Attendance, attainment and engagement

Does class attendance influence attainment?

Which factors influence class attendance?

Nigel Ling
Kingston University

Week 1

Week 10

Revision class

The Proposition

the more lectures/tutorials students attend, the better their “engagement”, and the better their marks

Attendance data

Collected two ways:

registers (13-14)

clickers (14-15)

Modules

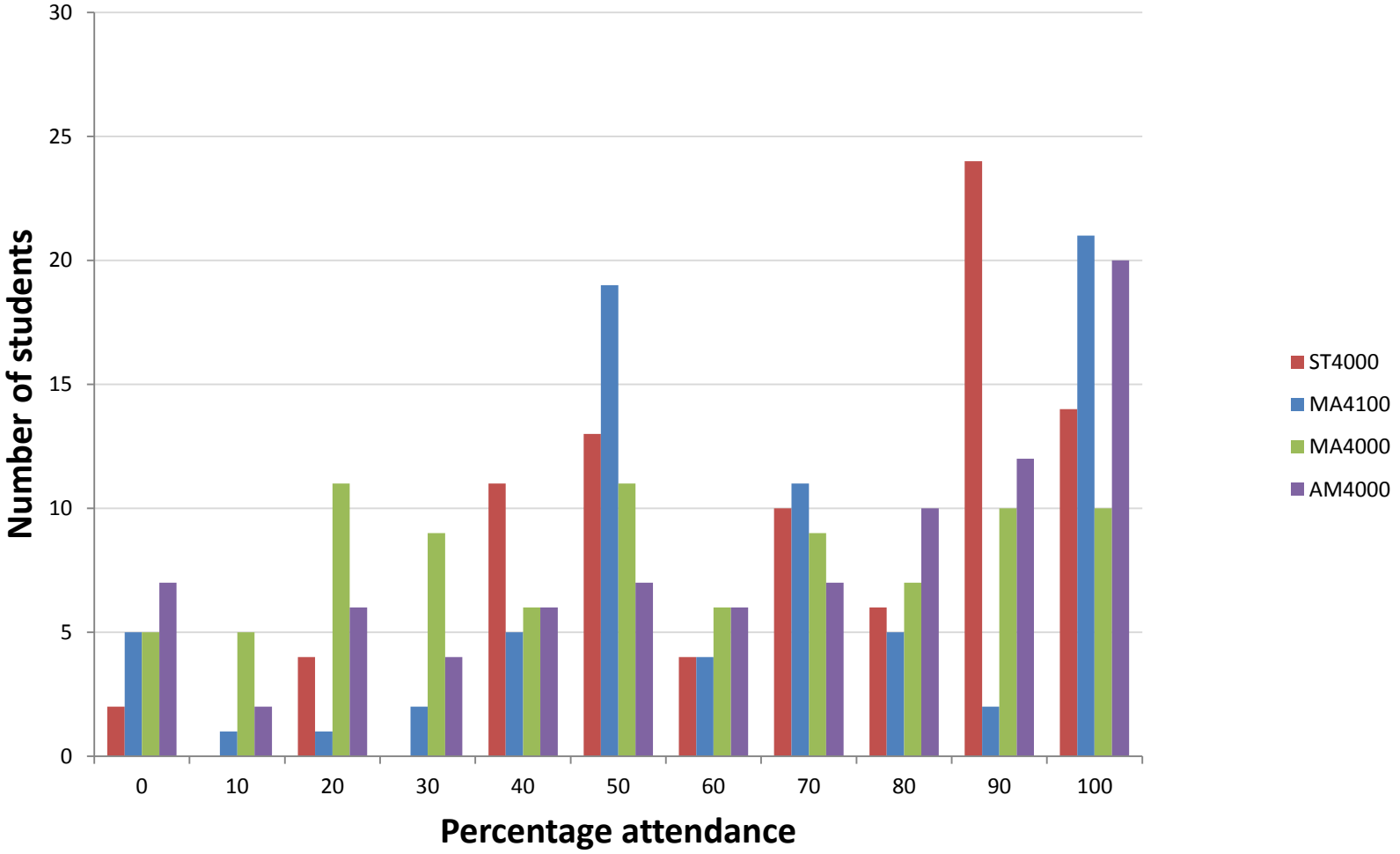
Intro to probability & stats (ST4000)
Applications of maths to finance (AM4000)
} 2013-14, 2014-15

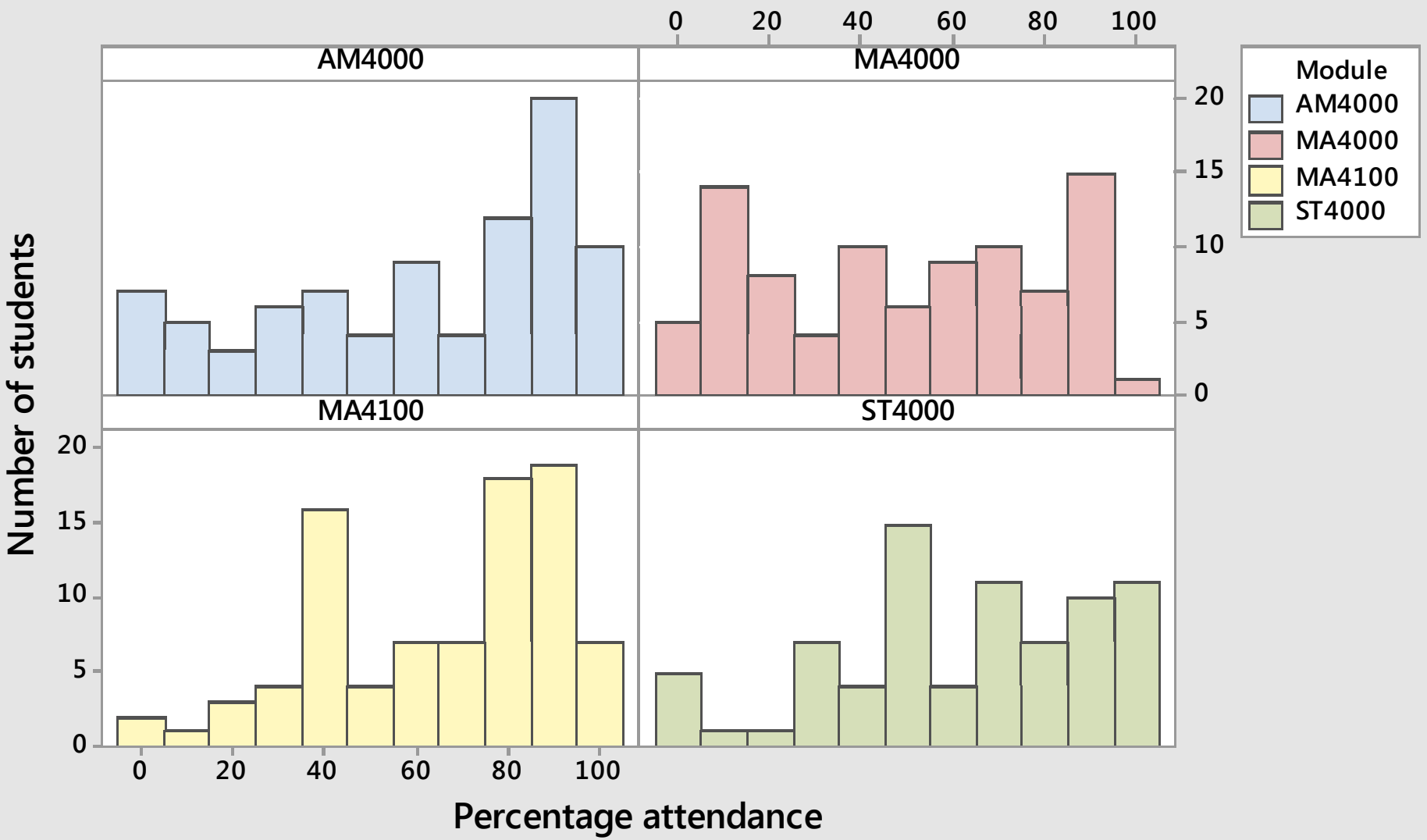
Intro to comp maths (MA4100)
Intro to maths methods (MA4000)
} 2014-15 only

