a) (1) Probit Model.

- $\hat{I} = 1.457 + 0.359 X_{1i} - 0.853 X_{2i} - 0.574 X_{3i} - 1.249 X_{4i}$

$P(y_i = 1 \mid X) = F(\hat{I})$

- $\frac{dy}{dx_1} = 0.107$ If x increase 1 unit from mean, $\hat{P}(Y=1)$ will increase by 10.7%.
- $\frac{dy}{dx_2} = -0.255$ ——, $\hat{P}(Y=1)$ will decrease by 25.5%.
- $\frac{dy}{dx_3} = -0.171$ ——, —— by 17.1%.
- $\frac{dy}{dx_4} = -0.373$ ——, —— 37.3%.

holding other x at mean.

- Individual Test

Each independent variable is statistically significant at $\alpha = 0.5$

- Overall Test : Significant since prob > chi2 = 0.0000
- pseudo R^2 = 40.64%.
- counted R^2 = 81.75%.

(2) Logit Model

- $\hat{I} = 2.517 + 0.629 X_{1i} - 1.488 X_{2i} - 0.956 X_{3i} - 2.155 X_{4i}$

$P(y=1 \mid X) = \frac{1}{1+e^{-\hat{I}}}$

- $\frac{dy}{dx_1} = 0.105$ If x ↑ 1 unit from mean, $\hat{P}(Y=1)$ will ↑ by 10.5%.
- $\frac{dy}{dx_2} = -0.247$ —— —— ↓ by 24.7%.
- $\frac{dy}{dx_3} = -0.139$ —— —— ↓ by 15.9%.
- $\frac{dy}{dx_4} = -0.358$ —— —— ↓ by 35.8%.

- Individual Test : All x's are significant
- Overall Test : Significant
- Psuedo R^2 = 40.46%.
- Counted R^2 = 81.75%.

b) Logit Model might be better because it has higher counted R^2. Even its psuedo R^2 is a bit lower.

c) $LR\text{-test} = 2[\log L_{UR} - \log L_R]$

$= 2(-147.469 - (-248.435))$

$= 201.93$

d) $\hat{I} = \hat{\beta}_0 + \hat{\beta}_1 \bar{X}_1 + \hat{\beta}_2 \bar{X}_2 + \hat{\beta}_3 \bar{X}_3 + \hat{\beta}_4 \bar{X}_4$

$= 2.516 + 0.6299(0.455) + (-1.488)(0.809) + (-2.155)(-0.1196)$

$+ (-0.956)(0.557)$

$= 1.324.$

$Pr(y=1|x) = \frac{1}{1+e^{-\hat{I}}} = 0.7898$

∴ Prob of a firm being a bad loan is predicted to be 78.98%.

e)

At Mean		At Median	
$\frac{dy}{dx_1}$	$= 0.1045$	$\frac{dy}{dx_1}$	$= 6.0841$
$\frac{dy}{dx_2}$	$= -0.247$	$\frac{dy}{dx_2}$	$= -0.1987$
$\frac{dy}{dx_3}$	$= -0.1587$	$\frac{dy}{dx_3}$	$= -0.1277$
$\frac{dy}{dx_4}$	$= -0.3577$	$\frac{dy}{dx_4}$	$= 0.2875.$

f)

$\frac{dy}{dx_1}$	$= 0.1266$	$\frac{dy}{dx_2}$	$= -0.3006$
$\frac{dy}{dx_3}$	$= -0.2022$	$\frac{dy}{dx_4}$	$= -0.4907.$

g) Counted $R^2 = 81.75\%$.

f) Counted $R^2 = 79.5\%$.