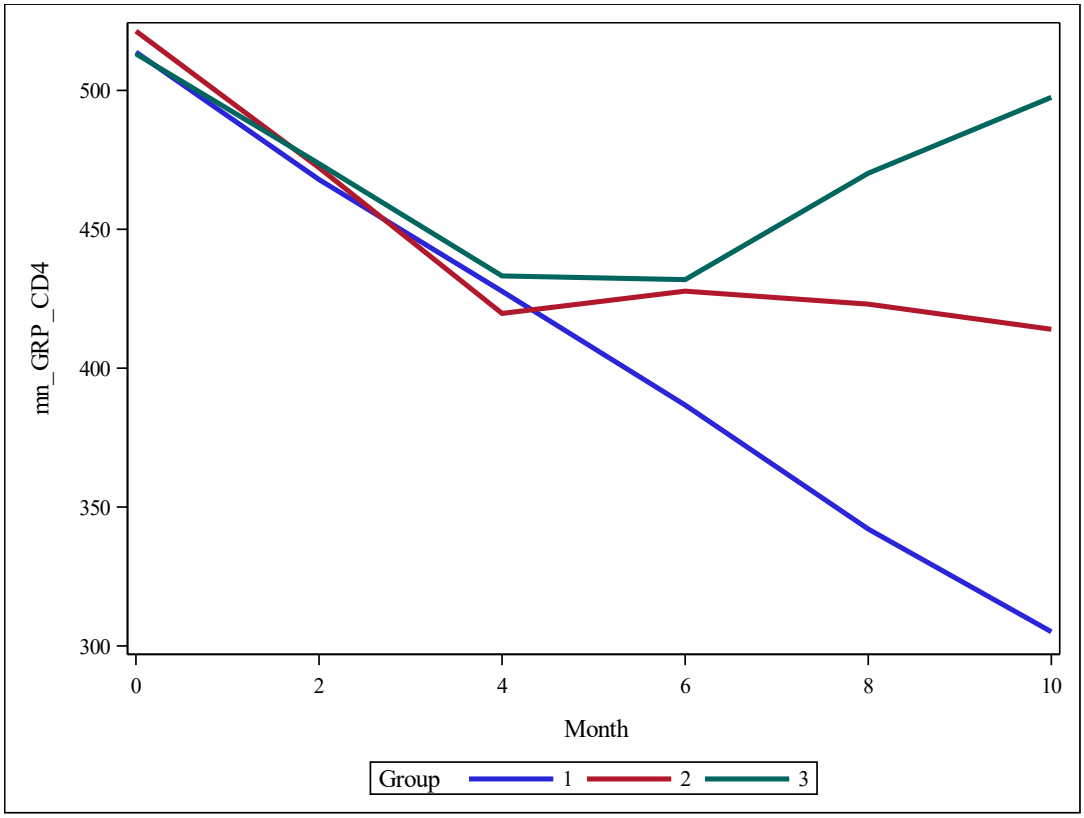
```
The datasets can be found at
http://www.biostat.jhsph.edu/~fdominic/teaching/LDA/lda.html under "DATA
SETS";

data hiv;
infile "C:\...\hivstudy.txt" dlm=tab;
input ID Month CD4 Group;
run;


ods rtf file="C:\...\Examples\09 - Profile and Parametric examples2.rtf";

proc print data = hiv (obs=10);
run;
```

