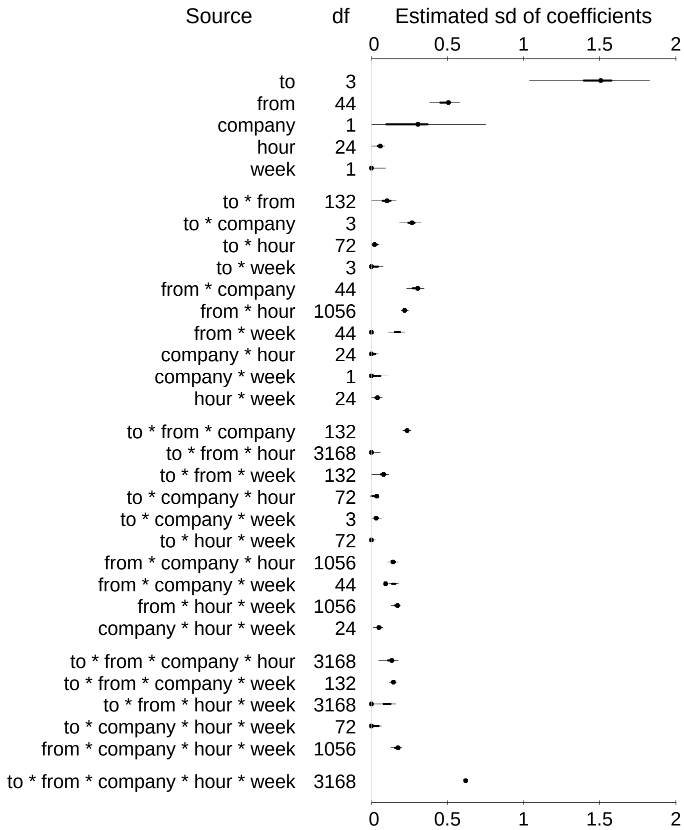

Figure 22.2 *ANOVA display for the World Wide Web data. The bars indicate 50% and 95% intervals for the finite-population standard deviations s_m. The display makes apparent the magnitudes and uncertainties of the different components of variation. Since the data are on the logarithmic scale, the standard-deviation parameters can be interpreted directly. For example, $s_m = 0.20$ corresponds to a coefficient of variation of* $\exp(0.2) - 1 \approx 0.2$ *on the original scale, and so the exponentiated coefficients* $\exp(\beta_j^{(m)})$ *in this batch correspond to multiplicative increases or decreases in the range of 20%. (The dots on the bars show simple classical estimates of the variance components that were used as starting points in the multilevel analysis.)*

22.3 Summarizing multilevel models using ANOVA

It can be helpful to graph the estimates of variance components, especially for complex data structures with many levels of variation. In basic multilevel models (that is, the models covered in this book), each variance parameter corresponds to a set of coefficients—for example, $y \sim \mathrm{N}(X\beta, \sigma_y^2)$, or $\alpha \sim \mathrm{N}(\mu_\alpha, \sigma_\alpha^2)$. As discussed in Section 21.2, the standard deviation of a set of coefficients gives a sense of their predictive importance in the model. An analysis-of-variance plot, which shows the relative scale of different variance components, can be a useful tool in understanding a model.

A five-way factorial analysis: internet connect times

We illustrate the analysis of variance with an example of a linear model fitted for exploratory purposes to a highly structured dataset.