

Process Capability Indices and Stress-Strength Models Relations

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We explore the possibility of combining ideas from two currently popular, though seemingly distinct, fields of study within the general topic of Statistical Quality Control. These are (i) Process Capability Indices (PCIs), and (ii) “Stress-Strength” models with particular attention to evaluation and estimation of the probability that “stress” (X) does not exceed “strength” (Y), i.e. “Pr [$Y < X$]” – a commonly used code-name for this class of studies.

The use of PCIs is motivated by a desire to have an index related to the probability that an attribute (Z) of a component (size, density, elastic strength, etc.) falls within fixed specification limits [sometimes the ‘specification interval’ is one-sided – e.g. ($-$,) or (, $+$) – and only a lower or upper limit is specified.]

However, in some circumstances it may be desired to have an ‘index’ allowing for possibly varying limits – T_L or T_U , say, for lower and upper limits respectively. We are then interested in Pr [$T_L < Z < T_U$]. If only one limit (T_L or T_U) is finite, we are back to the stress-strength model calculation of Pr [$Y < X$] type. The more complicated analysis for Pr [$T_L < Z < T_U$] has been considered by Singh(1980), but – to the best of our knowledge – there are few (if any) other articles of this kind in the “stress-strength” literature.

We plan to develop analyses covering less restricted situations than those in Singh (1980).

REFERENCE

Singh, N. (1980). On the estimation of Pr ($X_1 < Y < X_2$). *Commun. Statist. – Theory Meth.*, 9, 1551-1561.

RESUME

The title refers to two classes of indices, in the field of quality assurance, that, so far, have followed separate lines of development. This paper discusses possible advantages to be derived from merging these two lines of study.

Dans cet article, on examine les deux classes des indices qu'on trouve dans les études sur l'assurance de la qualité. On est arrivé à ces deux genres d'indices par deux voies différentes de raisonnement. On souligne les avantages à gagner par un rapprochement de ces deux genres des études.