Problem# 1. Main goal of this hw is to study the performance of the weight least squared estimation using the data described as follow:

Elections for the French presidency proceed in two rounds. In 1981, there were 10 candidates in the first round. The top two candidates then went on to the second round, which was won by Francois Mitterand over Valery Giscard-d’Estaing. The losers in the first round can gain political favors by urging their supporters to vote for one of the two finalists. Since voting is private, we can not know how these votes were transferred; we might hope to infer from the published vote totals how this might have happened. Anderson and Loynes (1987) published data on these vote totals in every fourth department of France. The data is “fpe” in R.

```r
> data(fpe)
> fpe
  EI A B C D E F G H J K A2 B2 N
Ain  260  51  64  36  23  9  5  4  4  3  3  105 114  17
Alpes  75  14  17  9  9  3  1  2  1  1  1  32  31  5
Ariege 107  27  18  13  17  2  2  2  1  1  1  57  33  6
...
Val.D.Oise 533 111 100  74  81 12 12 10  7  7  6 252 192 14
Vendee  336  61 105  59 19 10 11  6  5  4  3 115 176  8
Yonne  216  44  52  31  24  7  4  4  3  3  2  91  91  8
```

A and B stand for Mitterand’s Giscard’s votes in the first round, respectively, while A2 and B3 represent their votes in the second round. C-K are the first round votes of the other candidates while EI is electeurs inscrits or registered voters. All numbers are thousands. The total number of voters in the second round was greater than the first-we can compute the difference as N.

We can represent the transfer of votes as:

\[
A2 = \beta_A A + \beta_B B + \beta_C C + \beta_D D + \beta_E E + \beta_F F + \beta_G G + \beta_H H + \beta_J J + \beta_K K + \beta_N N
\]

where \( \beta_i \) represents the proportion of votes transferred from candidate \( i \) to Mitterand in the second round. Now we would expect these transfer proportions to vary somewhat between departments, so if we treat the above as a regression equation, there will be some error from department to department.

- Estimate the model using dual model regression.
- Compare the dual model regression with the single model regression.
- Discuss what you find from this comparison.