Microeconometrics Assignment 2 - Task 4

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The difference in the coefficient estimates is zero when rounded to even the fourth decimal place:

```
##                         [,1]
## (Intercept)  -1.202367e-05
## educ         -6.146039e-06
## marry        -6.979884e-06
## insur         2.358886e-05
## credithist.1  1.268898e-05
## credithist.2 -2.048102e-05
## credithist.3  5.382957e-06
## credithist.4  1.531826e-05
## credithist.5  2.335534e-05
## bankr         9.752733e-06
## white        -9.591134e-06
## oblig         3.890473e-07
```

This is because the multinomial logit model reduces to the binomial logit model in case of a binomial dependent variable as can be seen in the formulas. In the multinomial logit model, the probability π_{ij} of individual i choosing alternative j is given by:

$$\pi_{ij_{multinomial}} = \frac{\exp(x_i'\beta_j)}{\sum_{r=1}^{J} \exp x_i'\beta_j}.$$

Compare this to the binomial logit model, where the probability π_i of individual i picking alternative $j = 1$ is given by:

$$\pi_{i_{binomial}} = \frac{\exp(x_i'\beta)}{1 + \exp(x_i'\beta)}.$$

In the multinomial model, due to identification constraints, β_1 is fixed at 0. This establishes $j = 1$ as the reference category. For the remaining $J - 1$ categories, β_j coefficients are estimated. If the dependent variable has only two categories, i.e. $J = 2$, this means that only one β and one π_i need to be calculated (for the one category that is not the reference category) so the index j in π_{ij} and β_j can be dropped. Since the constraint for $\beta_1 = 0$ means that $\exp(x_i'\beta_1)$ evaluates to 1, this reduces the denominator in the multinomial logit model to $1 + \exp(x_i'\beta_2)$. After dropping the now obsolete index of the coefficient vector, the two formulas given above are equal.