

A Least Squares Estimation Method for Exact Numerical Data in the Analytic Hierarchy Process

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Abstract

The Analytic Hierarchy Process (AHP) has found its way into various areas of decision making. Decision analysis using the AHP involves four steps: setting up the decision hierarchy, collecting input data, using an estimation method to estimate the relative weights of decision elements, and arriving at a set of ratings for the decision alternatives. The AHP provides a systematic way to make a decision. In this paper, we are concerned with cases where exact numerical data with which to compare the decision elements are known and ratios between numerical values can be used to derive estimates of their relative importance. Our purpose is to find the relative weight of the decision elements that will best reflect the data. The most important criterion that must be considered with exact numerical data is the minimized sum of squares errors. We perform least squares estimation to find an estimator of relative weights and then construct a consistency index for the least squares estimation method to determine the goodness of fit of the estimator. We then illustrate the application of this procedure by using it to analyze several financial stocks in order to determine which is the most promising investment.

Keywords: Analytic Hierarchy Process, Least Squares Estimation, Consistency Index.