(Re)introduction to Mx

Starting at the beginning

- Data preparation
  - Mx expects 1 line per case/family
  - Almost limitless number of families and variables
  - Space delimited is best
  - Can use a missing code ie -9 or can use the default ‘.’

Important structural stuff (As I was going to St Ives ...)

- Script is composed of one or more jobs (can handle many ‘nested’ jobs in one script or 2 non nested jobs)
- Each job is composed of one or more groups
  - Each group is ‘opened’ with a title
  - Each group is ‘closed’ with an end statement
  - You must tell Mx how many groups will be in the job

A bit about groups

- 3 types of groups
  - Calculation
  - Data
    - If analysing raw data Mx expects a Means Model and a Covariance Model
  - Constraint

Matrices: the building blocks

- Many types
- Denoted by a single letter
  - Elements defined by letter and 3 numbers
    - A 1 2 1 = A matrix group 1 row 2 column 1
- All constants and estimated parameters must be placed in a matrix & Mx must be told what type of matrix it is
- Letters can be reused in subsequent groups

Short cuts

- Anything after ! is read as a comment
- Can predefine frequently used/changed parameters
  - #define nvar=2
- Can read in another file within the script
  - #include starting_values.txt
- Can run loops – via the repeat comand
- Use an end of line signal (; or /) except in the Labels command

Setting up the script – calculation group

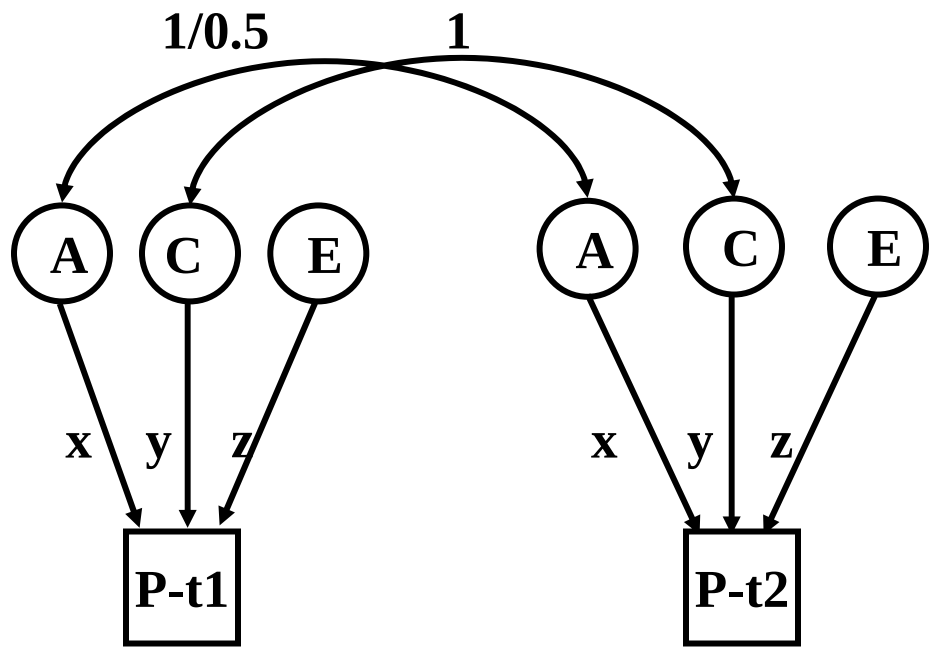
- 1st line is the title
- 2nd specifies group type
- Matrix definition
  - Begin Matrices – End Matrices
  - If a matrix is not specified free it will be considered fixed
- Algebra
  - Begin Algebra – End Algebra
- Starting values for free/estimated parameters or specified values for constants
- End

Setting up the script – data group

- 1st line is the title
- 2nd specifies group type and number of variables
- 3rd line gives data location
  - Rectangular file = continuous data
  - Ordinal file = ordinal data (Mx will expect a thresholds model not a means model)
- List the variables
- Select if …
- Select variables
  - Order is important! Select all vs for twin1 then twin2 then sib1 ect
- Specify which vs are covariates (definition variables)

