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Variance Inflation Factor and Condition Number in multiple linear regression

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ABSTRACT

The Variance Inflation Factor and the Condition Number are measures traditionally applied to the analysis of linear regression models. This paper presents a new method for the estimation of these measures, based on empirical data. The method is applied to the analysis of the condition number of the covariance matrix of the data. The results show that the proposed method is more accurate than the traditional methods.

KEYWORDS



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Notes

- 1 Note that the constant term disappears after the standardization of the data.
- 2 Note that, when data are standardized, the VIF and CN coincide with the result obtained from typified data.
- 3 Note that these examples are not regression models since $n=p$.
- 4 Denoting $X_1=1$, the auxiliary regression to calculate the VIF is expressed as $X_2=\gamma_1+w$, where it is verified that $\hat{\gamma}=X^{-2}$ and, consequently, $SSR=\sum_{i=1}^n(X_{2i}-\hat{\gamma}_1)^2=SST$. In this case, it is always verified that $R_{aux}^2=1$. The version of the previous regression with unit length data is given by $X_{2,lu}=\gamma_{1lu}+w$ where $X_{2,lu}=X/a$ with $a=\sum_{i=1}^n X_{2i}^2$ and $1_{lu}=1/n$. In this case, $\hat{\gamma}=n/a \cdot X^{-2}$ and, then, $SSR=(1/a)\sum_{i=1}^n(X_{2i}-n \cdot X^{-2} \cdot 1/n)^2=SST$. Thus, this situation will be similar to the initial one.



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