Problem Set 7

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Abstract

This document summarizes and compares the regression results of female wages analysis. And the document also summarizes the progress of my final project.

1 Summary Table

Please refer to Figure 1 on the page 2 for the summary statistics information

2 Missing rate and the Type of Missingness

The missing rate of wages dataset is around 0.2512, In my opinion, the type of missing could either be Missing at Random or Missing not at random. The missing value of log wages could be relevant to the observed variables and also could be the result caused by unobserved variables. For example, a female worker with a graduate degree might also be a full-time housewife who does not work in industry, and a female worker who has a number of kids and senior citizen that need to be taken care of might not have a job in a company.

3 The Comparison Among s

The true value of $\hat{}1 = 0.093$, which is different from all of the estimated values obtained from the imputation methods. You can get the information about s from the table listed on page two 2. The pattern we observe is that the estimates from the imputation methods are generally smaller than the true value of $\hat{}1$.

Comparing the estimates, we can see that the mean imputation method has lowest of ($= 0.043^{***}$), followed by the multiple imputation method ($= 0.06$). and the listwise deletion and missing log as predicted value methods have the same magnitude of s ($= 0.065^*$ and $= 0.065^{***}$, respectively).

Mean imputation model gives the most biased value of 0.043, compared with the true beta of 0.093. The assumption for mean imputation is that the missing value is missing at random. If the missing values in our dataset is not missing at random or missing completely at random, the mean imputation model could be biased.

Regarding the estimates for the last two methods, the missing log as predicted value method produces a similar estimate ($= 0.065^{***}$) to the listwise deletion method ($= 0.065^*$). This is expected as both methods involve a form of deletion, either explicitly or implicitly, which may introduce similar biases. The missing log as predicted value method replaces the missing values with predicted values based on a regression model. This method may produce less biased estimates than mean imputation but can still be biased because it relies on a single imputed value.

The multiple imputation method produces a slightly smaller estimate ($= 0.06^{**}$) than the other two methods. In my opinion, the multiple imputation method produces a more accurate and sophisticated results. beacuse it creates multiple imputed datasets by modeling the missing data based on observed data. Comparing among the four method, I consider that multiple imputation method generates more reliable correlation.

	logwage	hgc	tenure	age	Married_Ind	College_Ind
count	1669.000000	2229.000000	2229.000000	2229.000000	2229.000000	2229.000000
mean	1.625190	13.101391	5.970615	39.151638	0.641992	0.237775
std	0.385534	2.524306	5.507216	3.061954	0.479522	0.425816
min	0.004940	0.000000	0.000000	34.000000	0.000000	0.000000
25%	1.362255	12.000000	1.583333	36.000000	0.000000	0.000000
50%	1.655079	12.000000	3.750000	39.000000	1.000000	0.000000
75%	1.936200	15.000000	9.333333	42.000000	1.000000	0.000000
max	2.261495	18.000000	25.916670	46.000000	1.000000	1.000000

Figure 1: The Summary Statistics.

```
===============================================================================
                Listwise deletion Mean imputation Missing Log Multiple imputation
-------------------------------------------------------------------------------
const           0.963***          1.201***        0.963***    0.959***
                (0.130)           (0.101)         (0.000)     (0.097)
hgc             0.036***          0.020***        0.036***    0.036***
                (0.006)           (0.004)         (0.000)     (0.004)
college         0.065**           0.043**         0.065***    0.060***
                (0.027)           (0.022)         (0.000)     (0.021)
tenure          0.050***          0.037***        0.050***    0.049***
                (0.005)           (0.004)         (0.000)     (0.004)
tenure_sq       -0.002***         -0.001***       -0.002***   -0.002***
                (0.000)           (0.000)         (0.000)     (0.000)
age             0.000             -0.000          0.000***    0.000
                (0.003)           (0.002)         (0.000)     (0.002)
Married_Ind     0.023             0.028**         0.023***    0.021
                (0.018)           (0.014)         (0.000)     (0.013)
R-squared       0.203             0.132           1.000       0.281
R-squared Adj.  0.200             0.130           1.000       0.279
===============================================================================
Standard errors in parentheses.
* p<.1, ** p<.05, ***p<.01
```

Figure 2: The beta comparison table.

4   Final Project

The utilized model in my final project is OLS regression model. I am more familiar with this model but I might switch the model after we gain more knowledge in machine learning. I using financial data from WRDS database.