Setting up the script – data group

- Matrix definition
  - Call matrices from previous groups and/or define new matrices
- Algebra & starting values
- Means Model
  - can include covariates ie age, sex …
- Covariance Model
  - Expected to be nsib*nvar by nsib*nvar
- End



Variance/covariance matrices

MZ

	t1	t2
t1	$a^2+c^2+e^2$	a^2+c^2
t2	a^2+c^2	$a^2+c^2+e^2$

DZ

	t1	t2
t1	$a^2+c^2+e^2$	$0.5a^2+c^2$
t2	$0.5a^2+c^2$	$a^2+c^2+e^2$

So what do you get

- Mx starts by reading back the script

```
 ** Mx startup successful **

 **MX-PC 1.54** Job started on 03/08/05 at 16:45:51
! SCRIPT NAME   : example_ace.mx  (dp)
! GOAL          : To calculate variance components
! DATA          : continuous
! INPUT                 : raw data
! UNI/BI/MULTI : uni
! DATA-GROUPS   : MZM DZM MZF DZF DOSMF DOSFM
! MEANS MODEL   : grand mean, sex effect
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!


The following MX script lines were read for group  1

#DEFINE NVAR 1
     ! MX READS 1. THIS CORRESPONDS TO ONE PHENOTYPE TO BE ANALYSED

#DEFINE NDEF 1    ! NUMBER OF COVARIATES (AGE AND SEX IN THIS SCRIPT)
#DEFINE NSIB 2    !TELLS MX THE SIZE OF THE LARGEST SIBSHIP
G1: CALCULATION GROUP
DATA CALC NGROUPS=3
```

So what do you get

- Data summary

Summary of VL file data for group 2

	SEX2	SEX1	TWIN1	TWIN2
Code	-2.0000	-1.0000	1.0000	2.0000
Number	100.0000	100.0000	100.0000	100.0000
Mean	0.5000	0.5000	0.4696	0.5929
Variance	0.2500	0.2500	10.0539	7.6557
Minimum	0.0000	0.0000	-8.6900	-6.5100
Maximum	1.0000	1.0000	5.9600	7.1800

Summary of VL file data for group 3

	SEX2	SEX1	TWIN1	TWIN2
Code	-2.0000	-1.0000	1.0000	2.0000
Number	150.0000	150.0000	150.0000	150.0000
Mean	0.5267	0.4933	0.2276	-0.0323
Variance	0.2493	0.2500	9.0769	8.6139
Minimum	0.0000	0.0000	-10.1800	-5.9100
Maximum	1.0000	1.0000	7.4500	7.6300

So what do you get

- Parameter specifications

```
  PARAMETER SPECIFICATIONS

  GROUP NUMBER: 1

G1: calculation group

  MATRIX A
 This is a computed FULL matrix of order    1 by    1
  It has no free parameters specified

  MATRIX C
 This is a computed FULL matrix of order    1 by    1
  It has no free parameters specified

  MATRIX E
 This is a computed FULL matrix of order    1 by    1
  It has no free parameters specified

  MATRIX G
 This is a FULL matrix of order    1 by    2
    1 2
 1  4 5

  MATRIX H
 This is a FULL matrix of order    1 by    1
  It has no free parameters specified

  MATRIX P
 This is a FULL matrix of order    1 by    1
    1
 1  6
```

So what do you get

- Estimates

```
  MX PARAMETER ESTIMATES

  GROUP NUMBER: 1

G1: calculation group

  MATRIX A
 This is a computed FULL matrix of order    1 by    1
  [=X*X']
             1
 1      4.9765

  MATRIX C
 This is a computed FULL matrix of order    1 by    1
  [=Y*Y']
             1
 1      2.2310

  MATRIX E
 This is a computed FULL matrix of order    1 by    1
  [=Z*Z']
             1
 1      1.6885
```