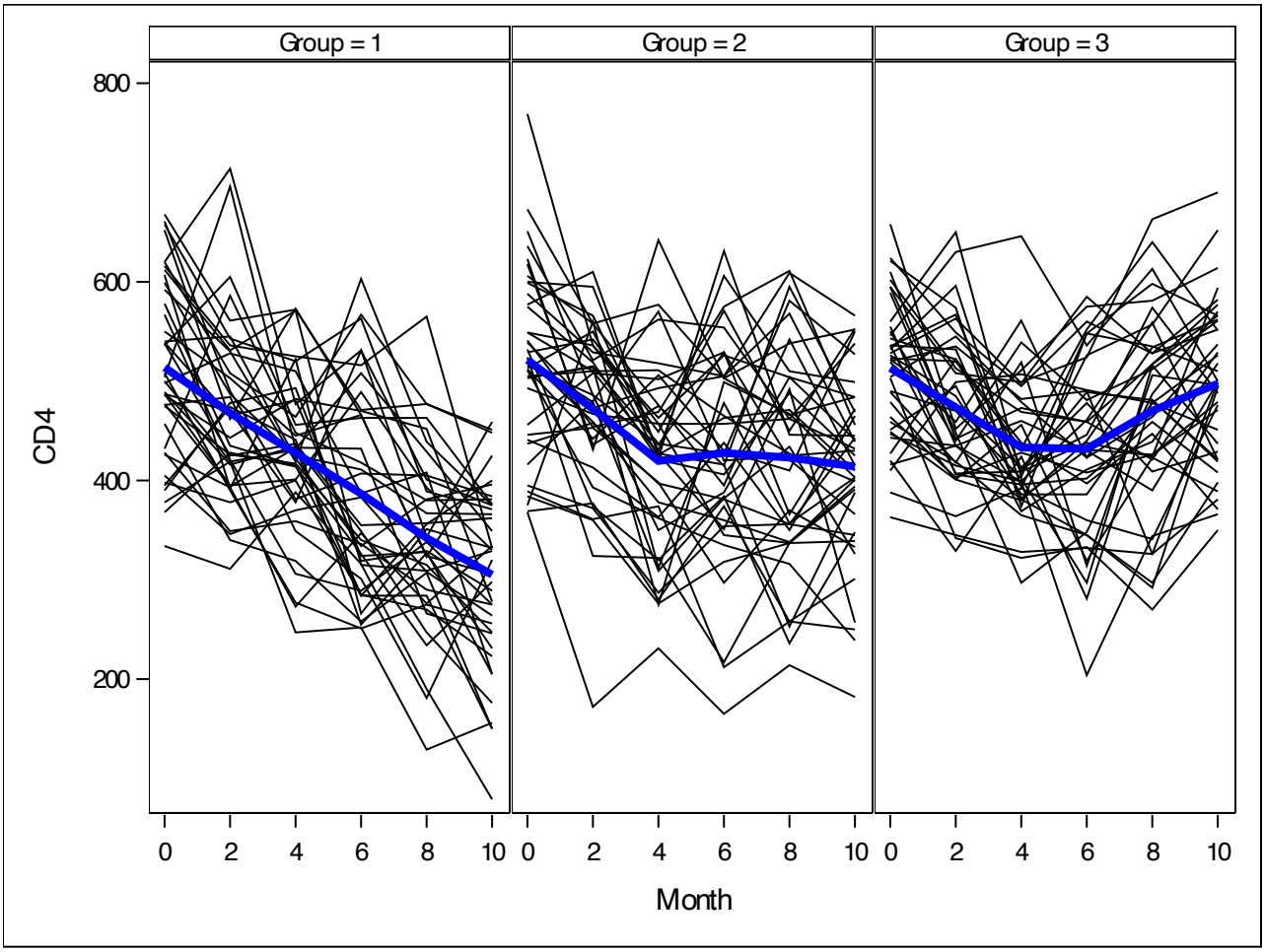
| Obs | ID | Month | CD4 | Group |
|---|---|---|---|---|
| 1 | 1 | 0 | 658 | 1 |
| 2 | 1 | 2 | 543 | 1 |
| 3 | 1 | 4 | 520 | 1 |
| 4 | 1 | 6 | 563 | 1 |
| 5 | 1 | 8 | 389 | 1 |
| 6 | 1 | 10 | 371 | 1 |
| 7 | 2 | 0 | 500 | 1 |
| 8 | 2 | 2 | 419 | 1 |
| 9 | 2 | 4 | 431 | 1 |
| 10 | 2 | 6 | 285 | 1 |

```
*Now we will include the mean line on the graph by TRT;
proc sort data=hiv;
by Group Month;

*Calculate the mean by week;
proc means mean data=hiv noprint;
by Group Month;
var CD4;
output out = MN_GRP_dat mean = mn_GRP_CD4;
run;

*First, let's look at the mean by TRT group;
Proc SGplot data = MN_GRP_dat;
series x=Month y=mn_GRP_CD4 / group =Group LineAttrs= (pattern=1
thickness=3);
```

```
run;
```




```
*We'll look at the means by TRT group with the rest of the data;
data stacked_hiv;
set hiv MN_GRP_dat;
run;


* Now we'll combine them onto one plot with two panels;
Proc SGpanel data = stacked_hiv;
PanelBy Group / columns=3;
series x=Month y=CD4 / group =ID LineAttrs= (pattern=1 color="black");
series x=Month y=mn_GRP_CD4 / LineAttrs= (pattern=1 color="blue"
thickness=4);
run;
```




```
data hiv_spline;
set hiv;
sp_mn1 = min(month,4);
sp_mn2 = max(0,month-4);
run;
```

```
proc mixed data=hiv_spline;
class ID group(ref='1');
model CD4 = group month sp_mn2 group*month group*sp_mn2/solution;
random intercept/ subject=ID type=UN g gcorr;
run;
```

| Estimated V Matrix for ID 1 | | | | | | |
|---|---|---|---|---|---|---|
| Row | Col1 | Col2 | Col3 | Col4 | Col5 | Col6 |
| 1 | 7932.96 | 4252.14 | 4252.14 | 4252.14 | 4252.14 | 4252.14 |
| 2 | 4252.14 | 7932.96 | 4252.14 | 4252.14 | 4252.14 | 4252.14 |
| 3 | 4252.14 | 4252.14 | 7932.96 | 4252.14 | 4252.14 | 4252.14 |
| 4 | 4252.14 | 4252.14 | 4252.14 | 7932.96 | 4252.14 | 4252.14 |

