

APPENDIX 21.1: EXPLANATION OF SAS SYNTAX FROM EXAMPLES

Example 1: SAS Code for Multilevel Binary Outcome Data

```
PROC GLIMMIX data=SASUSER.HighTech_
    GLMM COVTEST;
CLASS exchg;
MODEL hightech = rd_exp g_acq rd_exp*g_acq/
    solution link=logit dist = binomial
    ODDSRATIO;
RANDOM INTERCEPT /SUBJECT=exchg
    TYPE=VC;
run;
```

Explanation of SAS Syntax:

PROC GLIMMIX ← invokes the Generalized Linear Mixed Model procedure
 data = SASUSER.HighTech_GLMM ← specifies the input datafile
 COVTEST; ← requests z-tests for covariance (random) effects
 CLASS exchg; ← denotes our classification variable
 MODEL hightech = rd_exp g_acq rd_exp*g_acq ← describes the fixed-effects model as IVs = DVs, including the cross-level interaction between R & D expenditures (*rd_exp*) and gross acquisition expenses (*g_acq*)
 /solution ← requests fixed-effects significance tests
 link = logit ← specifies the link function
 dist = binomial ← specifies the distribution for the response variable
 ODDSRATIO; ← requests parameter estimates to be reported as Odds Ratios
 RANDOM ← indicates random effects will be specified
 INTERCEPT ← specifies the Intercept as a Random effect
 /SUBJECT=exchg ← indicates the level of the Random effects
 TYPE=VC; ← specifies variance components as the covariance structure

run; ← every PROC command must end with a RUN command

Example 2: SAS Code for Multilevel Count Outcome Data

```
PROC GLIMMIX data=SASUSER.PATENT_
    GLMM COVTEST;
CLASS sic2;
MODEL patents = intan_assets ind_mun
    intang_assets*ind_mun /solution link=log
    dist=negbinomial;
RANDOM INTERCEPT intan_assets/
    SUBJECT=sic2 TYPE=VC;
run;
```

Explanation of SAS Syntax:

PROC GLIMMIX ← invokes the Generalized Linear Mixed Model procedure
 data=SASUSER.PATENT_GLMM ← specifies the input datafile
 COVTEST; ← requests z-tests for covariance (random) effects
 CLASS sic2; ← denotes our classification variable
 MODEL patents = intan_assets ind_mun ← describes the fixed-effects model as IVs = DVs, intang_assets*ind_mun including the cross-level interaction between intangible assets (*intan_assets*) and industry munificence (*ind_mun*)
 /solution ← requests fixed-effects significance tests
 link=log ← specifies the link function
 dist=negbinomial; ← specifies the distribution for the response variable
 RANDOM ← indicates random effects will be specified
 INTERCEPT intan_assets ← specifies the Intercept and Intangible Assets (*intan_assets*) as Random effects
 /SUBJECT = sic2 ← indicates the level of the Random effects
 TYPE=VC; ← specifies the covariance structure as variance components
 run; ← every PROC command must end with a RUN command