due to high credit score, self-employment, and favorable financial ratios.

- **LowestPOSOTO:** `01IKKLC69B` (-184.89) and `ZDDRGVTEXS` (-188.66) due to extreme age penalties (20 and 19 years old respectively) combined with unemployment.

- **NegativePOSOTO:** Loans 16, 18, and 19 indicate severe risk primarily from:

  - Age < 21 (penalty of $-10 \times$ Age)
  - Unemployment status
  - High debt-to-income ratios