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1.13 · Indian Institute of Technology Bombay



Anyone familiar with the Central Limit Theorem assumptions justification?

[Question](#)

Asked October 3, 2014

In the application of the Central Limit Theorem to sampling statistics, the key assumptions are that the samples are independent and identically distributed. How do you justify these assumptions (i.e. why are they likely to be true?)

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**Jochen Wilhelm** added an answer

October 3, 2014

Assumptions follow by logical reasoning from design issues. So it is the *design*, i.e. the way how the samples are obtained, what makes these assumptions reasonable.

NB: The CLT is not restricted to identically distributed values. It works for any combination of any distributions, as long as they have a finite variance. The

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[... Read more](#)**Stéphane Girard** added an answer

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October 4, 2014

The independence assumption is also important (if you sum n times the same measure, you will not obtain a Gaussian behavior). In practice, the knowledge of the sampling scheme can be sufficient to decide if the independence assumption holds.

**Deleted profile** Added an answer

2 Recommendations

October 6, 2014

Dear Ravi,

I would add one more reason (rather technical, but goes well with the statistical design): the i.i.d. hypothesis is the correct set-up for a CLT satisfied by the densities of the normalized sums, and one works easier with densities rather than general

[... Read more](#)**Emilio José Chaves** added an answer

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October 18, 2014

Ravi. The CLT holds for some predesigned distributions that assume central symmetry like normal distributions. So the conclusion is implicit in the main assumptions, and proving this tautology is easy. Another case is when you generate random numbers between two numbers, like 1 to 5; it will conduce to $U=3$, just in the middle of line.

[... Read more](#)**Jochen Wilhelm** added an answer

1 Recommendation

October 18, 2014

Emilio,

the first version of the CLT was valid only for i.i.d variables. This condition was relaxed in modern proofs of the CLT. The only restriction is that the variables have a finite variance (e.g. Cauchy-distributed variables are out). So there is no tautology.


[... Read more](#)**Emilio José Chaves** added an answer

October 18, 2014

Jochen,

In the given non-linear example ($Y=1-0.2 \cdot X^2$) variable Y is the phenomenon measured and asumed as perfect CDF for descending data of Y. X is its cummulative frequency

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1 Recommendation



Emilio José Chaves added an answer

October 19, 2014

Fausto,

I agree that ""Symmetry"" of the "density" (of the Random Variables) is not very important.... as $n \rightarrow \infty$." but would add that even if N is not big (less than 20)." That is important because it means that most statistical texts and teachers may

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Andriy Olenko added an answer

December 29, 2014

Another approach is when one considers the problem in the context of time series analysis. In the theory of time series researchers need to estimate and test hypothesis about the mean of an original stationary time series or the mean of some transformations of non-stationary time series. Therefore CLT-type results are very important.

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Sandipan Dey

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