

JNSA 19: 1-3

ON THE DISTRIBUTION OF A SCALED BETA RANDOM VARIABLE

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Abstract

The paper considers the distribution of a transformed variable $Y = \lambda X$ where λ is a positive constant and X has a Beta distribution $B(\alpha, \beta)$. It is shown that Y is a scaled Beta distribution with three parameters λ , α and β . Moments of Y are obtained. Estimators of the parameters are derived using both MLE and method of moments.

Key words: Scaled Beta, three- parameter Beta distribution.

JNSA 19: 4-18

ON THE PRECISION AND MEAN SQUARE ERROR MATRICES APPROACHES IN OBTAINING THE AVERAGE INFORMATION MATRIX VIA THE SUPER CONVERGENT LINE SERIES

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Abstract

The average information matrices computed using the precision and mean square error matrices approaches are compared. This is achieved algebraically by taking the determinants of the average information matrices. The average information matrix computed using the precision matrices approach is found to be the same with that computed using the mean square error matrices approach. On the whole, ignoring the bias in a response function using the precision matrices approach has no effect on the quality of the average information matrix unlike in using the mean square error matrices approach where the bias is not ignored and computations are more cumbersome. Illustrative examples are also given.

Keywords/phrases: Mean Square Matrix, Precision Matrix, Response Surface, Information Matrix, Super Convergent Line Series

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ON SPECTRAL METHOD OF DETECTING OUTLIERS IN TIME SERIES

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Abstract

We present a technique for detecting outliers in frequency domain of time series using the spectral method. The technique is particularly useful when it is desired to avoid the smearing and swamping effect of outlier on other regular observations. We propose an algorithm for detection of aberrant observations in the frequency domain that is capable of detecting outliers more exactly using the modified robust test statistic. The methods and the algorithm are illustrated with real and simulated data. Different number of outliers was detected from used data and the results are consistent with earlier works in the literature.

It is valuable to know that the occurrence of outliers has direct influence on the phase and amplitude of the spectrum, producing an upward shift in the spectrum and the variance of the model. The study shows that spectral method is a better and more sophisticated technique in detection of outliers especially when the data are large, highly periodic and volatile.

Keywords: Outliers, Fourier Transform, Spectrum, Periodogram, Robustness, Simulation.

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On Quasi-Association Modeling of Agreement between Raters when Ratings are in Ordered Categories

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Abstract

Whenever the categorical scale in the arising cross-classified table from the ratings of two raters or observers is ordered, quasi-independence model rarely fits well. Also, even after conditioning on the event that raters' responses differ, there is often a monotone pattern to the association that remains. One of the major statistical issues in raters' agreement studies is concerned with the extent to which observers classify individual subjects into the same category on the measurement scale. In order to assess the levels of agreement in the ordered categories of the arising cross-classified table, a parametric model like quasi-association (QA) that includes the pattern or level of agreement parameter which permits linear-by-linear association off the main diagonal in its model is required. In addition, when our interest is to identify category(ies) that is of importance to or favoured by the raters out of the entire ordered categories, quasi-association will be suitable. In this paper we model quasi-association for raters' agreement by considering different combination of categories involved in the measurement by step-wise selection procedure using both the overall model of quasi-association and uniform association (UA) models as the bound or baseline. We observed that inclusion of any level of agreement that is significant in the model improved the fit of the model. In addition, inclusion of level of agreement parameter by quasi-association improved the fit. Also

when our goal is to identify the most favoured categories out of the existing categories, quasi-association is appropriate.

Keywords: Quasi-association, Quasi-independence, Uniform association, agreement, ordered category, raters.

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EMPIRICAL INVESTIGATION OF EFFECT OF MULTICOLLINEARITY ON TYPE II ERROR RATES OF THE ORDINARY LEAST SQUARES ESTIMATORS

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Abstract

In this paper we investigated the effect of multicollinearity on the type II error rates of the OLS estimator. A regression model with constant term (β_0) and two independent variables (with β_1 and β_2 as their respective regression coefficients) that exhibit multicollinearity was considered. A Monte Carlo experiment of 1000 trials was conducted at eight levels of multicollinearity and different sample sizes. At each specification, the true regression coefficients were set at unity while 1.5, 2.0 and 2.5 were taken as their hypothesized values.

Results show that at each hypothesized value of β_0 , the type II error rate is the same at all levels of multicollinearity at a specified sample size but the error rate decreases asymptotically. Furthermore as the hypothesized value increases, results do not only show that the type II error rate decreases but tends faster to zero asymptotically. The pattern of effect of type II error rate of β_1 and β_2 is the same as that of β_0 except that at each hypothesized value the error rate increases as level of multicollinearity increases at a specified sample size.

Key words: Regression Model, OLS estimator, Multicollinearity, Type II error rates.

JNSA 19: 58-65

INVESTIGATING THE CHOICE OF FEW COMPONENTS IN PRINCIPAL COMPONENT REGRESSION

By

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Abstract

In fitting a predictive model, Principal Component Regression has been found to be a powerful tool for dealing with the problem of multicollinearity (Brien et al, 1995). Stepwise regression using the Monte Carlo approach was used to investigate which methods are appropriate for selecting components to be retained in model building. Data sets at different levels of multicollinearity were simulated. It was discovered that components with higher eigen values are not necessarily the only to be included in model building. Sometimes, the one with the least eigen value could be included.

Key Words: Component Scores, Multicollinearity, Stepwise Regression, Principal Component Regression.

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ON SOME CLASSES OF PRODUCT ESTIMATORS IN DOUBLE SAMPLING

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Abstract

Product estimator is used in the estimation of the population mean when the auxiliary variable is negatively correlated with characteristic of interest. This paper proposes some classes of product estimators in double sampling for estimating the population mean. It is found empirically that the proposed estimators are superior to the sample mean and ordinary product estimator. Also, when the optimum values of the constants of proportionality are used, the minimum variances of these estimators tend to the minimum variance of ordinary double sampling for regression estimator.

Key Words: Bias, Estimator, Double Sampling, Variance, Mean Square Error.

JNSA 19: 74-79

ANALYZING COMPETING RISK SURVIVAL TIME DATA USING COX AND PARAMETRIC PROPORTIONAL HAZARDS MODELS

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Abstract

Cox Proportional hazards model has been the most popular Semiparametric model in analyzing continuous survival time data. In this paper, results of analysis of malignant cancer reveal that the model compares well with the parametric Weibull model in terms of parameter estimates and standard errors. Simulation results further show that there is no loss in efficiency when Cox model is used when compared to Weibull model regardless of the parametric nature of the baseline hazards.

Key words: Survival time, Cox model, Partial likelihood, Competing risk, Parametric model.

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A REVIEW OF STATISTICAL MODELS FOR EARLY DETECTION OF OUTBREAK
OF DISEASE EPIDEMICS AND APPLICATION

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Abstract

Statistical models provide a unique description to available data from public health surveillance systems which can provide meaningful measures of population risks for disease, disability, and death. Analysis and evaluation of these data help public health practitioners react to important health events in a timely manner both locally and nationally.

Different methods exist for monitoring Health Surveillance data, and no method is universally superior. This paper discusses some methods commonly used for detection of outbreaks of diseases epidemics and demonstrates the applicability of two of these models on hospital data. It compares the performance of EWMA and CUSUM models for detection of outbreaks of disease epidemics and finds that EWMA chart is slightly superior to CUSUM models for early detection of outbreaks of malaria and measles.

Key words: Dynamics Models, CUSUM, EWMA, Average Run Length, Acceptable Quality level, infectious disease