Contingencies (MA6000) 2013-14

Psycholinguistics 2013-14

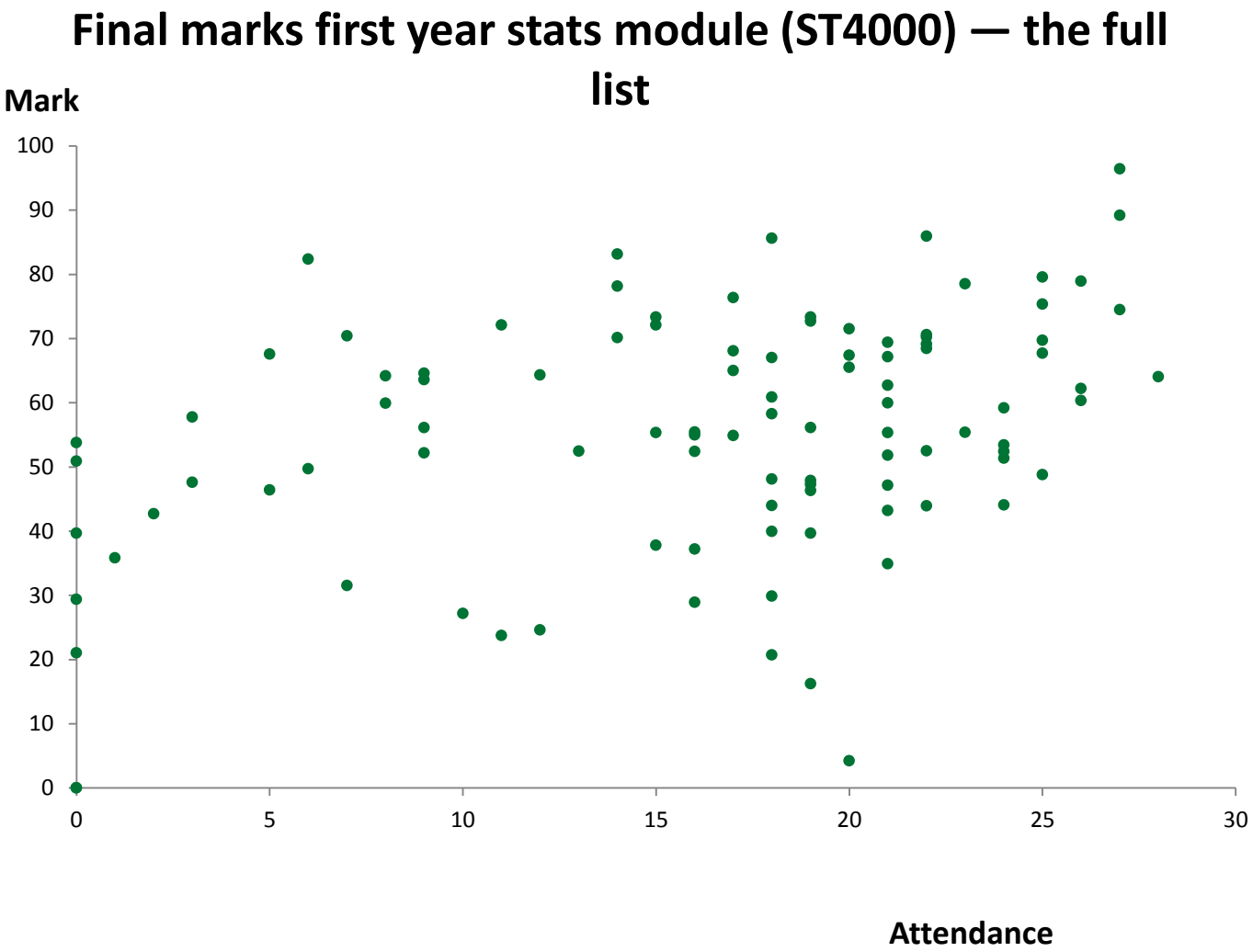
First year maths modules 14-15

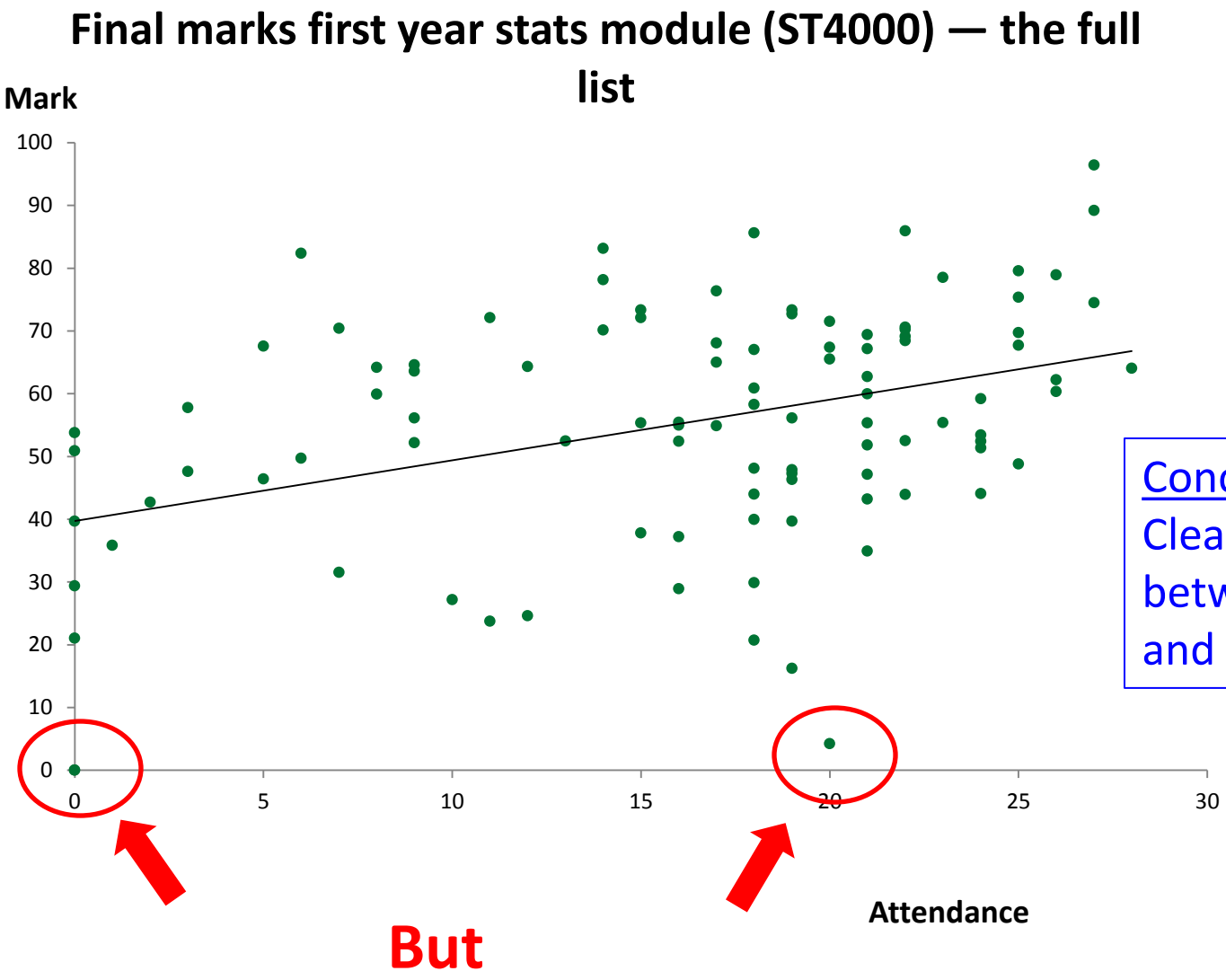




Panel variable: Module

2013 -14


Final marks first year stats module (ST4000) — the full list
Mark
100
90
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
30
Attendance

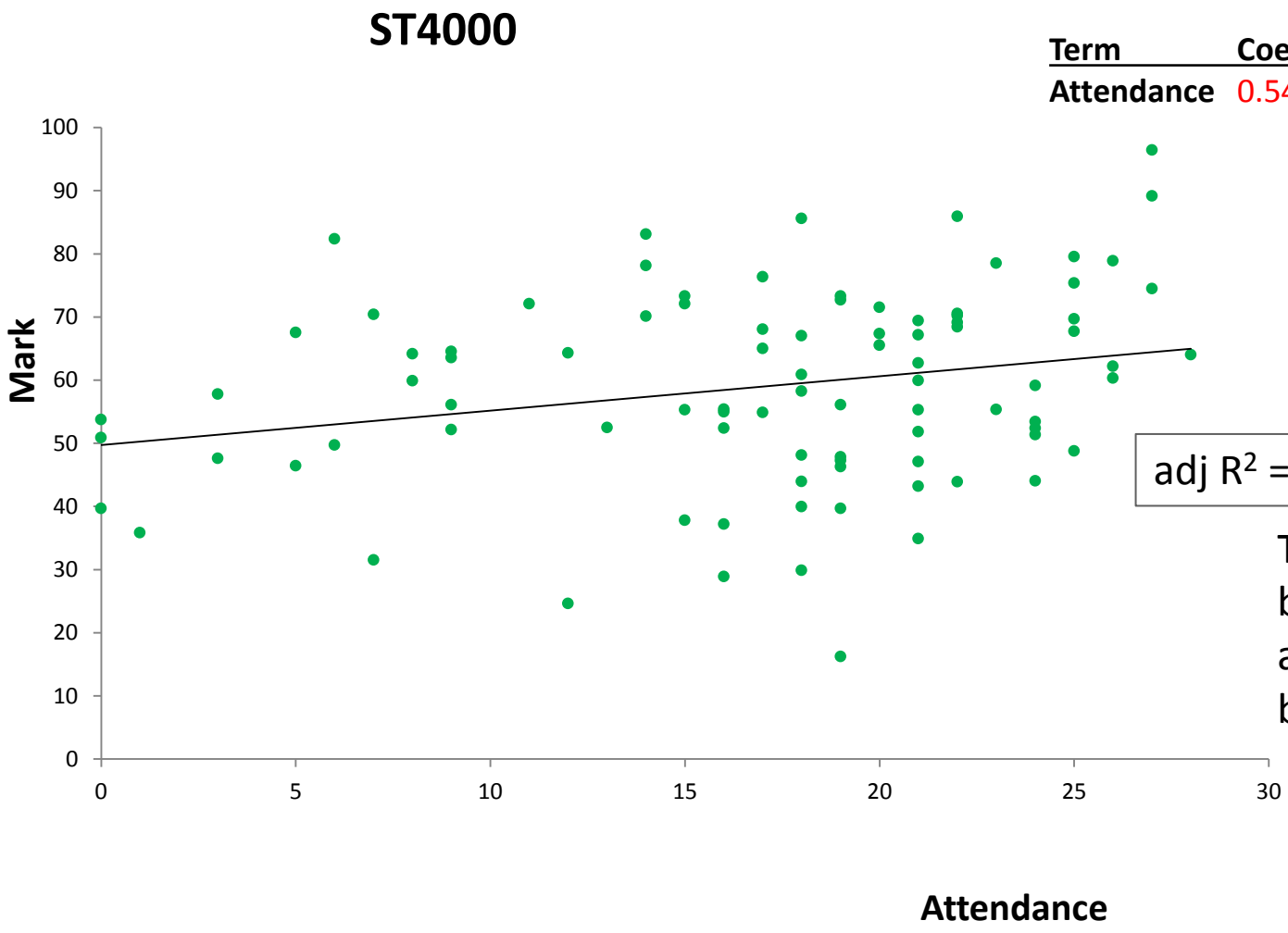


Conclude:
Clear relationship between final mark and attendance

FOs and students who miss some assessments will bias the result

2013 -14

Students who completed all assessments



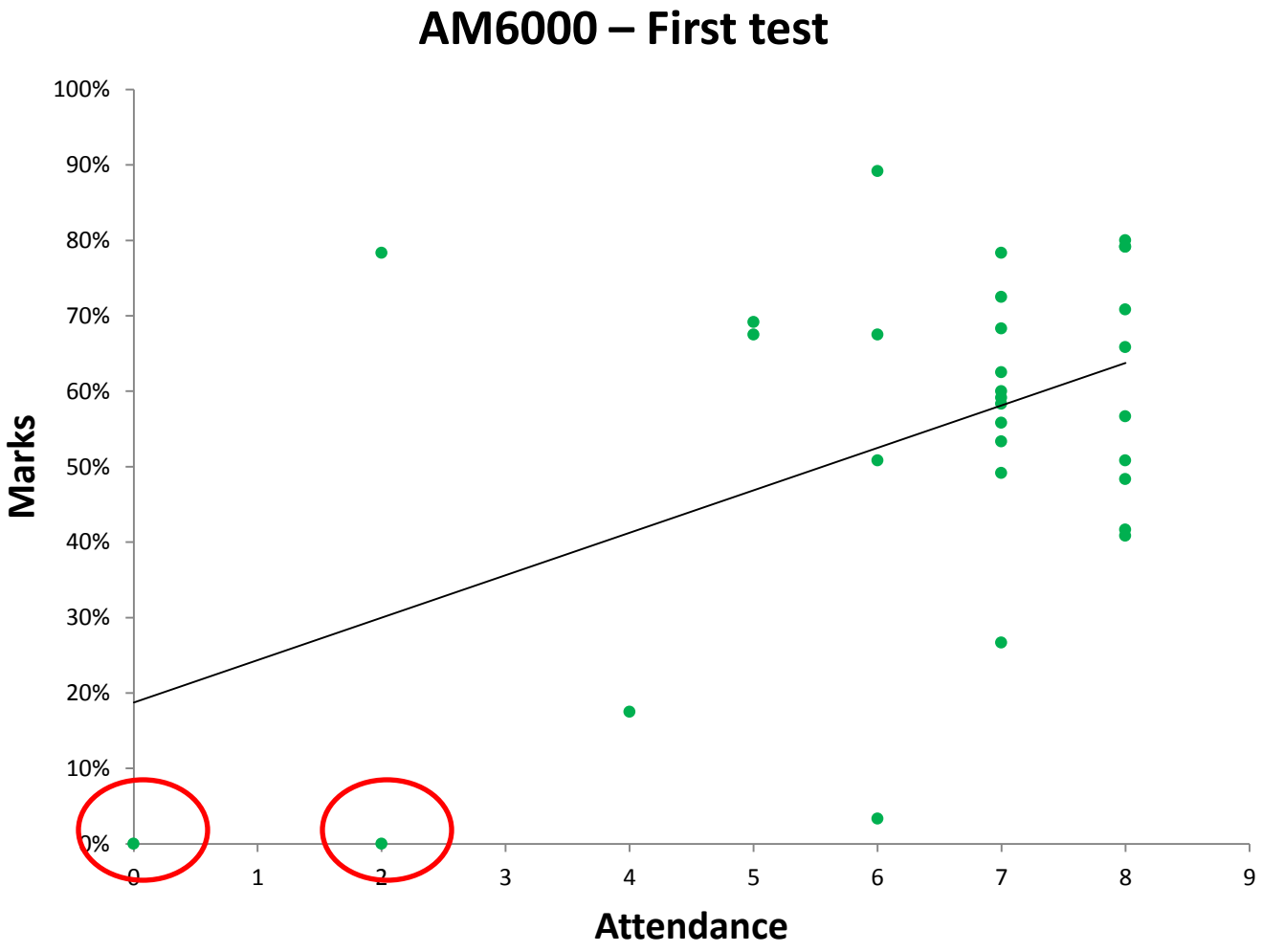
Term	Coef	SE Coef	T-Value	P-Value
Attendance	0.54	0.22	2.43	0.017

