



SDI Review Form 1.6

Journal Name:	British Journal of Mathematics & Computer Science
Manuscript Number:	2013_BJMCS_8110
Title of the Manuscript:	The Roles of Condition Number in Least Squares Equation
Type of the Article	Something between research and case study

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PART 1: Review Comments

	Reviewer's comment	Author's comment (<i>if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here</i>)
Compulsory REVISION comments	It is not quite clear what precisely is the interval least squares problem that is considered. Namely, where are the (interval) uncertainties: in the dependent variable Y , in the independent variable X , or in both.	OK
	2. Another big confusion comes from the notations: the interval quantities cannot be distinguished from the real quantities since both are denoted the same way and by the same letters. Only when reproducing Theorem 4.1 the interval quantities are in square brackets “[]”.	OK
	3. Theorem 4.1 (line 196) is due to Rump [20]. In the abstract (line 9), in the Introduction (line 82), on lines 247, 255, 257 and 259 this theorem is incorrectly attributed to Popova [8]. While, lines 268–269 of the Conclusion are more correct: “... the theorem due to [20] as exemplified by Popova in [8] was adopted ...”	OK
	Section 4 is mathematically inconsistent. I skip some incorrectness in lines 174 and 176 as minor.	OK
	(a) Basing on line 179 it seems that the goal is: computing the interval hull of the nonparametric solution set $\Sigma([B], [b])$, where B, b are as denoted on lines 76–77. Then, why a parametric linear system (4.1) is considered on lines 180–215? Which are the parameters in your least squares problem?	OK
	(b) The statement on lines 213–215 is false. (4.1) is a parametric system, while $[B]\beta = [b]$ is a nonparametric one. The boundary of the parametric solution set to (4.1) is, in general, nonlinear, see G. Alefeld et al., J. of Computational and Applied Mathematics 152 (2003) 1–15. The parametric solution set (4.2) may be non-convex even in a single orthant. Therefore one cannot compute (in general) neither the parametric solution set (4.2) nor its interval hull by methods for	OK
		OK



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	nonparametric interval systems The statement on lines 235–237 is also false. Theorem 4.2 gives the exact interval hull of $\Sigma([B], [b])$ (in exact arithmetic), that is the smallest interval vector containing $\Sigma([B], [b])$. The same is obtained if you compute the interval hull of the vertices of $\Sigma([B], [b])$ obtained by (4.6). Therefore there is nothing to improve. The Rump/Krawczik method from [20] for nonparametric systems (which is different from that one in Theorem 4.1) yields only an enclosure (not the smallest) of $\Sigma([B], [b])$. Section 5 contains a single small numerical example. (a) It is again not clear what does "Take Gaussian noise $p = 0.0005$ for the data set." Mean. What is p in your problem: $\delta Y_i, \delta X_i = \delta Y_i$, $\Delta B_{ij} = \delta b_i$, or what? (b) The fit, that I did, of the point data from Table 1 yields $\beta = (0.150252, -0.145231, 0.108877, 0.252976)$, Which is quite different from what is reported on line 246? This means that the reader cannot reproduce the presented results. (c) Although it is not clear what parametric system the authors solve, we can compare the results presented in tables 2 and 3. – We see that the interval vector from Table 2 does not intersect any of the two vectors in Table 3, which means that the solution enclosure presented in Table 2 has nothing to do with the solution enclosures presented in Table 3. The solution enclosure, obtained by the nonparametric method from [20], is wider than the solution enclosure obtained by (4.6). See the review-remark (4c) above. Thus, the authors themselves confirm the inconsistency of the theoretical considerations in Section 4. As early as in 1983, (S. Rump, Solving Algebraic Problems with High Accuracy. In: Kulisch, U., Miranker W. (eds), A New Approach in Scientific Computation, Academic Press, 1983, 51–120.), Rump writes: since $T > T$ is generally ill-conditioned, solving the interval system $[B]\beta = [b]$ is "out of question" and proposes to solve an augmented interval system. This approach is improved in: Popova, E., Improved solution enclosures for over- and underdetermined interval linear systems, Lect. Notes in Computer Science 3743, 2006, 305–312. There are also other papers that discuss various aspects of interval least squares. No one is cited.	OK OK OK OK OK OK OK
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<u>Minor</u> REVISION comments	The language style is awful which makes the paper almost unreadable. The paper is abundant with mathematical technical errors and English errors. If I report all of them it would take more space than the paper itself. Almost every sentence on lines 22-37 should be accompanied by some references.	OK OK OK
<u>Optional/General</u> comments	In view of the severe methodological incorrectness of sections 4 and 5, due to which any repair would mean (in my opinion) a new research.	