| Estimated V Matrix for ID 1 | | | | | | |
|---|---|---|---|---|---|---|
| Row | Col1 | Col2 | Col3 | Col4 | Col5 | Col6 |
| 5 | 4252.14 | 4252.14 | 4252.14 | 4252.14 | 7932.96 | 4252.14 |
| 6 | 4252.14 | 4252.14 | 4252.14 | 4252.14 | 4252.14 | 7932.96 |

| Estimated V Correlation Matrix for ID 1 | | | | | | |
|---|---|---|---|---|---|---|
| Row | Col1 | Col2 | Col3 | Col4 | Col5 | Col6 |
| 1 | 1.0000 | 0.5360 | 0.5360 | 0.5360 | 0.5360 | 0.5360 |
| 2 | 0.5360 | 1.0000 | 0.5360 | 0.5360 | 0.5360 | 0.5360 |
| 3 | 0.5360 | 0.5360 | 1.0000 | 0.5360 | 0.5360 | 0.5360 |
| 4 | 0.5360 | 0.5360 | 0.5360 | 1.0000 | 0.5360 | 0.5360 |
| 5 | 0.5360 | 0.5360 | 0.5360 | 0.5360 | 1.0000 | 0.5360 |
| 6 | 0.5360 | 0.5360 | 0.5360 | 0.5360 | 0.5360 | 1.0000 |

| Covariance Parameter Estimates | | | | | |
|---|---|---|---|---|---|
| Cov Parm | Subject | Estimate | Standard Error | Z Value | Pr > Z |
| UN(1,1) | ID | 4252.14 | 637.15 | 6.67 | <.0001 |
| Residual | | 3680.82 | 213.58 | 17.23 | <.0001 |

| Fit Statistics | |
|---|---|
| -2 Res Log Likelihood | 8153.7 |
| AIC (Smaller is Better) | 8157.7 |
| AICC (Smaller is Better) | 8157.7 |
| BIC (Smaller is Better) | 8163.3 |

```
proc mixed data=hiv_spline;
class ID group(ref='1');
model CD4 = group month sp_mn2 group*month group*sp_mn2/solution;
random intercept month/ subject=ID type=UN g gcorr;
run;
```

| Estimated G Matrix | | | | |
|---|---|---|---|---|
| Row | Effect | ID | Col1 | Col2 |
| 1 | Intercept | 1 | 3315.86 | 85.1966 |
| 2 | Month | 1 | 85.1966 | 3.7143 |

| Estimated G Correlation Matrix | | | | |
|---|---|---|---|---|
| Row | Effect | ID | Col1 | Col2 |
| 1 | Intercept | 1 | 1.0000 | 0.7677 |
| 2 | Month | 1 | 0.7677 | 1.0000 |

| Estimated V Matrix for ID 1 | | | | | | |
|---|---|---|---|---|---|---|
| Row | Col1 | Col2 | Col3 | Col4 | Col5 | Col6 |
| 1 | 6945.46 | 3486.25 | 3656.64 | 3827.04 | 3997.43 | 4167.82 |
| 2 | 3486.25 | 7301.10 | 3856.75 | 4042.00 | 4227.25 | 4412.50 |
| 3 | 3656.64 | 3856.75 | 7686.46 | 4256.97 | 4457.07 | 4657.18 |
| 4 | 3827.04 | 4042.00 | 4256.97 | 8101.53 | 4686.89 | 4901.86 |
| 5 | 3997.43 | 4227.25 | 4457.07 | 4686.89 | 8546.32 | 5146.54 |
| 6 | 4167.82 | 4412.50 | 4657.18 | 4901.86 | 5146.54 | 9020.82 |

| Estimated V Correlation Matrix for ID 1 | | | | | | |
|---|---|---|---|---|---|---|
| Row | Col1 | Col2 | Col3 | Col4 | Col5 | Col6 |
| 1 | 1.0000 | 0.4896 | 0.5005 | 0.5102 | 0.5188 | 0.5265 |
| 2 | 0.4896 | 1.0000 | 0.5148 | 0.5256 | 0.5351 | 0.5437 |
| 3 | 0.5005 | 0.5148 | 1.0000 | 0.5395 | 0.5499 | 0.5593 |
| 4 | 0.5102 | 0.5256 | 0.5395 | 1.0000 | 0.5633 | 0.5734 |
| 5 | 0.5188 | 0.5351 | 0.5499 | 0.5633 | 1.0000 | 0.5861 |
| 6 | 0.5265 | 0.5437 | 0.5593 | 0.5734 | 0.5861 | 1.0000 |