adj R^2 = 0.05

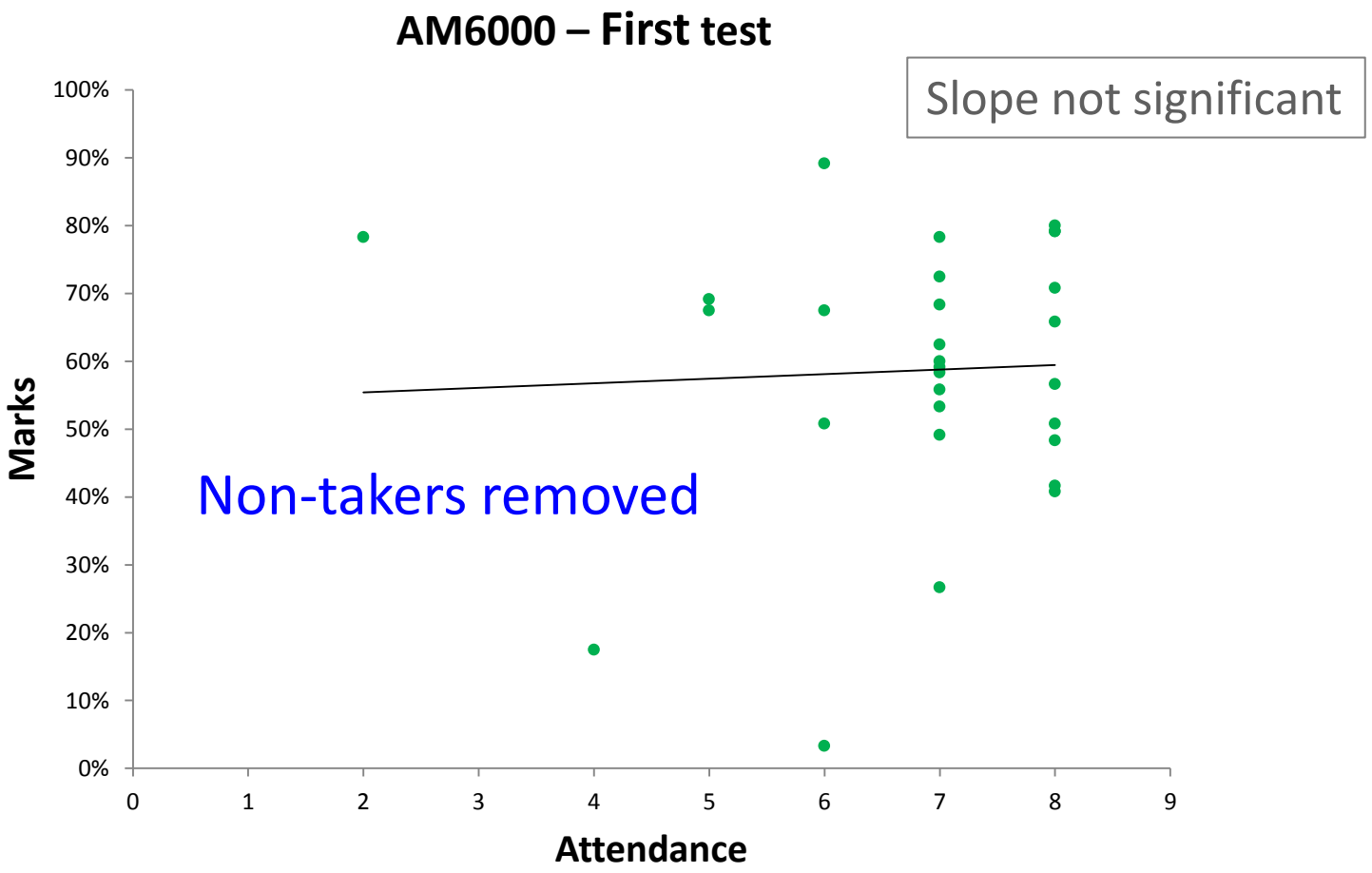
Tells us the relationship between marks and attendance is weak at best

R^2 is the proportion of mark explained by attendance

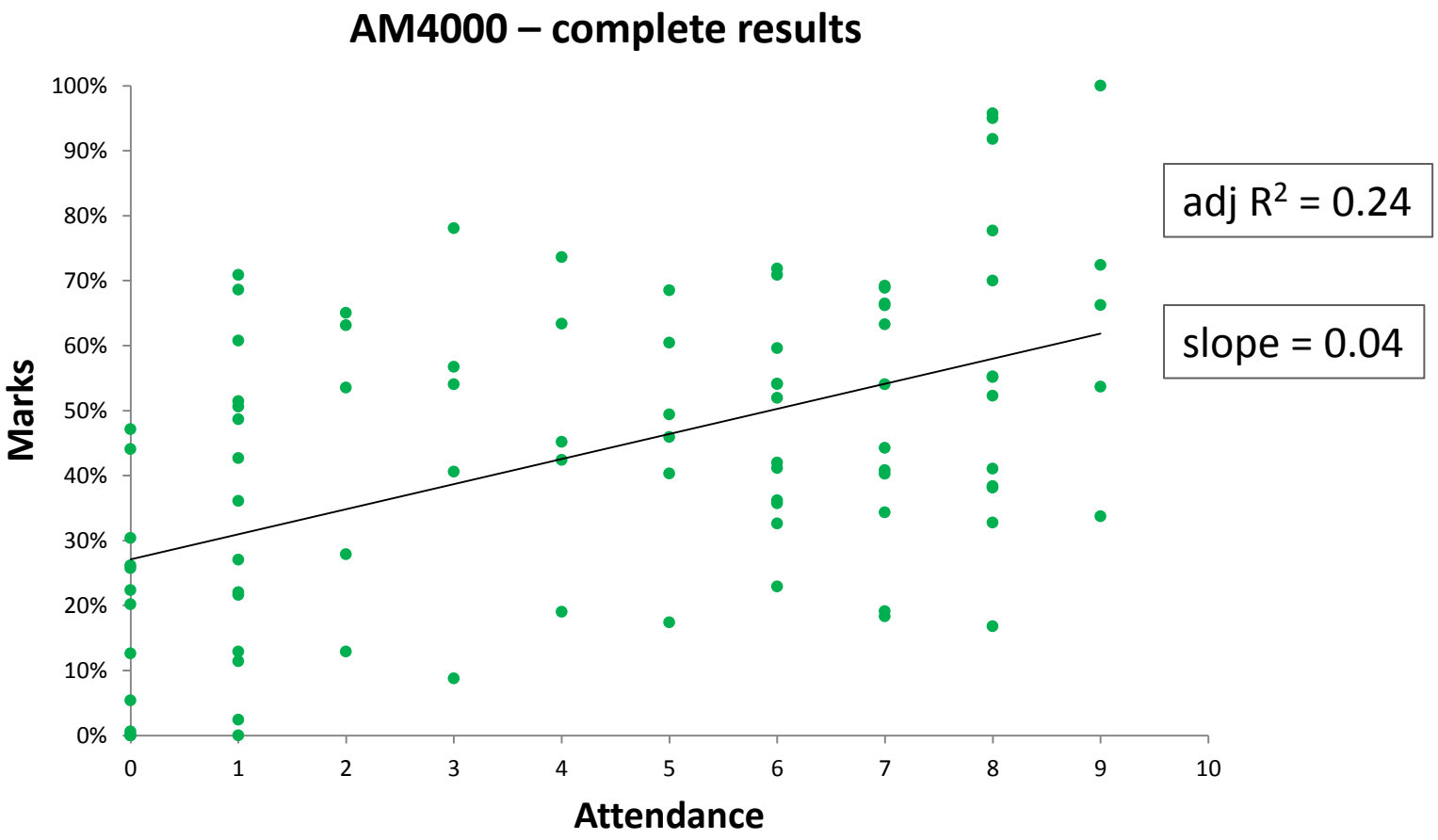
2013 -14


AM6000 – First test
Marks
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
1
2
3
4
5
6
7
8
9
Attendance

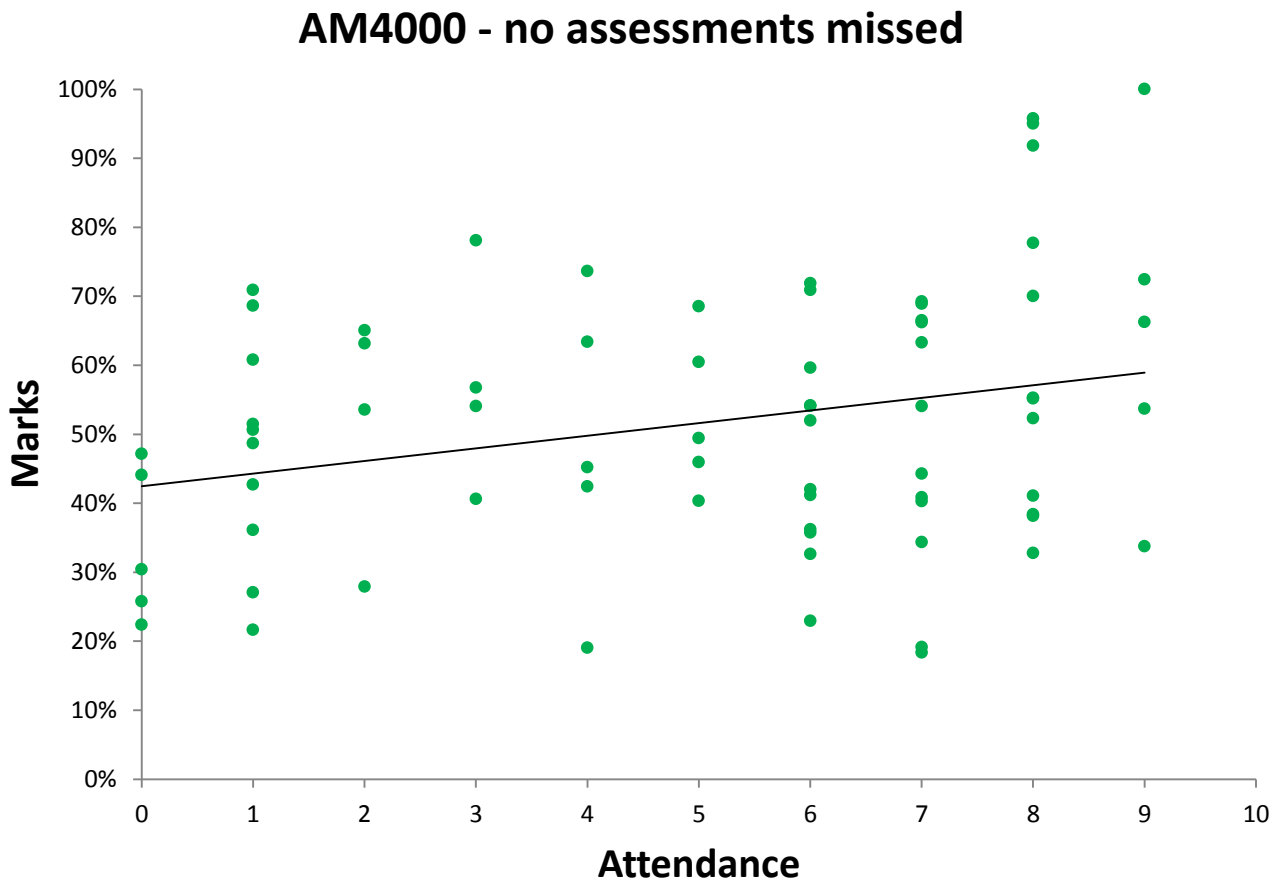
2013 -14


AM6000 – First test
Slope not significant
Non-takers removed
Marks
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
1
2
3
4
5
6
7
8
9
Attendance

2013 -14


AM4000 – complete results
Marks
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
1
2
3
4
5
6
7
8
9
10
Attendance
adj R^2 = 0.24
slope = 0.04

