Our JSPI paper (currently in press) and our JASMBI paper assume there are $k$ factors that can be varied independently in the unit hypercube $[-1,1]^k$. The analysis in the paper uses orthonormal polynomials defined with respect to a uniform measure on the hypercube. The polynomials are derived by requiring orthogonality to all lower-degree terms and then by requiring that the integral of the square of the polynomial, on $[-1,1]^k$, equals 1. Note that the final requirement results in polynomials whose coefficients are functions of $k$, the number of factors. The polynomials used in the paper are listed here.

Constant Term:

$$\frac{1}{2^{k/2}}$$

Linear Terms in Each Factor:

$$\left(\frac{3}{2^k}\right)^{1/2} X_i$$

Pure Quadratic Terms in Each Factor:

$$\left(\frac{45/4}{2^k}\right)^{1/2} (X_i^2 - 1/3)$$

Two-factor Linear by Linear Interactions

$$\left(\frac{9}{2^k}\right)^{1/2} X_i X_j$$

Pure Cubic Terms in Each Factor

$$\left(\frac{175/4}{2^k}\right)^{1/2} (X_i^3 - \frac{3}{5}X_i)$$

Pure Quartic Terms in Each Factor

$$\left(\frac{11025/64}{2^k}\right)^{1/2} (X_i^4 - \frac{6}{7}(X_i^2 - 1/3) - 1/5)$$