| Covariance Parameter Estimates | | | | | |
|---|---|---|---|---|---|
| Cov Parm | Subject | Estimate | Standard Error | Z Value | Pr Z |
| UN(1,1) | ID | 3315.86 | 693.12 | 4.78 | <.0001 |
| UN(2,1) | ID | 85.1966 | 54.9406 | 1.55 | 0.1210 |
| UN(2,2) | ID | 3.7143 | 8.0032 | 0.46 | 0.3213 |
| Residual | | 3629.60 | 235.03 | 15.44 | <.0001 |

| Fit Statistics | |
|---|---|
| -2 Res Log Likelihood | 8148.7 |
| AIC (Smaller is Better) | 8156.7 |
| AICC (Smaller is Better) | 8156.8 |
| BIC (Smaller is Better) | 8167.9 |

```
proc mixed data=hiv_spline;
class ID group(ref='1');
model CD4 = group month sp_mn2 group*month group*sp_mn2/solution;
random intercept month sp_mn2/ subject=ID type=UN g gcorr;
run;
```

**Estimated G Matrix**

| Row | Effect | ID | Col1 | Col2 | Col3 |
|---|---|---|---|---|---|
| 1 | Intercept | 1 | 3450.37 | 46.6611 | 71.0062 |
| 2 | Month | 1 | 46.6611 | 9.1407 | -15.5416 |
| 3 | sp_mn2 | 1 | 71.0062 | -15.5416 | 37.1470 |

**Estimated G Correlation Matrix**

| Row | Effect | ID | Col1 | Col2 | Col3 |
|---|---|---|---|---|---|
| 1 | Intercept | 1 | 1.0000 | 0.2627 | 0.1983 |
| 2 | Month | 1 | 0.2627 | 1.0000 | -0.8434 |
| 3 | sp_mn2 | 1 | 0.1983 | -0.8434 | 1.0000 |

**Estimated V Matrix for ID 1**

| Row | Col1 | Col2 | Col3 | Col4 | Col5 | Col6 |
|---|---|---|---|---|---|---|
| 1 | 7040.40 | 3543.69 | 3637.01 | 3872.35 | 4107.68 | 4343.01 |
| 2 | 3543.69 | 7263.61 | 3803.46 | 4013.19 | 4222.92 | 4432.65 |
| 3 | 3637.01 | 3803.46 | 7559.94 | 4154.03 | 4338.16 | 4522.29 |
| 4 | 3872.35 | 4013.19 | 4154.03 | 7989.01 | 4643.92 | 4888.87 |
| 5 | 4107.68 | 4222.92 | 4338.16 | 4643.92 | 8539.72 | 5255.45 |
| 6 | 4343.01 | 4432.65 | 4522.29 | 4888.87 | 5255.45 | 9212.07 |

**Estimated V Correlation Matrix for ID 1**

| Row | Col1 | Col2 | Col3 | Col4 | Col5 | Col6 |
|---|---|---|---|---|---|---|
| 1 | 1.0000 | 0.4955 | 0.4985 | 0.5163 | 0.5298 | 0.5393 |
| 2 | 0.4955 | 1.0000 | 0.5133 | 0.5268 | 0.5362 | 0.5419 |
| 3 | 0.4985 | 0.5133 | 1.0000 | 0.5345 | 0.5399 | 0.5419 |
| 4 | 0.5163 | 0.5268 | 0.5345 | 1.0000 | 0.5622 | 0.5699 |
| 5 | 0.5298 | 0.5362 | 0.5399 | 0.5622 | 1.0000 | 0.5925 |
| 6 | 0.5393 | 0.5419 | 0.5419 | 0.5699 | 0.5925 | 1.0000 |

| Covariance Parameter Estimates | | | | | |
|---|---|---|---|---|---|
| Cov Parm | Subject | Estimate | Standard Error | Z Value | Pr Z |
| UN(1,1) | ID | 3450.37 | 866.70 | 3.98 | <.0001 |
| UN(2,1) | ID | 46.6611 | 175.33 | 0.27 | 0.7901 |
| UN(2,2) | ID | 9.1407 | 57.9141 | 0.16 | 0.4373 |
| UN(3,1) | ID | 71.0062 | 247.20 | 0.29 | 0.7739 |
| UN(3,2) | ID | -15.5416 | 82.4936 | -0.19 | 0.8506 |
| UN(3,3) | ID | 37.1470 | 128.65 | 0.29 | 0.3864 |
| Residual | | 3590.03 | 267.59 | 13.42 | <.0001 |

| Fit Statistics | |
|---|---|
| -2 Res Log Likelihood | 8148.4 |
| AIC (Smaller is Better) | 8162.4 |
| AICC (Smaller is Better) | 8162.5 |
| BIC (Smaller is Better) | 8181.9 |

```
proc mixed data=hiv_spline method=ml;
class ID group(ref='1');
model CD4 = group month sp_mn2 group*month group*sp_mn2/solution;
random intercept/ subject=ID type=UN g gcorr;
run;
```