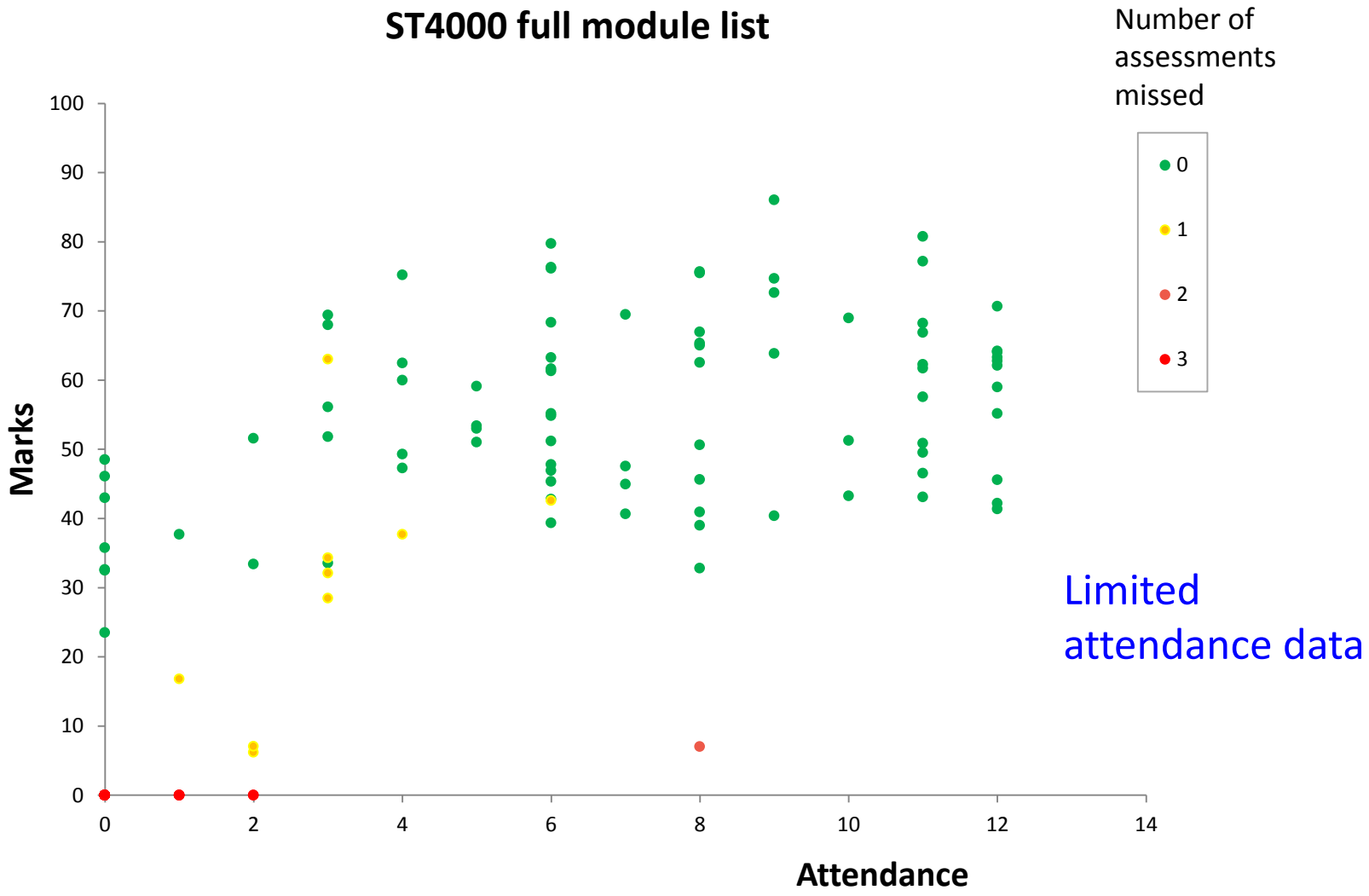
Remove F0s and partial completers



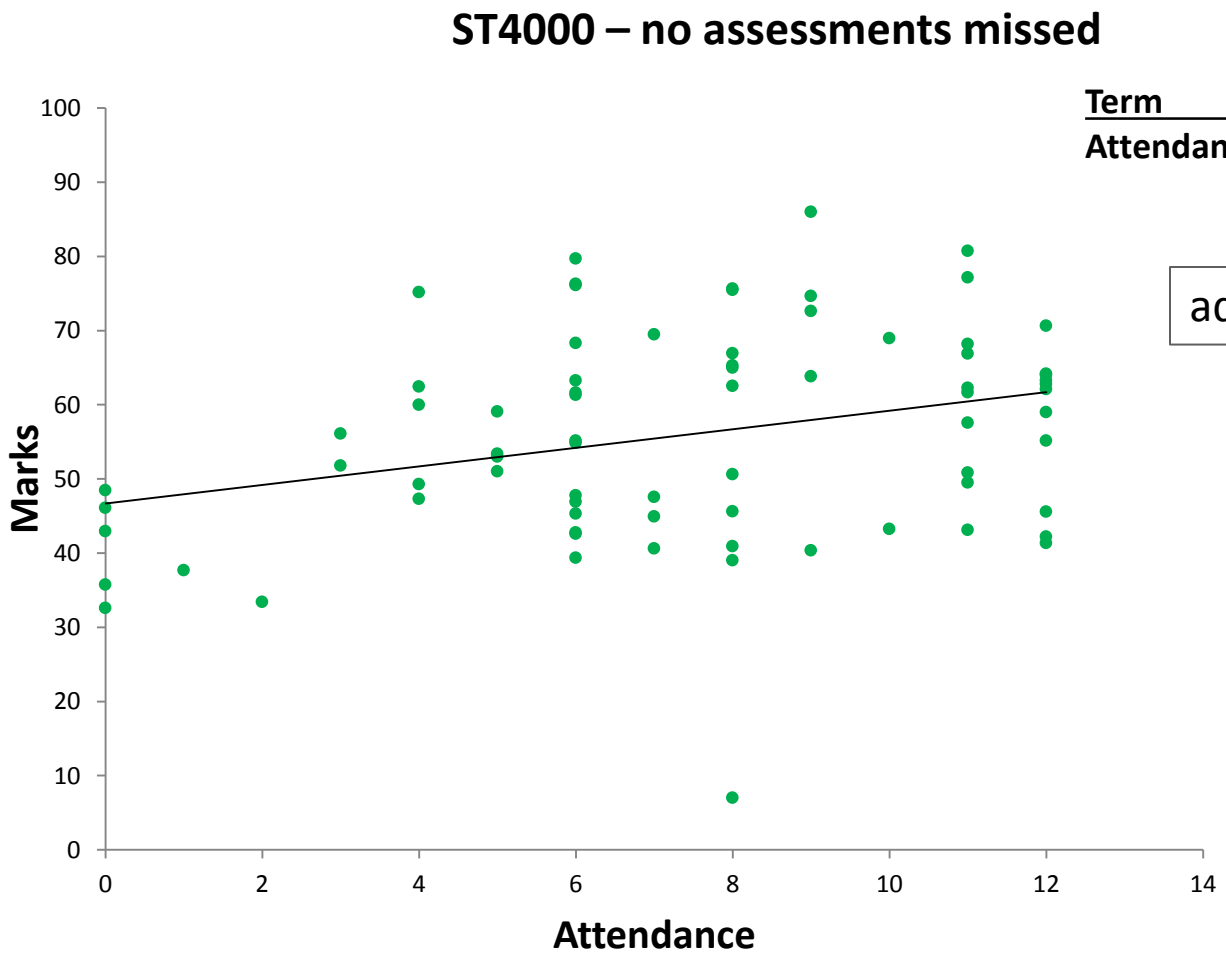
adj R^2 = 0.06

slope = 0.02 *

2014-15


ST4000 full module list
Number of assessments missed
0
1
2
3
Marks
Attendance
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
Limited attendance data

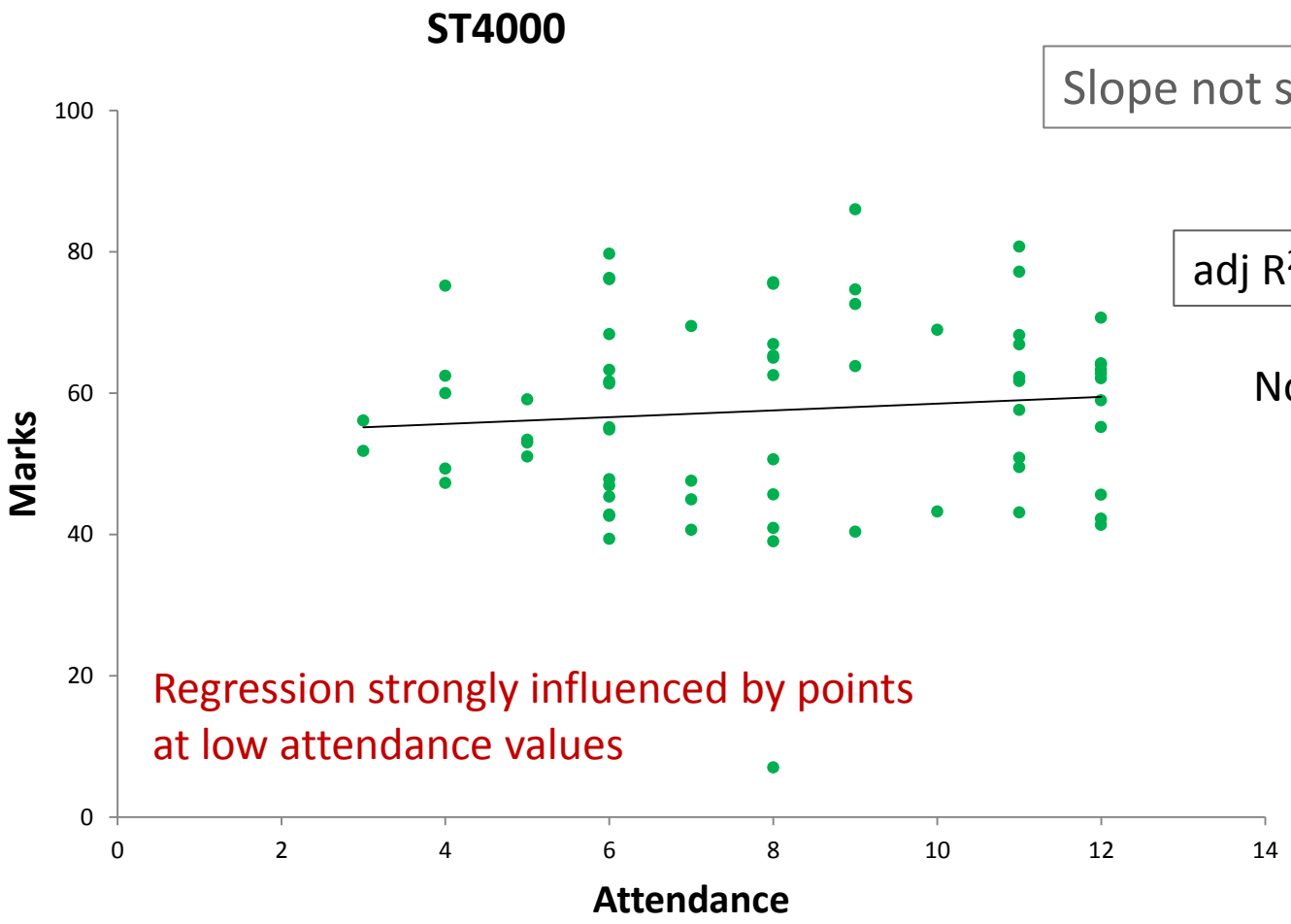
Remove FOs and partial completers



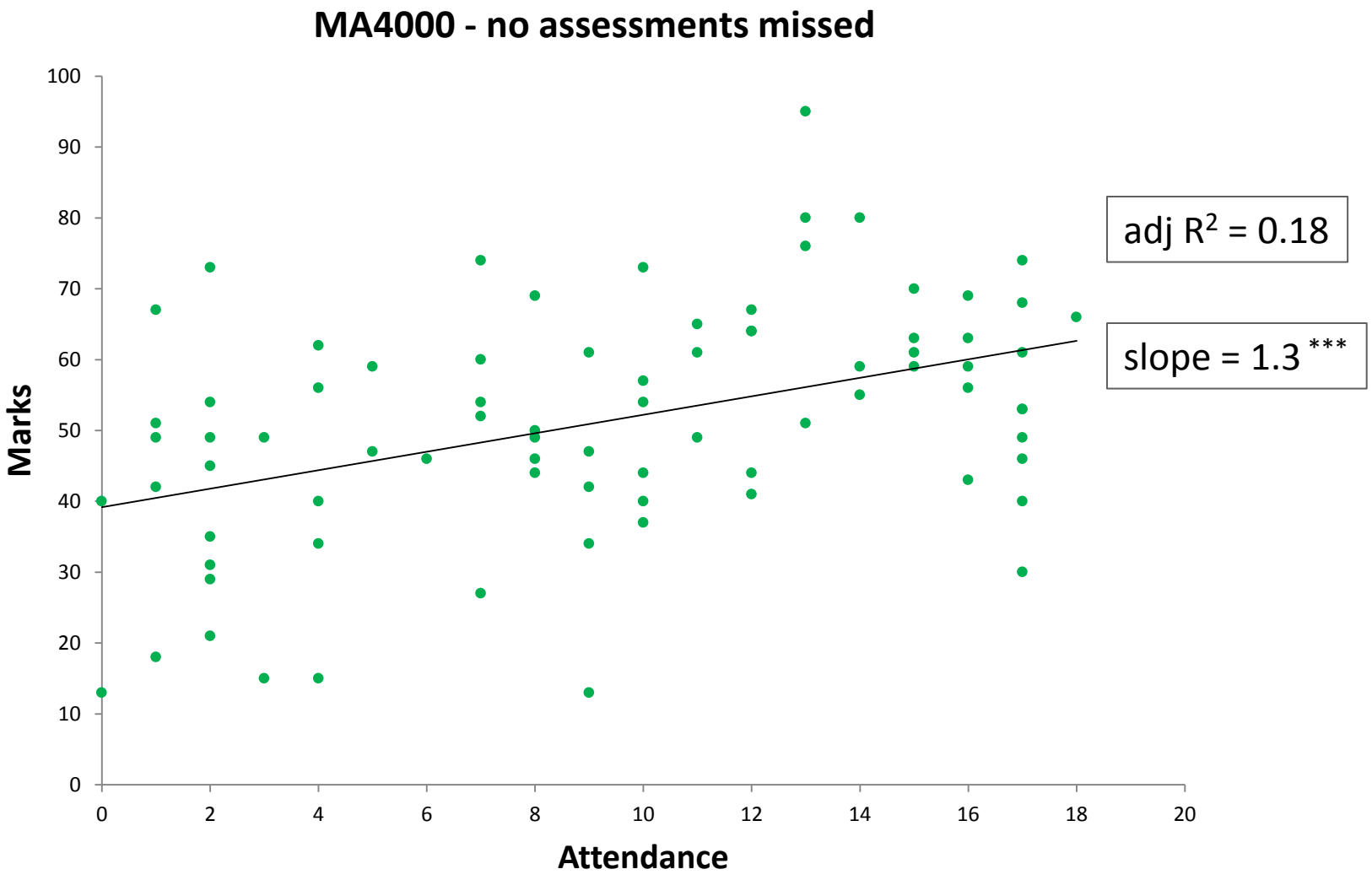
Term	Coef	SE Coef	T-Value	P-Value
Attendance	1.250	0.453	2.76	0.007

