For example, if the effect size is the same, the sample size for a study with 95% power and 1% type I error rate is 2.3 times the sample size for the same study with 80% power and a 5% type I error rate. This can be represented visually through the use of power curves. Power curves are just line graphs of the values of the sample size per treatment relative to power $(1-\beta)$ for the varying values of α for a given effect size. These curves are very useful when trying to visualize the differences in sample size and power for various assumptions. Fig. 10.1 represents the power curves for Example 1 when mimicking the values of α and β used in Table 10.2. Here, we see the sample size varies directly with changes to α and $1-\beta$ (power).

TABLE 10.4 Efficiency of Sample Size Relative to a Reference Study With $\alpha=0.05$ when $\beta=0.20$ When Effect Size Is Constant

	β (Type II Error)			
α (Type I Error)	**0.01**	**0.05**	**0.1**	**0.2**
0.01	3.1	2.3	1.9	1.5
0.02	2.8	2.0	1.7	1.3
0.05	2.4	1.7	1.3	1
0.1	2.0	1.4	1.1	0.8

X. CHANGING ASSUMPTIONS ABOUT THETA (θ)

In this section, changing assumptions about the population effect size, θ, are considered. Here, the study design parameters of α and β are considered constant, and only changes to θ are of interest. If two values of θ are possible, called θ_1 and θ_2, the sample sizes between the two scenarios can be represented as:

$$\frac{n_1}{n_2}=\frac{2(1/\theta_1)^2\left(z_{1-(\alpha/2)}+z_{1-\beta}\right)^2}{2(1/\theta_2)^2\left(z_{1-(\alpha/2)}+z_{1-\beta}\right)^2}$$

After reducing the fraction by removing common terms, the equation becomes:

$$\frac{n_1}{n_2}=\frac{(1/\theta_1)^2}{(1/\theta_2)^2}$$

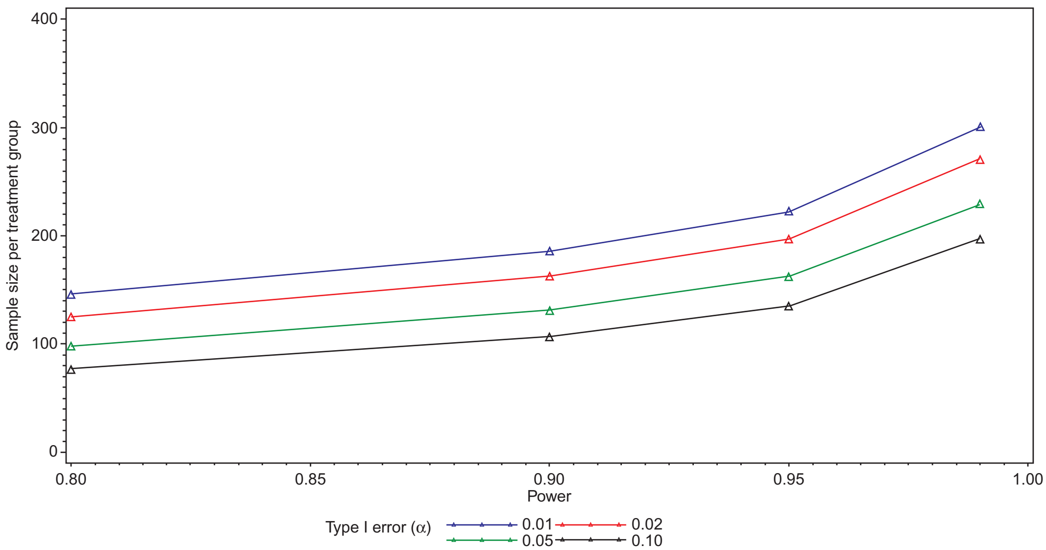

FIGURE 10.1 Power curves corresponding to Example 1.