| Fit Statistics | |
|---|---|
| -2 Log Likelihood | 8194.5 |
| AIC (Smaller is Better) | 8216.5 |
| AICC (Smaller is Better) | 8216.9 |
| BIC (Smaller is Better) | 8247.2 |

```
proc mixed data=hiv_spline  method=ml;
class ID month group(ref='1');
model CD4 = group month group*month /solution;
random intercept/ subject=ID type=UN g gcorr;
run;
```

| Fit Statistics | |
|---|---|
| -2 Log Likelihood | 8189.6 |
| AIC (Smaller is Better) | 8229.6 |
| AICC (Smaller is Better) | 8230.8 |
| BIC (Smaller is Better) | 8285.4 |

```
proc mixed data=hiv_spline;
class ID month group(ref='1');
model CD4 = group month group*month /solution;
random intercept/ subject=ID type=UN g gcorr;
run;
```

| Estimated V Matrix for ID 1 | | | | | | |
|---|---|---|---|---|---|---|
| Row | Col1 | Col2 | Col3 | Col4 | Col5 | Col6 |
| 1 | 7954.81 | 4247.77 | 4247.77 | 4247.77 | 4247.77 | 4247.77 |
| 2 | 4247.77 | 7954.81 | 4247.77 | 4247.77 | 4247.77 | 4247.77 |
| 3 | 4247.77 | 4247.77 | 7954.81 | 4247.77 | 4247.77 | 4247.77 |
| 4 | 4247.77 | 4247.77 | 4247.77 | 7954.81 | 4247.77 | 4247.77 |
| 5 | 4247.77 | 4247.77 | 4247.77 | 4247.77 | 7954.81 | 4247.77 |
| 6 | 4247.77 | 4247.77 | 4247.77 | 4247.77 | 4247.77 | 7954.81 |

| Estimated V Correlation Matrix for ID 1 | | | | | | |
|---|---|---|---|---|---|---|
| Row | Col1 | Col2 | Col3 | Col4 | Col5 | Col6 |
| 1 | 1.0000 | 0.5340 | 0.5340 | 0.5340 | 0.5340 | 0.5340 |
| 2 | 0.5340 | 1.0000 | 0.5340 | 0.5340 | 0.5340 | 0.5340 |
| 3 | 0.5340 | 0.5340 | 1.0000 | 0.5340 | 0.5340 | 0.5340 |
| 4 | 0.5340 | 0.5340 | 0.5340 | 1.0000 | 0.5340 | 0.5340 |
| 5 | 0.5340 | 0.5340 | 0.5340 | 0.5340 | 1.0000 | 0.5340 |
| 6 | 0.5340 | 0.5340 | 0.5340 | 0.5340 | 0.5340 | 1.0000 |

| Covariance Parameter Estimates | | |
|---|---|---|
| Cov Parm | Subject | Estimate |
| UN(1,1) | ID | 4247.77 |
| Residual | | 3707.04 |

| Fit Statistics | |
|---|---|
| -2 Res Log Likelihood | 8069.1 |
| AIC (Smaller is Better) | 8073.1 |
| AICC (Smaller is Better) | 8073.1 |
| BIC (Smaller is Better) | 8078.6 |

```
proc mixed data=hiv_spline;
class ID month group(ref='1');
model CD4 = group month group*month /solution;
repeated month/ subject=ID type=CSH r rcorr;
run;
```

| Estimated R Matrix for ID 1 | | | | | | |
|---|---|---|---|---|---|---|
| **Row** | **Col1** | **Col2** | **Col3** | **Col4** | **Col5** | **Col6** |
| **1** | 7311.02 | 3829.84 | 3840.99 | 4434.63 | 4322.16 | 4003.54 |
| **2** | 3829.84 | 7041.51 | 3769.53 | 4352.12 | 4241.75 | 3929.05 |
| **3** | 3840.99 | 3769.53 | 7082.56 | 4364.79 | 4254.09 | 3940.49 |
| **4** | 4434.63 | 4352.12 | 4364.79 | 9441.01 | 4911.58 | 4549.50 |
| **5** | 4322.16 | 4241.75 | 4254.09 | 4911.58 | 8968.22 | 4434.12 |
| **6** | 4003.54 | 3929.05 | 3940.49 | 4549.50 | 4434.12 | 7694.70 |