adj R^2 = 0.08

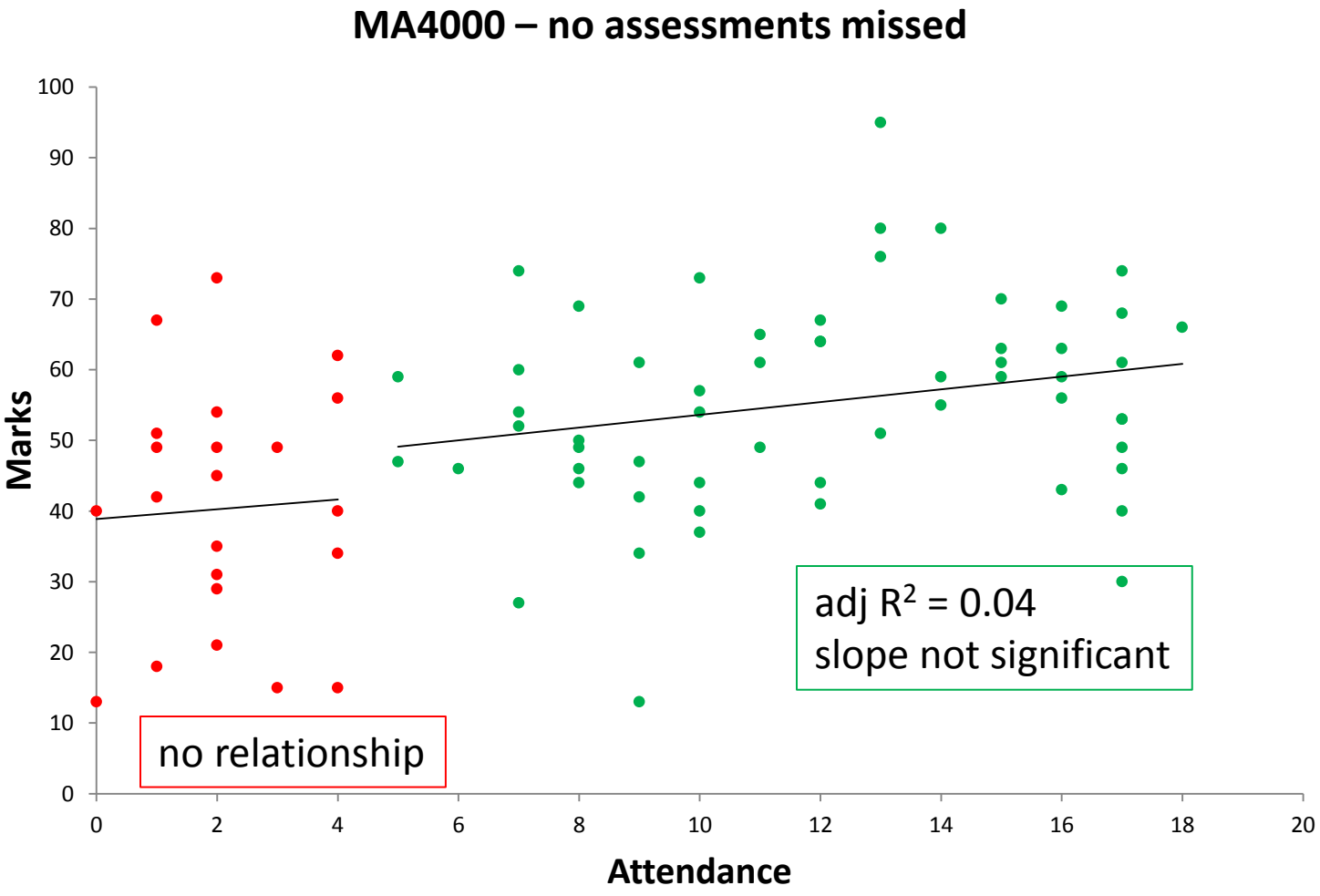
2014-15


ST4000
Marks
Attendance
100
80
60
40
20
0
0
2
4
6
8
10
12
14
Slope not significant
adj R^2 = – 0.006
No predictive value
Regression strongly influenced by points
at low attendance values

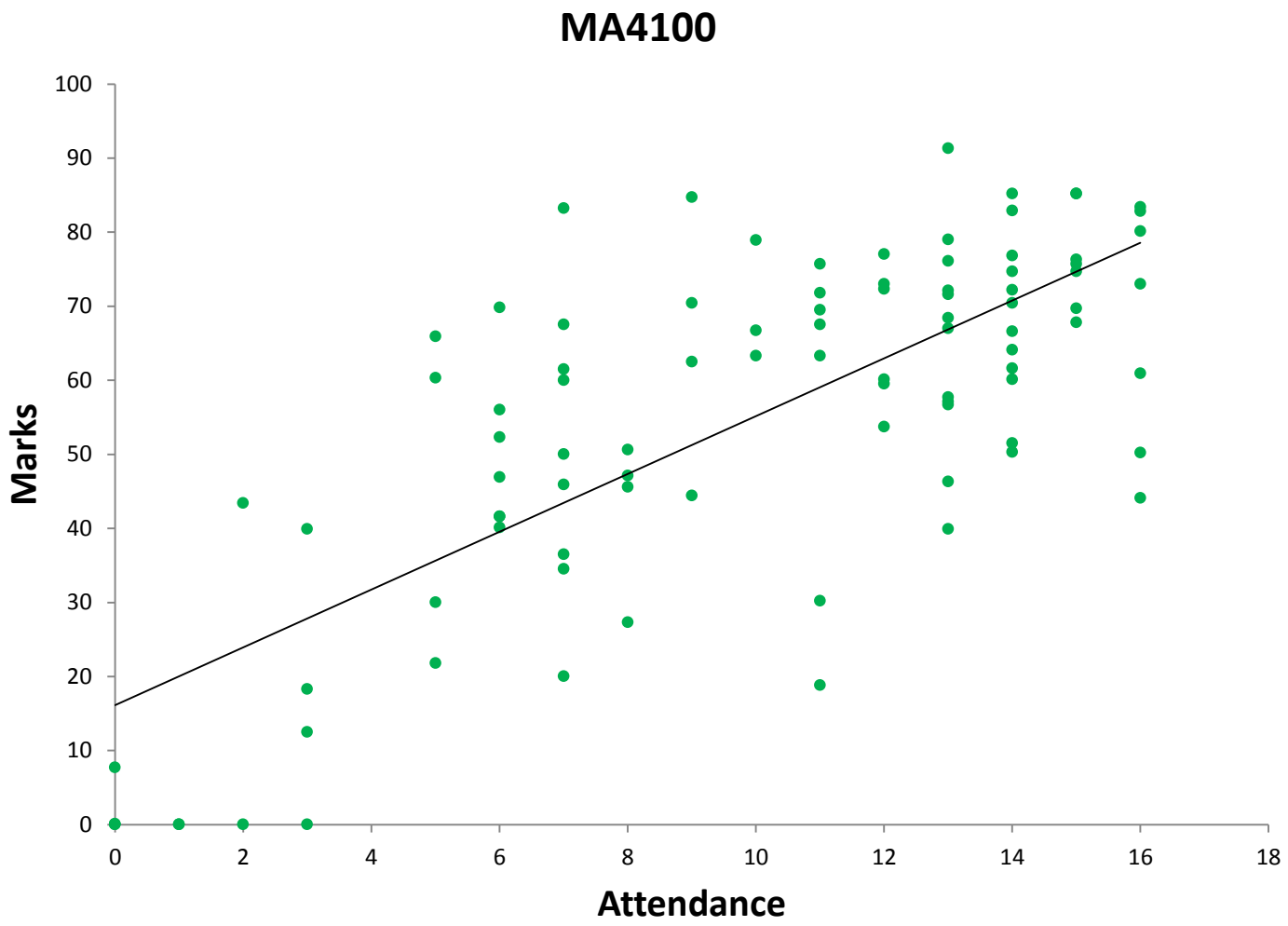
2014-15


MA4000 - no assessments missed
Marks
Attendance
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
12
14
16
18
20
adj R^2 = 0.18
slope = 1.3 ***

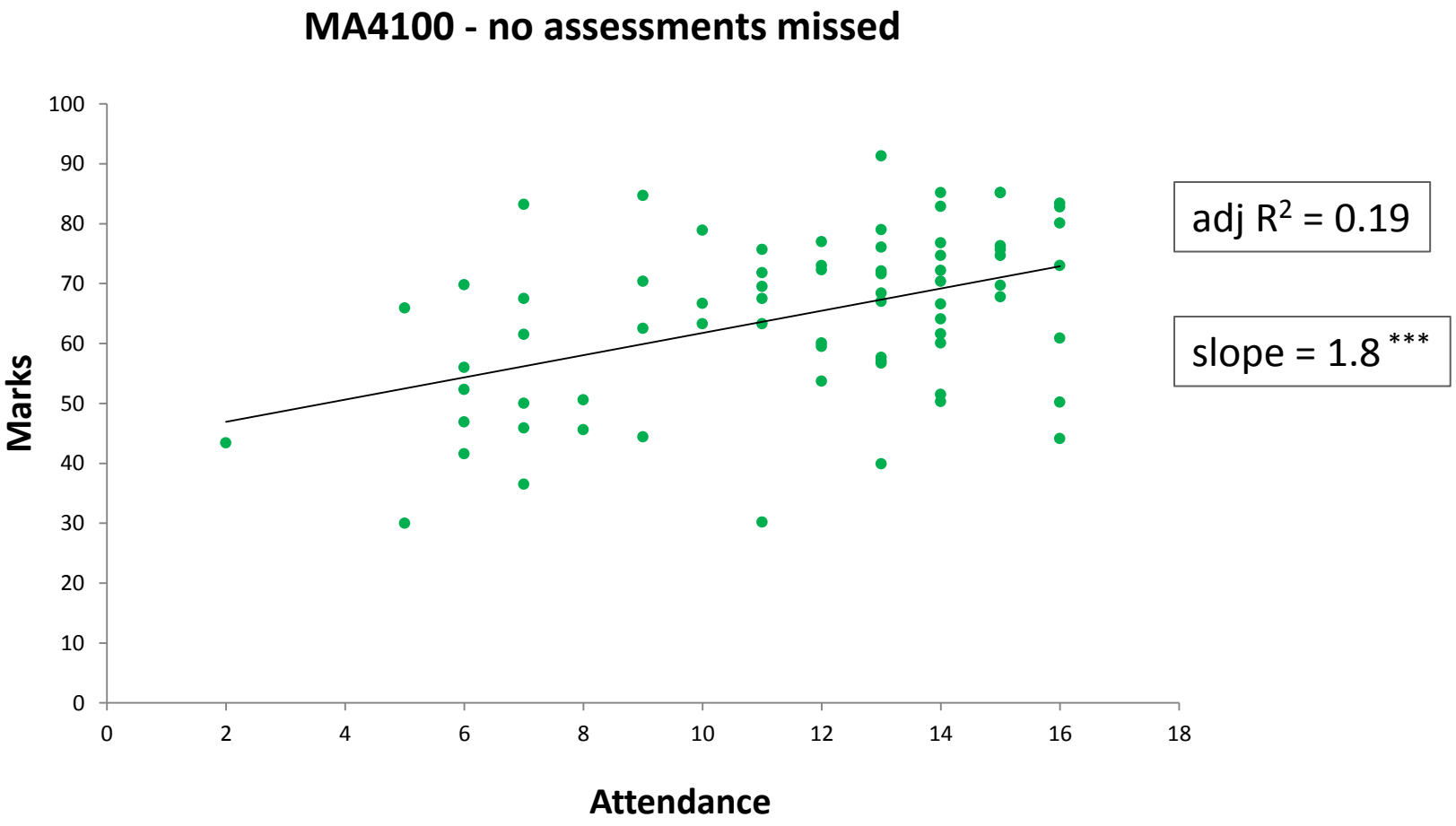
2014-15


MA4000 – no assessments missed
Marks
Attendance
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
12
14
16
18
20
adj R² = 0.04
slope not significant
no relationship