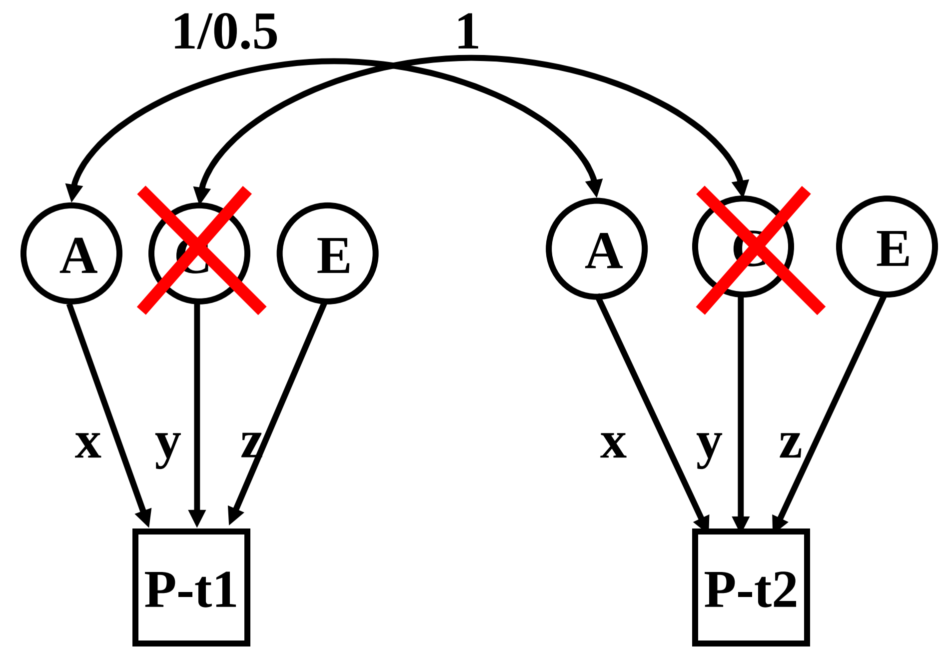
So what do you get

- Warnings & Fit information

```
 *** WARNING! ***
 Minimization may not be successful.  See above
 CODE GREEN - it probably was OK

Your model has    6 estimated parameters and    500 Observed statistics

-2 times log-likelihood of data >>>  2355.338
Degrees of freedom >>>>>>>>>>>>>>>>       494

This problem used  0.0% of my workspace

Task                         Time elapsed (DD:HH:MM:SS)
Reading script & data          0: 0: 0: 1.61
Execution                      0: 0: 0:-1.10
TOTAL                          0: 0: 0: 0.51
```

Testing for significance

- Drop the parameter(s) from the model or equate parameters using the multiple job option
  - Specify the matrix elements you wish to drop/equate
    - Drop A 1 1 1
    - EQ A 1 1 1 B 1 1 1
  - Compare the fit of the two models



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DZ

	t1	t2
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t2	$0.5a^2+\cancel{c^2}$	$a^2+\cancel{c^2}+e^2$

Exercise 1

- Save the full ACE model
  - save name.mxs
- Drop C
- Retrieve the full model
  - get name.mxs
- Drop A
- Drop C
- Record standardised VC and fit function

Questions

- Can you drop A?
- Can you drop C?
- Can you drop E from a model?

