Figure 1.2 shows SPSS commands to accomplish the analysis of variance of the data. The MANOVA specification defines Y to be the dependent variable and CAT and DRUG the factor variables with two and three levels respectively. Since only one dependent variable (Y) is indicated, a univariate analysis of variance is requested.

Figure 1.2

```
RUN NAME        A UNIVARIATE 2*3 EXAMPLE.
COMMENT         THE DATA ARE TAKEN FROM WINER(1971) PAGE 436.
                Y    : THE DEPENDENT VARIABLE.
                CAT  : FACTOR WITH 2 LEVELS.
                DRUG : FACTOR WITH 3 LEVELS.
VARIABLE LIST   CAT DRUG Y
INPUT FORMAT    FREEFIELD
INPUT MEDIUM    CARD
MANOVA          Y BY CAT(1,2) DRUG(1,3)/
READ INPUT DATA
1 1  8
1 1  4
1 1  0
1 2 10
1 2  8
1 2  6
1 3  8
1 3  6
1 3  4
2 1 14
2 1 10
2 1  6
2 2  4
2 2  2
2 2  0
2 3 15
2 3 12
2 3  9
END INPUT DATA
FINISH
```

The default model generated from the MANOVA specifications is a full factorial. For this example the model is

$$Y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \epsilon_{ijk}$$

where α_i is the main effect of category i, β_j is the main effect of drug j, and $(\alpha\beta)_{ij}$ is the interaction of patient category i and drug j. For the various tests, it is necessary to assume that the error terms, ϵ_{ijk}, are independently identically distributed as normal with mean 0 and variance σ^2.

1.3 Default Output

The default output (without any PRINT subcommand) from a MANOVA run includes

1 An analysis of variance (ANOVA) table. As shown in Figure 1.3a, it gives the sum of squares, degrees of freedom, mean square, *F* value, and the probabilities of each *F* value. The within-cells error term (default error-term if it exists) is used to obtain all the *F* values.

Figure 1.3a

TESTS OF SIGNIFICANCE FOR Y USING SEQUENTIAL SUMS OF SQUARES

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG. OF F
WITHIN CELLS	106.00000	12	8.83333		
CONSTANT	882.00000	1	882.00000	99.84906	0.0
CAT	18.00000	1	18.00000	2.03774	.179
DRUG	48.00000	2	24.00000	2.71698	.106
CAT BY DRUG	144.00000	2	72.00000	8.15094	.006

2 Statistics for parameter estimation (Figure 1.3b). These consist of estimates of the parameters (COEFF), the standard errors of the estimates (STD. ERR.), the t-value for testing that the parameter is zero, the two-tailed significance of the test, and 95% confidence intervals for the parameters. (Note that the parameters estimated here are not the original α_i, β_j, or $(\alpha\beta)_{ij}$; instead, contrasts of the parameters are estimated. See Section 1.52 for detailed information.)