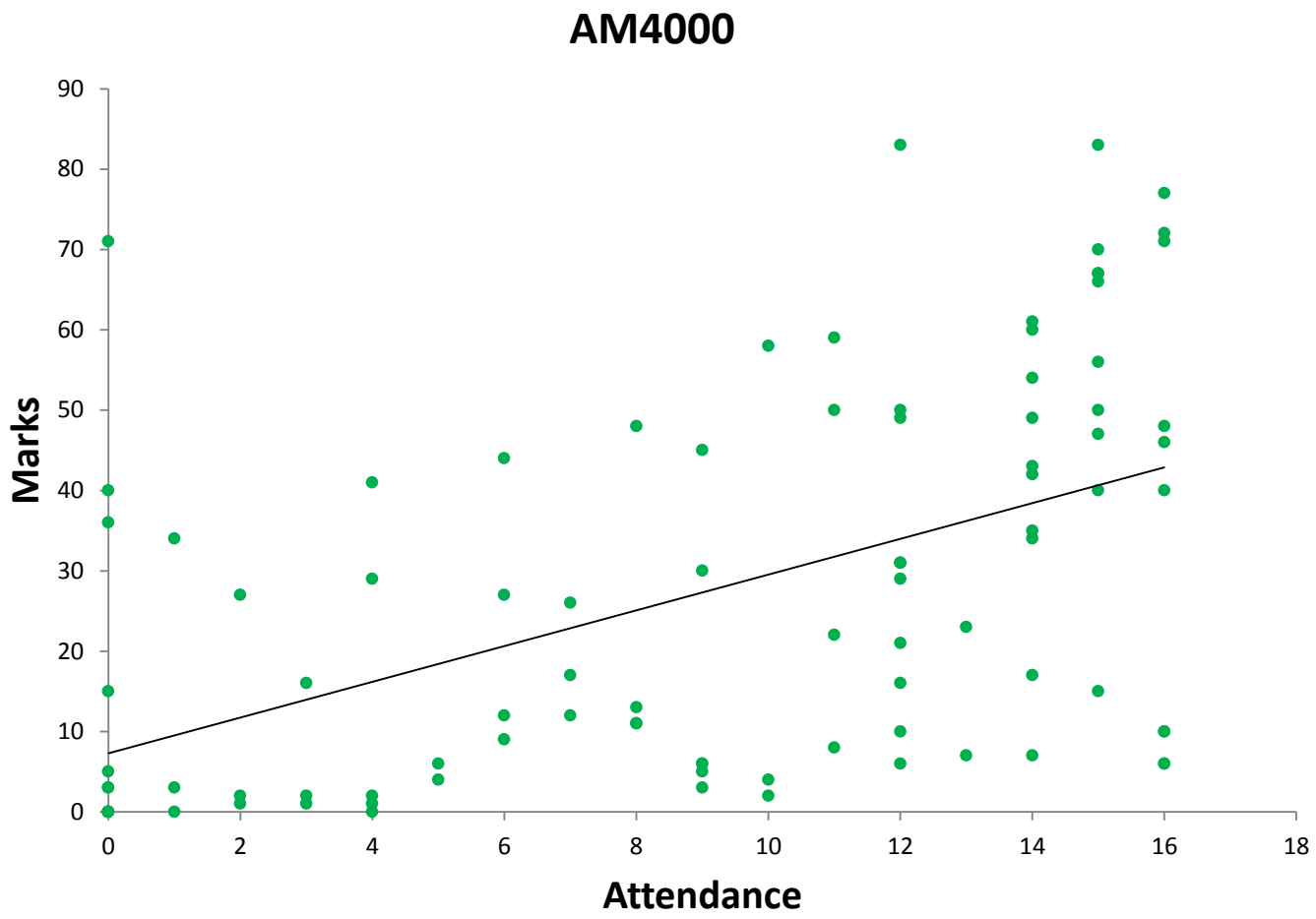
2014-15


MA4100
Marks
Attendance
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
18

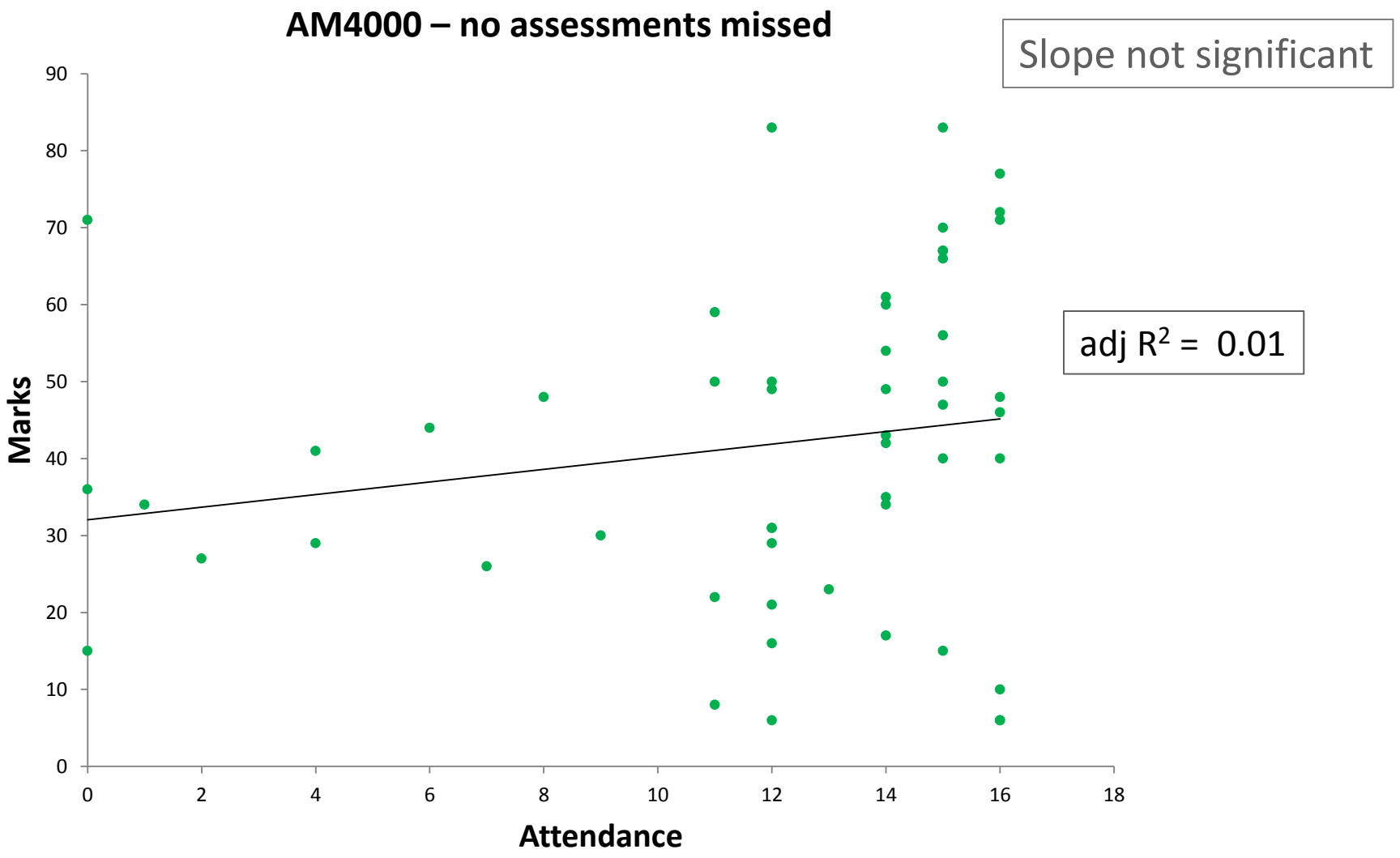
2014-15


MA4100 - no assessments missed
Marks
Attendance
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
12
14
16
18
adj R^2 = 0.19
slope = 1.8 ***