| Estimated R Correlation Matrix for ID 1 | | | | | | |
|---|---|---|---|---|---|---|
| **Row** | **Col1** | **Col2** | **Col3** | **Col4** | **Col5** | **Col6** |
| **1** | 1.0000 | 0.5338 | 0.5338 | 0.5338 | 0.5338 | 0.5338 |
| **2** | 0.5338 | 1.0000 | 0.5338 | 0.5338 | 0.5338 | 0.5338 |
| **3** | 0.5338 | 0.5338 | 1.0000 | 0.5338 | 0.5338 | 0.5338 |
| **4** | 0.5338 | 0.5338 | 0.5338 | 1.0000 | 0.5338 | 0.5338 |
| **5** | 0.5338 | 0.5338 | 0.5338 | 0.5338 | 1.0000 | 0.5338 |
| **6** | 0.5338 | 0.5338 | 0.5338 | 0.5338 | 0.5338 | 1.0000 |

| Covariance Parameter Estimates | | |
|---|---|---|
| **Cov Parm** | **Subject** | **Estimate** |
| **Var(1)** | ID | 7311.02 |
| **Var(2)** | ID | 7041.51 |
| **Var(3)** | ID | 7082.56 |
| **Var(4)** | ID | 9441.01 |
| **Var(5)** | ID | 8968.22 |
| **Var(6)** | ID | 7694.70 |
| **CSH** | ID | 0.5338 |

| Fit Statistics | |
|---|---|
| **-2 Res Log Likelihood** | 8061.8 |
| **AIC (Smaller is Better)** | 8075.8 |
| **AICC (Smaller is Better)** | 8076.0 |
| **BIC (Smaller is Better)** | 8095.3 |

If we have good motivation for the spline term at 4 months, I would use the spline model. If there wasn't motivation for the spline term, I would use the profile analysis.

```
proc mixed data=hiv_spline;
class ID group(ref='1');
model CD4 = group month sp_mn2 group*month group*sp_mn2/solution;
random intercept month/ subject=ID type=UN g gcorr;
run;
```

| Model Information | |
|---|---|
| **Data Set** | WORK.HIV_SPLINE |
| **Dependent Variable** | CD4 |
| **Covariance Structure** | Unstructured |
| **Subject Effect** | ID |
| **Estimation Method** | REML |
| **Residual Variance Method** | Profile |
| **Fixed Effects SE Method** | Model-Based |
| **Degrees of Freedom Method** | Containment |

| Class Level Information | | |
|---|---|---|
| **Class** | **Levels** | **Values** |
| **ID** | 120 | 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 |
| **Group** | 3 | 2 3 1 |

| Dimensions | |
|---|---|
| **Covariance Parameters** | 4 |
| **Columns in X** | 12 |
| **Columns in Z per Subject** | 2 |
| **Subjects** | 120 |
| **Max Obs per Subject** | 6 |

| Number of Observations | |
|---|---|
| **Number of Observations Read** | 720 |
| **Number of Observations Used** | 720 |
| **Number of Observations Not Used** | 0 |

| Iteration History | | | |
|---|---|---|---|
| **Iteration** | **Evaluations** | **-2 Res Log Like** | **Criterion** |
| **0** | 1 | 8452.53002008 | |
| **1** | 1 | 8148.70194016 | 0.00000000 |

Convergence criteria met.

| Estimated G Matrix | | | | |
|---|---|---|---|---|
| **Row** | **Effect** | **ID** | **Col1** | **Col2** |
| **1** | Intercept | 1 | 3315.86 | 85.1966 |
| **2** | Month | 1 | 85.1966 | 3.7143 |

| Estimated G Correlation Matrix | | | | |
|---|---|---|---|---|
| **Row** | **Effect** | **ID** | **Col1** | **Col2** |
| **1** | Intercept | 1 | 1.0000 | 0.7677 |
| **2** | Month | 1 | 0.7677 | 1.0000 |

| Estimated V Matrix for ID 1 | | | | | | |
|---|---|---|---|---|---|---|
| **Row** | **Col1** | **Col2** | **Col3** | **Col4** | **Col5** | **Col6** |
| **1** | 6945.46 | 3486.25 | 3656.64 | 3827.04 | 3997.43 | 4167.82 |
| **2** | 3486.25 | 7301.10 | 3856.75 | 4042.00 | 4227.25 | 4412.50 |
| **3** | 3656.64 | 3856.75 | 7686.46 | 4256.97 | 4457.07 | 4657.18 |
| **4** | 3827.04 | 4042.00 | 4256.97 | 8101.53 | 4686.89 | 4901.86 |
| **5** | 3997.43 | 4227.25 | 4457.07 | 4686.89 | 8546.32 | 5146.54 |
| **6** | 4167.82 | 4412.50 | 4657.18 | 4901.86 | 5146.54 | 9020.82 |