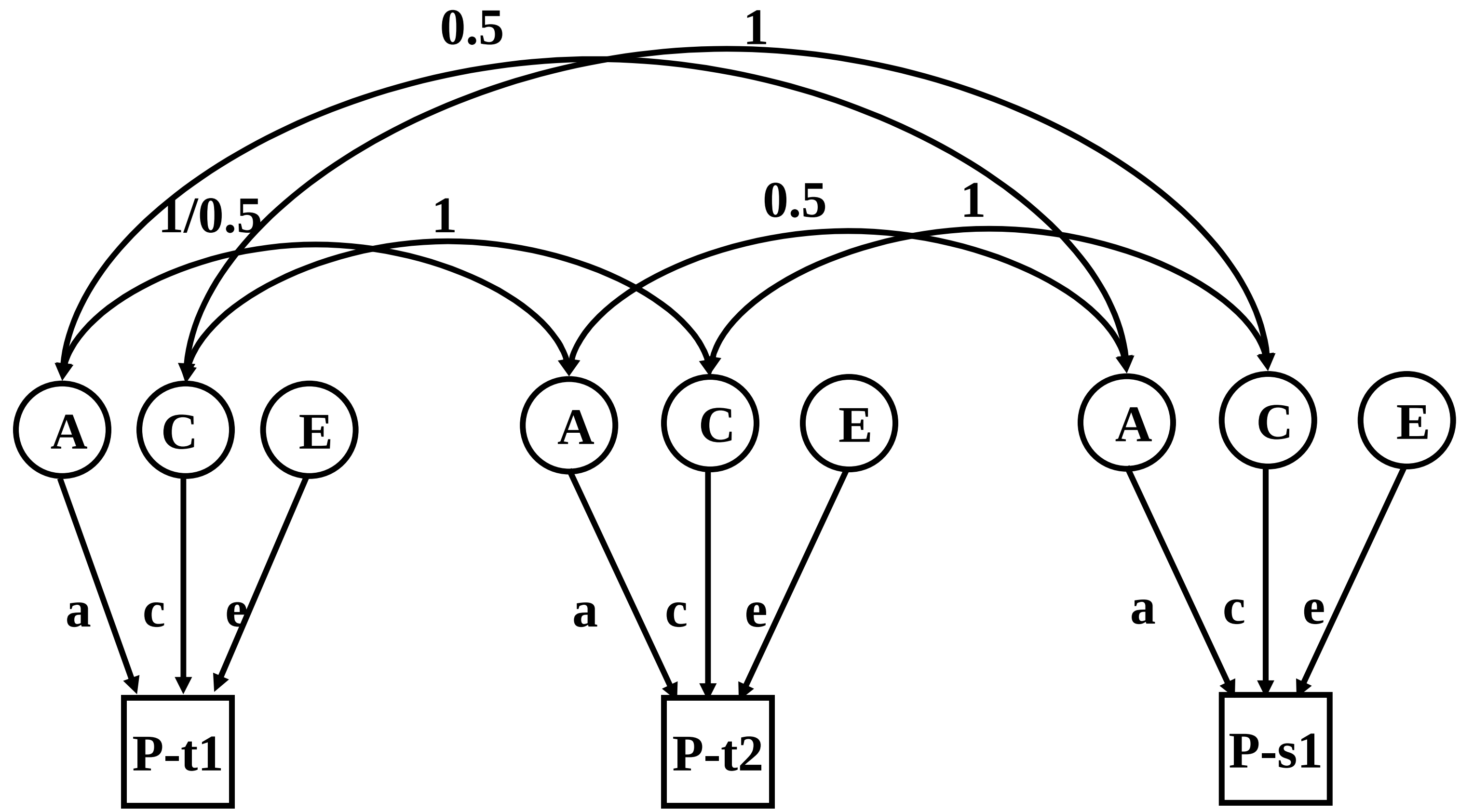
- How would you test to see if the means were equal for twin1 and twin2?
- How would you test to see if there was a significant effect of sex on the means?

Exercise 2: Adding a constraint group

- What will this do?

```
G4: Constraint Group for G1
Constraint
Begin Matrices;
A Computed nvar nvar =A1
C Computed nvar nvar =C1
E Computed nvar nvar =E1
I Unit 1 nvar
End matrices;
Begin algebra;
P=A+C+E ;
End algebra;
Constrain \d2v(P)=I ;
End
```

Exercise 2: Adding siblings



General Advice/Problem solving

- Scripting styles differ
- Check the parameter numbers
- Check the sample description
- Learn to love the manual
- Comments are your friends

Time for coffee