Reviewer's report

Title: Closed-form estimators of the intensity of seasonal occurrence.

Version: 1 Date: 21 January 2008

Reviewer: Guy Melard

Reviewer's report:

This paper deals closed-form estimators of the intensity of seasonal occurrence. More precisely, its aim is to obtain improvements with respect to Edwards' method for fitting a sine-curve to a monthly profile of illness occurrence. Obtaining a confidence interval for the peak-to-low ratio is of prime importance since it allows testing for seasonality. Like the original 1961 method and previous improvements, the method is based on a non-homogeneous Poisson process with an average which is expressed as a shifted cosine of time. Edwards' method was based on square roots of counts and relied on a first-order series expansion. The two methods proposed here are based on counts themselves, without a transformation, and rely on approximations of, respectively, first-order and second-order moments. The first method also appears to be related to a least-squares regression approach. A simulation study is undertaken to compare 5 estimators including Edwards' and a maximum likelihood estimator. An example due to Eatough (2002) is also revisited.

Major Compulsory Revisions

The paper seems to be interesting although more limited in scope than expected. On the one hand, there are new approaches to an existing method and real improvements substantiated by simulations and a SAS routine for MLE estimation. On the other hand, the methods are based on a narrow-scoped model with respect to e.g. Jones et al. (1988) and, since many estimators can be imagined, a kind of overall optimal estimator may be desirable, which is not the case of those proposed here.

My main reservation is about problems are reported about estimation of tp when R is close to 1. I believe they are essentially due to the parameterization being used. Estimation of the coefficients of the sine and cosine would have avoided the problem. Then estimates of R and the shift can be deduced using standard trigonometric relations.

Minor Essential Revisions

1. RD2 is not clearly defined as well the WLS/MLE estimators.
2. There remain several misprints in the paper, including missing parentheses around equation numbers (bottom of p. 4), missing "to" on page 4, line 3 from the bottom, bad journal (Biometrics instead of Biometrika) for Jones et al. (1988) and a misprint in the title of the same paper. This is just a sample of problems since the short referee delay has not allowed enough time.
3. I took Eatough (2002) data and fit model (3) and deduced an estimator using the equation after (3), say (3'), yielding 1.2337. It is like your RLS estimator without the second step. Testing for seasonality can be based on the sum of squares of the estimators of beta1 and beta2. If necessary a confidence interval can be deduced on the basis of derivatives of (3'). What is wrong with this simple, standard, approach?

Discretionary Revisions
1. Both Edwards' and the authors' method require a geometric interpretation which is not clear to me as presently stated in the paper (pages 3 and 4).
2. It seems to me that the example is not convincing. There may be seasonality in monocytic leukemia but the fact that the minima occur in July and August may be due to holidays. In economics it is customary to observe production decreases during these months.

What next?: Unable to decide on acceptance or rejection until the authors have responded to the major compulsory revisions

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:
I declare that I have no competing interests