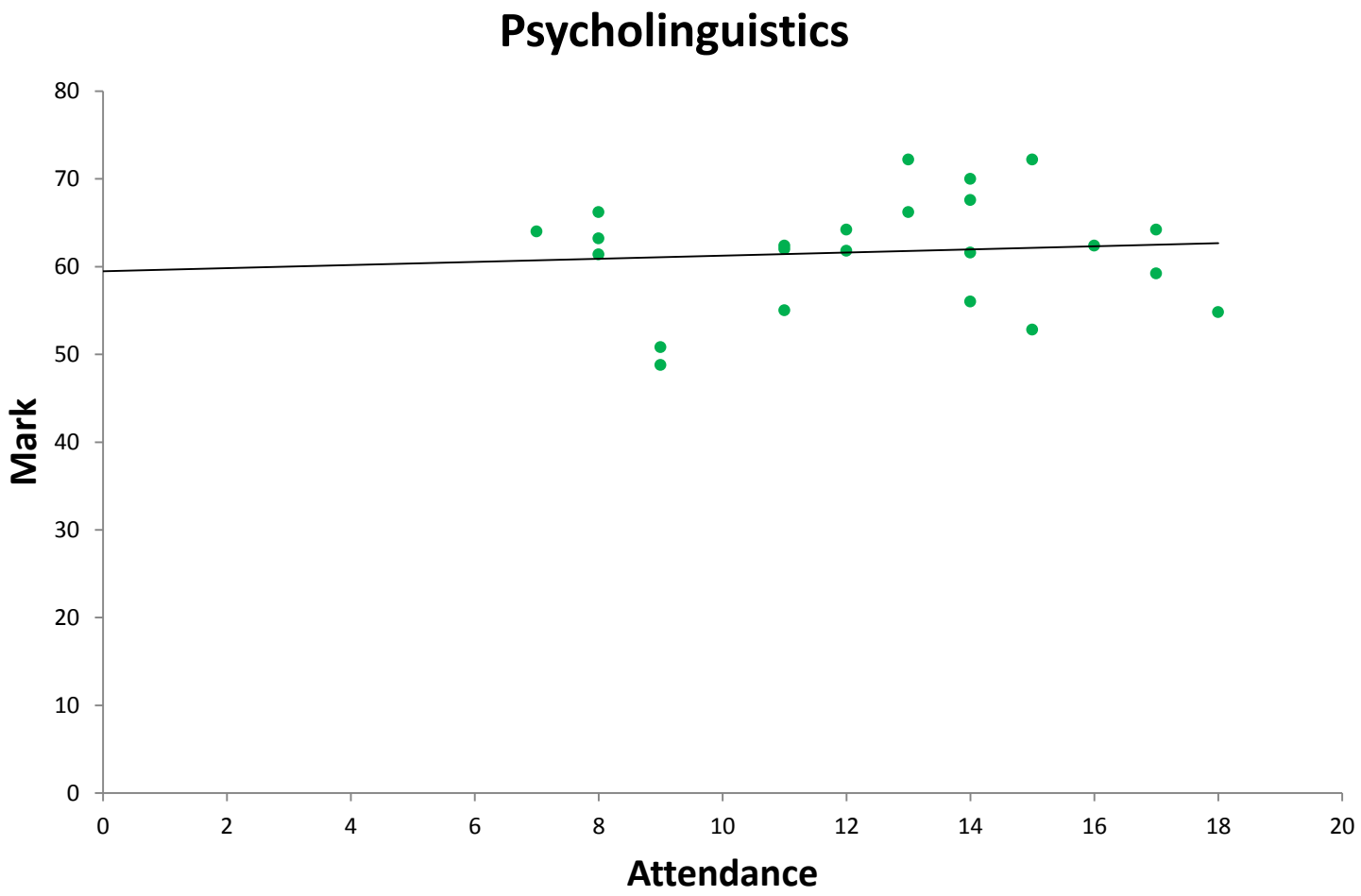
2014-15


AM4000
Marks
Attendance
0
10
20
30
40
50
60
70
80
90
0
2
4
6
8
10
12
14
16
18

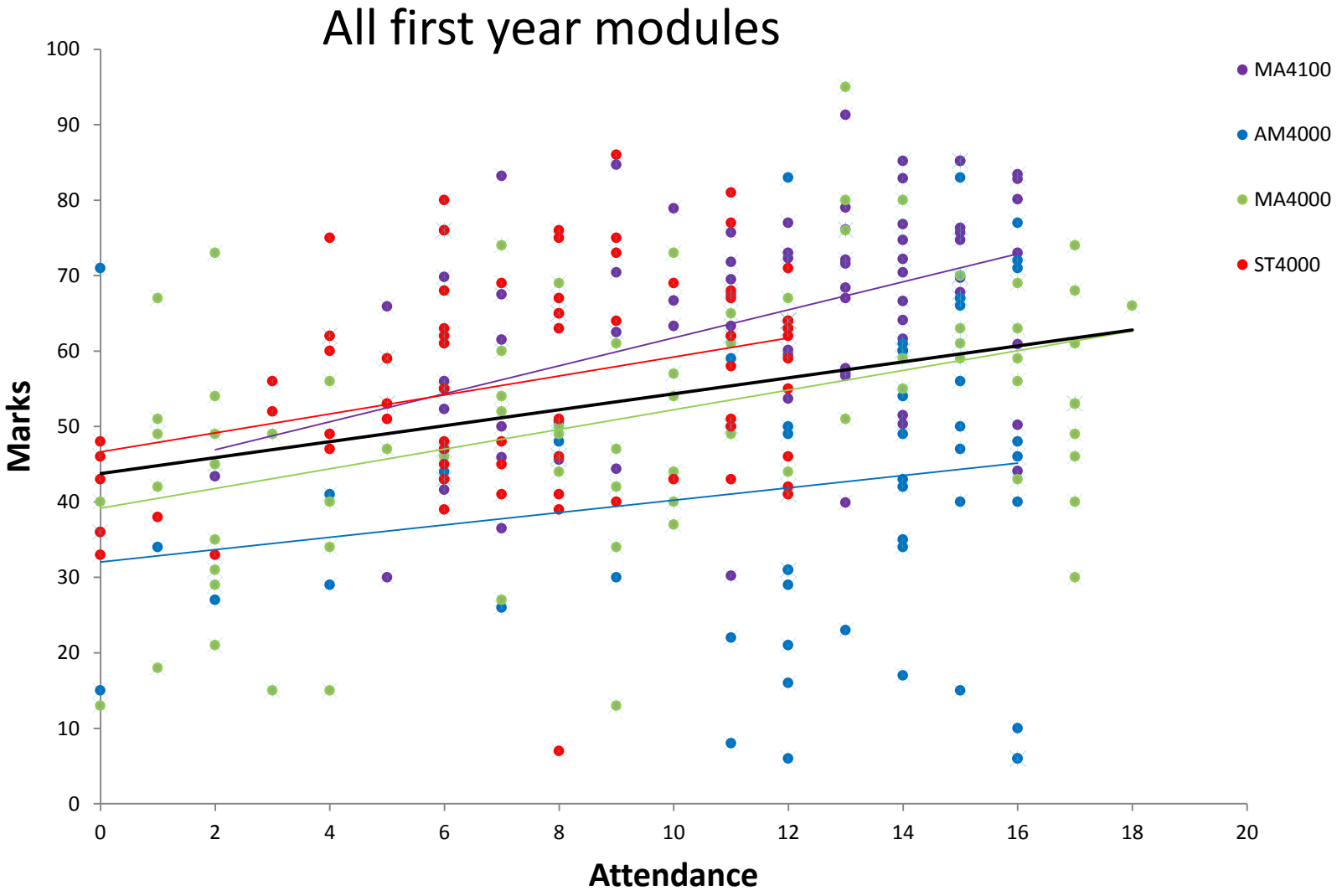
2014-15


AM4000 – no assessments missed
Slope not significant
adj R^2 = 0.01
Marks
Attendance
0
10
20
30
40
50
60
70
80
90
0
2
4
6
8
10
12
14
16
18

2013 -14


Psycholinguistics
Mark
Attendance
0
10
20
30
40
50
60
70
80
0
2
4
6
8
10
12
14
16
18
20

2014-15



If you were to pool all the data, **this would confound sources of variation**

Taking into account the variability between modules, what do these data tell us about the relationship between attainment and attendance?

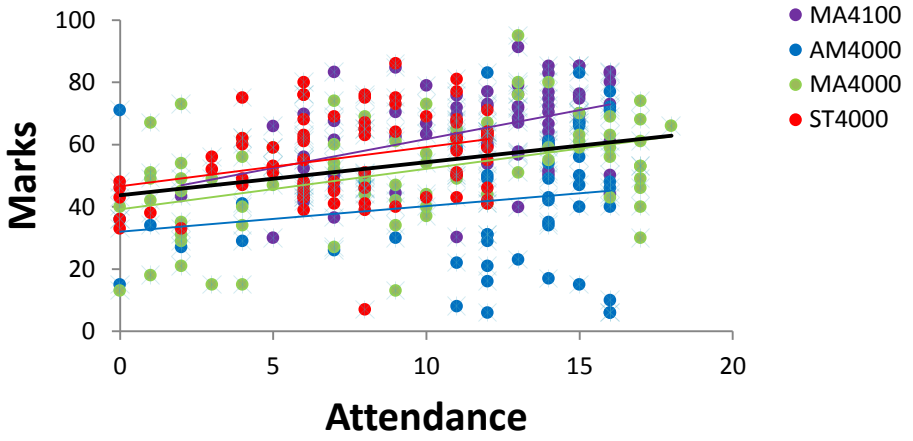
Testing the module slopes

Analysis of Variance

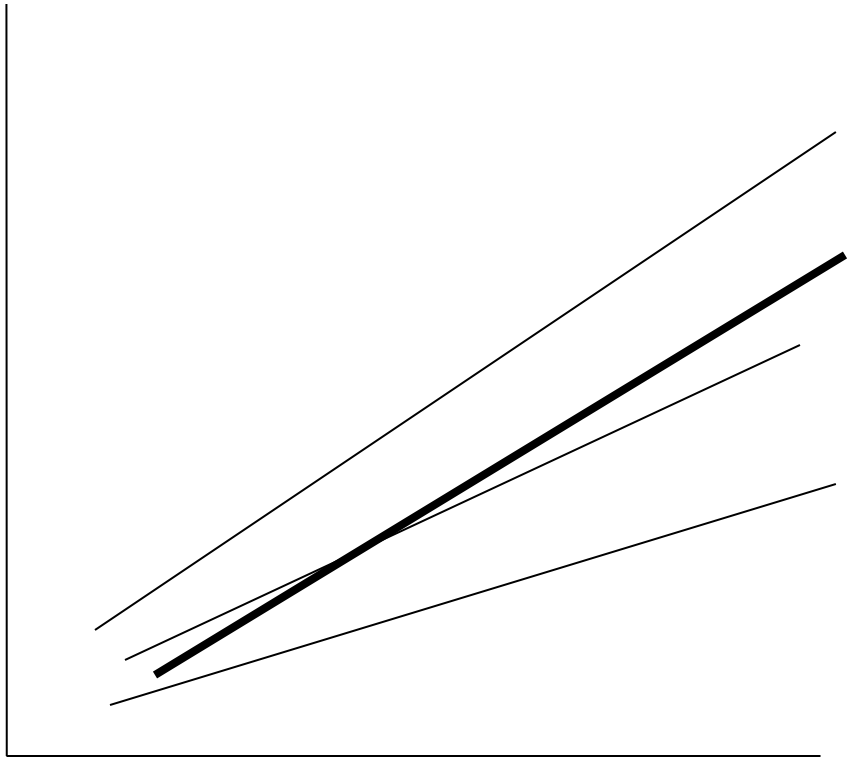
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Attendance	1	7564.6	7564.6	31.97	0.000
Module	3	1086.5	362.2	1.53	0.207
Attendance*Module	3	517.9	172.6	0.73	0.535
Error	273	64600.7	236.6		
Lack-of-Fit	51	10072.1	197.5	0.80	0.822
Pure Error	222	54528.6	245.6		
Total	280	90705.5			

Tests for difference between slopes – null

No difference between the slopes



To test whether the “slope of slopes” is significantly different to zero



$$\hat{Y}_{ij} = \hat{\beta}_{c}(X_{ij} - \overline{X}_{.j}) + \overline{Y}_{.j}$$

the common slope

NB not the same as the pooled slope

Source	*DF*	*Adj SS*	*Adj MS*	*F-Value*	*P-Value*
Attendance	1	8569	8568.8	36.32	0.000
Module	3	18713	6237.7	26.44	0.000
Error	276	65119	235.9		
Lack-of-Fit	54	10590	196.1	0.80	0.836
Pure Error	222	54529	245.6		
Total	280	90706			

Source	*DF*	*Adj SS*	*Adj MS*	*F-Value*	*P-Value*
Attendance	1	7564.6	7564.6	31.97	0.000
Module	3	1086.5	362.2	1.53	0.207
Attendance*Module	3	517.9	172.6	0.73	0.535
Error	273	64600.7	236.6		
Lack-of-Fit	51	10072.1	197.5	0.80	0.822
Pure Error	222	54528.6	245.6		
Total	280	90705.5			

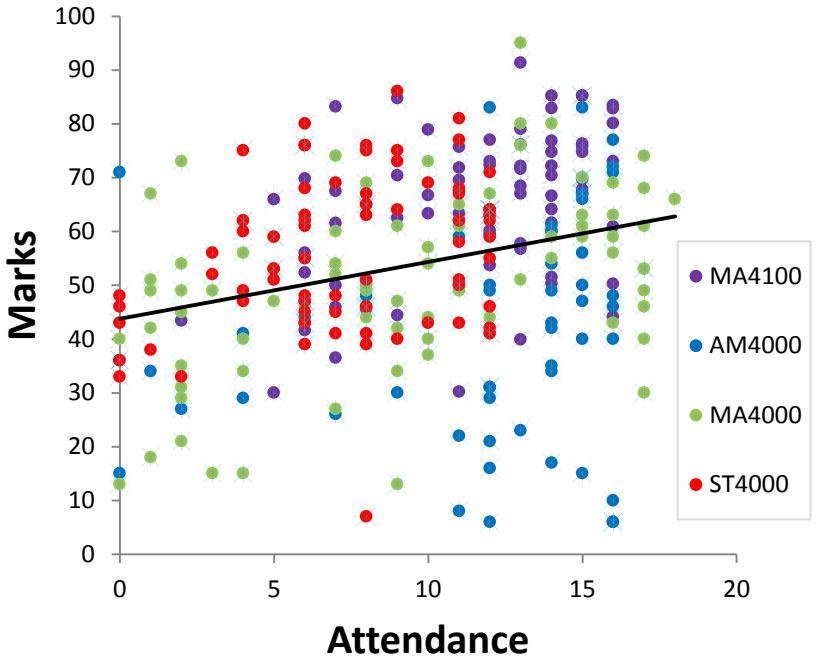
Within group partition

Source	*DF*	*Adj SS*	*Adj MS*	*F-Value*	*P-Value*
common slope	1	8569	8568.8	36.32	0.000
between slopes	3	517.9	172.6	0.73	0.535
pooled residuals	276	65119	235.9		
Within groups	280	74205.9			

$$SSE_{\text{common}} = \sum_m SS_{yy,m} - \frac{\left(\sum_m SS_{xy,m}\right)^2}{\sum_m SS_{xx,m}}$$

$$SSE_{\text{pooled}} = \sum_m \left[SS_{yy,m} - \frac{(SS_{xy})_m^2}{SS_{xx,m}} \right]$$

