# The Other Perspective on the Functional Chi-Square and the Possible Relationship with the Measure of Complete Dependence

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## Abstract

In this work, we mainly focus on the topic related to the specific kind of dependence called complete dependence (CD). Roughly speaking, a discrete random variable $Y$ is said to be completely dependent on a discrete random variable $X$ if and only if there is a function $f$ such that $\mathbb{P}(Y = f(X)) = 1$. Recently, Song and Zhang (2013) presented the concept of functional relationship based on Pearson's chi-square which possibly be related to the concept of complete dependence in some perspectives. Precisely, they proposed the new statistic for any contingency table, called the functional chi-square, which is defined by the difference between the sum of the Pearson's chi-square of the first variable over a fixed value of other variable and the Pearson's chi-square of the first variable. The functional chi-square can capture the functional relationship and determine which direction has a strong relationship. We clarify the possible relationship between these two concepts and then get some properties from the functional chi-square. From the alternative expression of the functional chi-square which we simplified from the original formula, we can show that the estimate of the functional chi-square is invariant under an injective function in each variable. Also, the examples which support such statement will be provided and some remarks and further work will be discussed.