| Estimated V Correlation Matrix for ID 1 | | | | | | |
|---|---|---|---|---|---|---|
| **Row** | **Col1** | **Col2** | **Col3** | **Col4** | **Col5** | **Col6** |
| **1** | 1.0000 | 0.4896 | 0.5005 | 0.5102 | 0.5188 | 0.5265 |
| **2** | 0.4896 | 1.0000 | 0.5148 | 0.5256 | 0.5351 | 0.5437 |
| **3** | 0.5005 | 0.5148 | 1.0000 | 0.5395 | 0.5499 | 0.5593 |
| **4** | 0.5102 | 0.5256 | 0.5395 | 1.0000 | 0.5633 | 0.5734 |
| **5** | 0.5188 | 0.5351 | 0.5499 | 0.5633 | 1.0000 | 0.5861 |
| **6** | 0.5265 | 0.5437 | 0.5593 | 0.5734 | 0.5861 | 1.0000 |

| Covariance Parameter Estimates | | | | | |
|---|---|---|---|---|---|
| Cov Parm | Subject | Estimate | Standard Error | Z Value | Pr Z |
| UN(1,1) | ID | 3315.86 | 693.12 | 4.78 | <.0001 |
| UN(2,1) | ID | 85.1966 | 54.9406 | 1.55 | 0.1210 |
| UN(2,2) | ID | 3.7143 | 8.0032 | 0.46 | 0.3213 |
| Residual | | 3629.60 | 235.03 | 15.44 | <.0001 |

| Fit Statistics | |
|---|---|
| -2 Res Log Likelihood | 8148.7 |
| AIC (Smaller is Better) | 8156.7 |
| AICC (Smaller is Better) | 8156.8 |
| BIC (Smaller is Better) | 8167.9 |

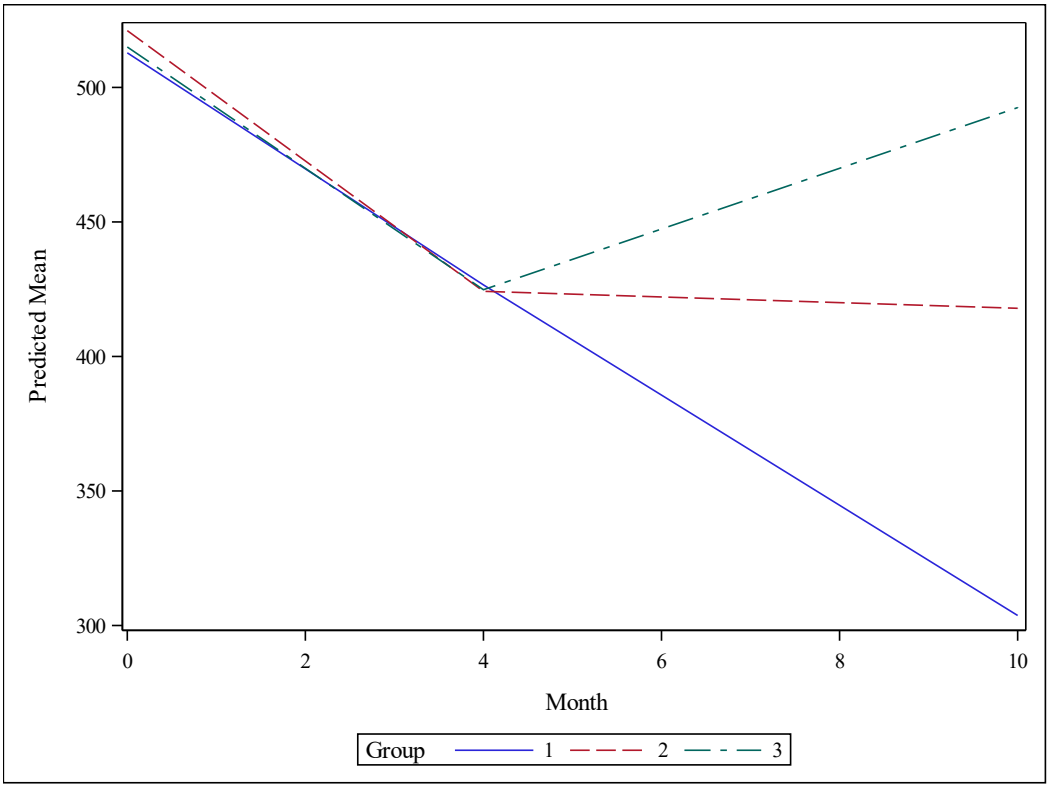
| Null Model Likelihood Ratio Test | | |
|---|---|---|
| DF | Chi-Square | Pr > ChiSq |
| 3 | 303.83 | <.0001 |

