Spreadsheet MOVER-R.
Confidence interval for the ratio of two independently estimated quantities.

This spreadsheet starts with confidence intervals for two quantities theta1 and theta2.
It calculates a confidence interval for the ratio theta1/theta2 using the MOVER-R algorithm.
Reference: Newcombe, Statistical Methods in Medical Research, 2013.
The algorithm assumes that the quantities theta1 and theta2 are estimated independently.
This will be true if the two estimates are derived from separate studies.
Or if they come from two independent groups of individuals within the same study.
For example, treatment groups A and B, or males and females.

The algorithm assumes that the same confidence level applies to the intervals for theta1 and theta2.
This confidence level then applies to the ratio theta1/theta2.

The algorithm requires that theta2 and its confidence limits must be strictly positive.
theta1 and its confidence limits may be positive or negative.
theta1 and theta2 may represent continuous or binary data.

E.g. theta1 and theta2 could be means of the same strictly positive continuous variable in 2 different groups.

The algorithm may also be used to get an interval for the product of two quantities, theta1 * theta3.
This is done by letting theta2 = 1/theta3.
Let L3 and U3 denote the lower and upper limits for theta3.
L2 = 1/U3 and U2 = 1/L3 are then used as the lower and upper limits for theta2.
It is essential to input these limits in the correct order.
As an example derived from binary data with theta1 not necessarily positive:
Let theta1 denote the relative risk minus 1.
If RR>1, theta1>0; if RR<1, theta1<0.
Let theta2 the reciprocal of the baseline risk, from a separate study.
Then theta1/theta2 represents the absolute risk difference.
The exemplar dataset represents this situation with BR 0.04 (0.016 to 0.1) and RR 1.3 (1.04-1.625).
Intervals for variables derived from binary data should be calculated by boundary-respecting methods.

The algorithm checks data validity as follows.
For theta2, all input values must be strictly positive.
For theta1, they may be either positive or negative.
Both variables must satisfy the conditions lower limit <= estimate <= upper limit.
Error codes are returned for the confidence limits if these conditions are violated.

Depending on the context of application, the user should also check whether
(a) the input values - point estimates and confidence limits for theta1 and theta2
(b) the calculated point estimate and confidence limits for theta1/theta2
lie within the relevant ranges for validity.

To perform these calculations, replace values in **bold** as appropriate.

Input data:	Estimate	Lower limit	Upper limit
Theta1	**0.3**	**0.04**	**0.625**
Theta2	**25**	**10**	**62.5**
Input data validity check	TRUE		
Results:			
Theta1/Theta2	0.012000	0.001392	0.038514