How to Use the Excel NormS Functions Spreadsheet.

The Gaussian Standard Normal Distribution is shown in blue. The function that generates this curve is Standardized so that the total area under the curve equal is to 1, making the curve suitable to use as a probability distribution function (PDF).

The curve shown has mean 0 and its standard deviation equals 1.
For any value on the x axis (known as a z-score), the area under the curve to the left of that value is called the *cumulative probability* at that z-score.

Cumulative probability as a function of z-score is shown in red.

This spreadsheet shows, in Column C, for z-scores between -4 and 4 (99.9936% of all cases), the probability to the left of that z-score, called the *cumulative probability*. The Excel function that generates cumulative probability from a z-score (z) is NORMSDIST(z). The probability to the right of the z-score, (one minus the cumulative probability) is given in Column D.

It is also easy to convert a cumulative probability (p) into a z-score. This Excel function, the inverse of the NORMSDIST function, is called NORMSINV, and is shown in Column E.

Solving problems.

Example 1. To determine how probable is that an event drawn from a Gaussian Standard Normal Distribution is more than two standard deviations below the mean, calculate NORMSDIST(-2). The answer is the cumulative probability p = .023, or 2.3%. [Cell C32] The probability that an event is *not* more than two standard deviations below the mean, is one minus the cumulative probability, .977 or 97.7%. [Cell D32].

Example 2. Assume the average high school teacher in the U.S. is paid $28,000, with standard deviation = $3,000. What is the probability that a U.S. high school teacher is paid between $25,000 and $31,000?

Answer: First, convert the low end of the interval, $25,000, to a Z-Score. Z = ($25,000 – $28,000)/$3,000 = -1. The area under the curve to the left of -1 is .159. [Cell C42] There is a 15.9% chance that a teacher is paid less than $25,000. Next, convert the high end of the interval to a z-score. z = ($31,000 - $28,000)/ $3,000 = 1. The cumulative probability at z = 1 is .841 [Cell C62] area under the curve to the *right* of z = 1 is (1- .841) = .159. [Cell D62]. There is a 15.9% chance that a teacher is paid more than $31,000. Therefore the probability that a teacher is paid more than $25,000 and less than $31,000 is 1 – (.159 + .159) = 1 – (.318) = .682, or 68.2%.