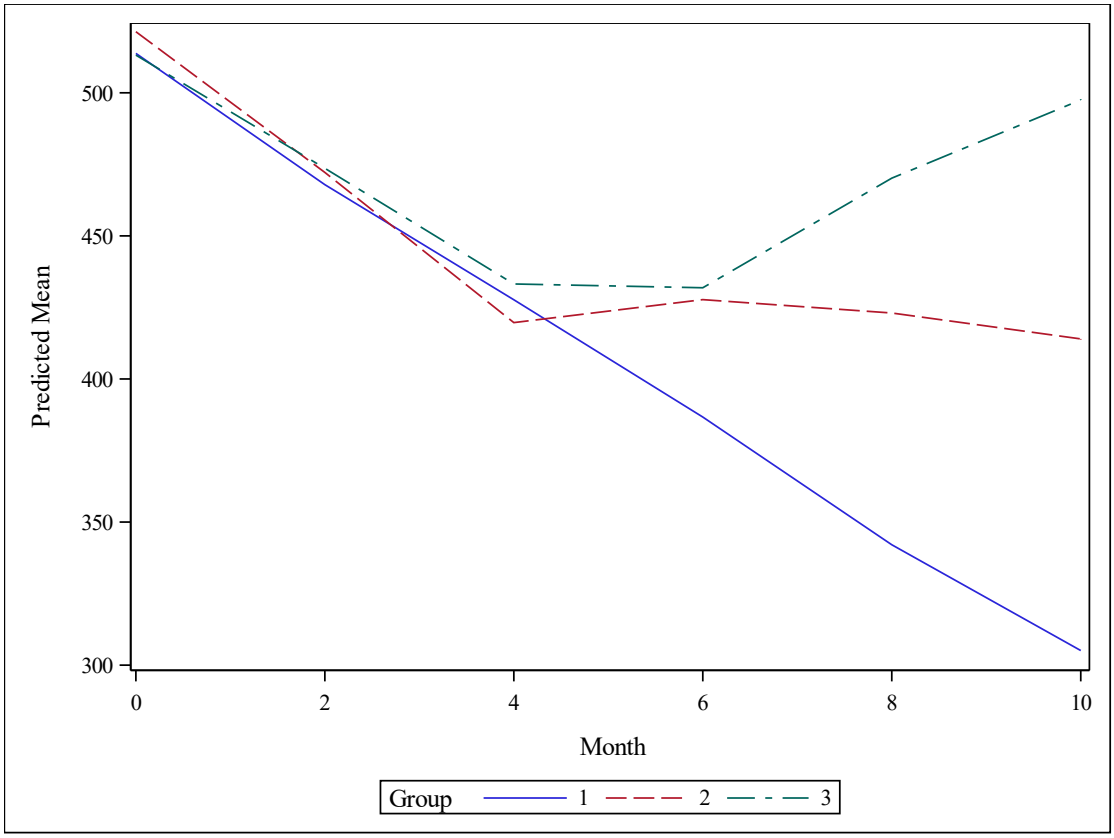
| Solution for Fixed Effects | | | | | | |
|---|---|---|---|---|---|---|
| Effect | Group | Estimate | Standard Error | DF | t Value | Pr > \|t\| |
| Intercept | | 512.86 | 12.5586 | 117 | 40.84 | <.0001 |
| Group | 2 | 8.2469 | 17.7605 | 477 | 0.46 | 0.6426 |
| Group | 3 | 2.1689 | 17.7605 | 477 | 0.12 | 0.9029 |
| Group | 1 | 0 | . | . | . | . |
| Month | | -21.5651 | 3.1056 | 117 | -6.94 | <.0001 |
| sp_mn2 | | 1.0849 | 4.5710 | 477 | 0.24 | 0.8125 |
| Month*Group | 2 | -2.6579 | 4.3919 | 477 | -0.61 | 0.5453 |
| Month*Group | 3 | -0.9908 | 4.3919 | 477 | -0.23 | 0.8216 |
| Month*Group | 1 | 0 | . | . | . | . |
| sp_mn2*Group | 2 | 22.0859 | 6.4644 | 477 | 3.42 | 0.0007 |
| sp_mn2*Group | 3 | 32.7530 | 6.4644 | 477 | 5.07 | <.0001 |
| sp_mn2*Group | 1 | 0 | . | . | . | . |

| Type 3 Tests of Fixed Effects | | | | |
|---|---|---|---|---|
| Effect | Num DF | Den DF | F Value | Pr > F |
| Group | 2 | 477 | 0.12 | 0.8906 |
| Month | 1 | 117 | 161.44 | <.0001 |
| sp_mn2 | 1 | 477 | 53.84 | <.0001 |
| Month*Group | 2 | 477 | 0.19 | 0.8294 |
| sp_mn2*Group | 2 | 477 | 13.36 | <.0001 |

## Let's compare these two models graphically:

```
proc mixed data=hiv_spline;
class ID month group(ref='1');
model CD4 = group month group*month/solution outpm=pred2;
repeated month/ subject=ID type=CS r rcorr;
run;

proc sgplot data=pred;
series y=pred x=month / group=group;
run;

proc sgplot data=pred2;
series y=pred x=month / group=group;
run;
```


Predicted Mean
500
450
400
350
300
0
2
4
6
8
10
Month
Group
1
2
3


Predicted Mean
500
450
400
350
300
0
2
4
6
8
10
Month
Group
1
2
3