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1. The variance of a set of data is defined by

Where the mean is defined by

The formula is impractical to feed data and compute variance as you go along.

1. To allow continuous updating, some calculators use the formula

show that (1) is algebraically equivalent to (2) and explain how it makes continuous updating possible.( Hint: consider the minimum number of values that need to be stored.)

1. Discuss the rounding error properties of the two algorithms. In particular, the calculator formula (2) can give a meaningless result.

Explain.

Answer:

a)

Which shows that the (1) and (2) is algebraically equivalent.

If we add a new

=

We can see from the above formula, the minimum number of values we need to be stored is m, n, and 

b)

The rounding error of the first formula is mainly that if some xi is far from the m and some xi are close to m, then the small value may be omitted due to the limit of the number of the significant digit.

For the Second formula, the error maybe occur when the xi become very large. So the xi square may overflow.

It is also the reason that the second formula can give a meaningless result. Since xi is easy to become large.

1. In a paper in the journal of Money, Credit and banking, a vice president of a federal reserve bank argued that rounding error in the official Consumer Price Index ( CPI) significantly affects the computation of the inflation rate u, The inflation rate is computed from the CPI, currently around 200, by

To determine if the rate is sensitive to rounding errors, we will derive a condition number for the calculation. To start, show that the condition number for the computation of the function

can be written as

if the CPI is reported to one decimal place, how many significant digits would you expect to lose in the computational of the inflation rate?

Answer:

, Since 

Then:





From the problem, we know that 

Then: 

So: 

 are both around 200 and CPI is reported to one decimal:



So normally, there will be 3 digits to lose in the computation of inflation rate. However, in the extreme situation, there will be at most 4 digits to lose.