Significant – but large number of data points



Source	*DF*	*Adj SS*	*Adj MS*	*F-Value*	*P-Value*
common slope	1	8569	8568.8	36.32	0.000
between slopes	3	517.9	172.6	0.73	0.535
pooled residuals	276	65119	235.9		
Within groups	280	74205.9			

$$R^2_{adj} = 1 - \frac{SS_{res} / df_{res}}{SS_{tot} / df_{tot}} = 1 - \frac{65119 / 276}{74205.9 / 280}$$

$$R^2_{adj} = 0.11$$

Not a strong relationship

Conclusions

1. Relationship between final mark and attendance weak at best
2. Effect even weaker when interclass variability is accounted for
3. Partial completers will bias slope fitting
4. Low attenders tend to dominate relationship
5. Should any relationship be found, this should not be construed as causal
6. Poor attendance *might* be an indicator of poor engagement (though not necessarily – different students learn in different ways)

Thanks to

Paul Booth
James Denholm-Price
Terry Sithole
Peter Soan

Motivation
Why Maths students miss lectures

Clickers allowed occasional questions at the start of lectures about the course and their progress

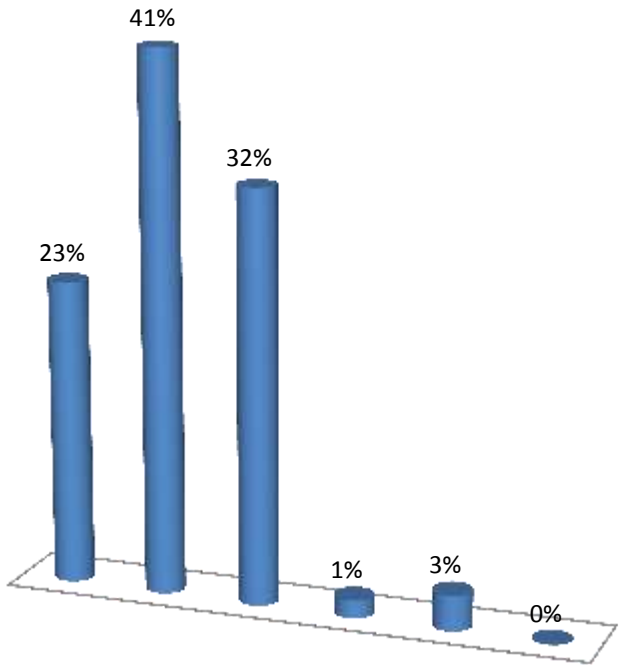
Students asked more detailed questions after a test 2014-15 — complete cohort

First week clicker questionnaire to first years.

How do you feel about doing a degree?

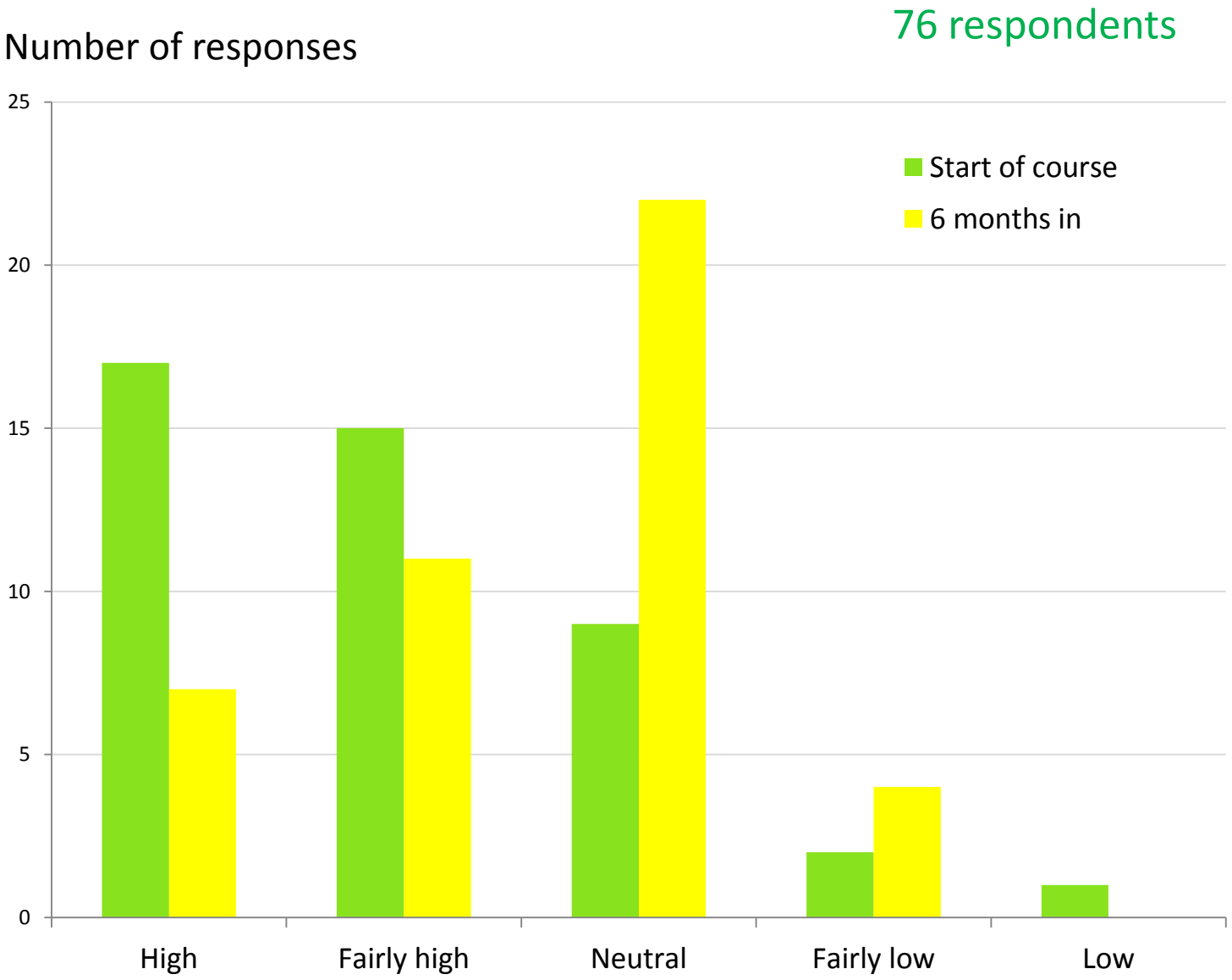
	Count	Percent
Brilliant – raring to go	17	23%
Good. Hopefully I'll cope	30	41%
A bit nervous but looking forward to it	23	32%
On the anxious side	1	1%
Not at all sure. Could be hard going	2	3%
Worried. Have I made a mistake?	0	0%

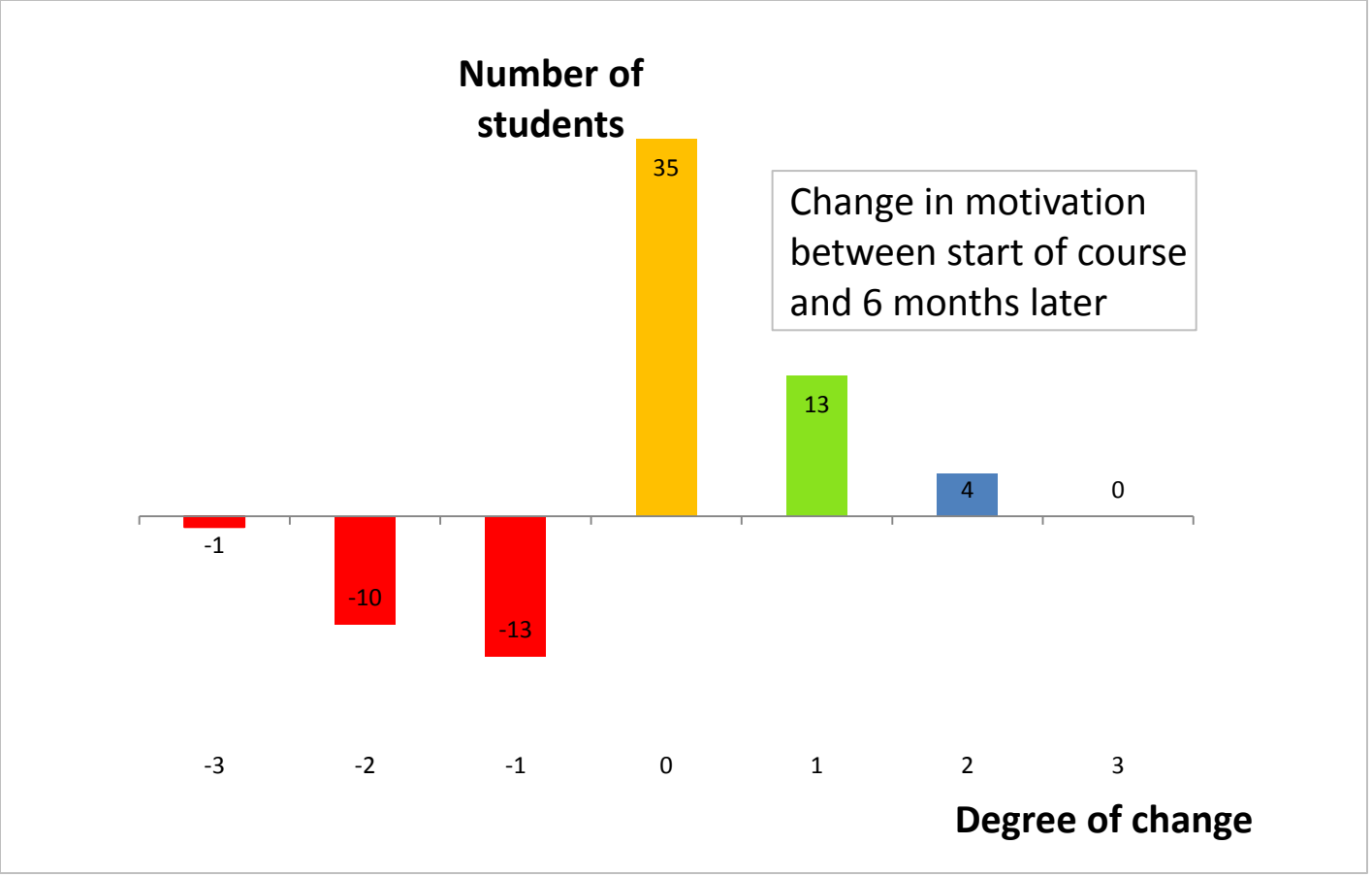
73 respondents

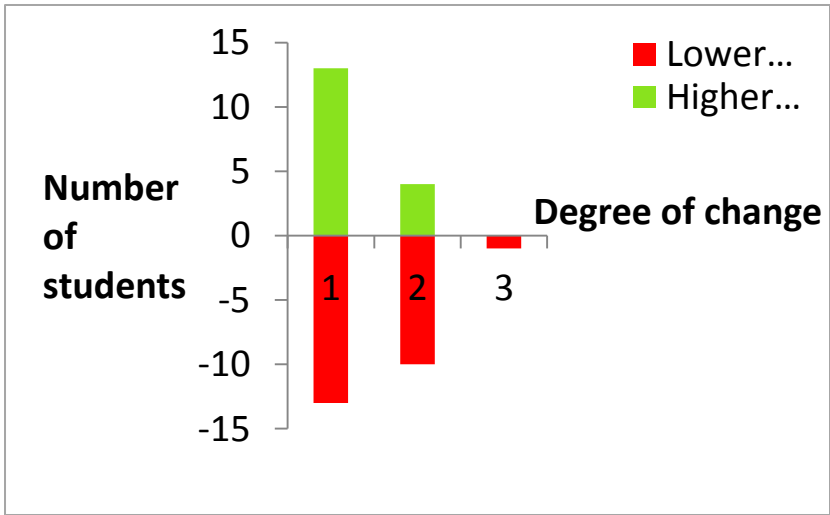


How motivation changes (after 6 months)

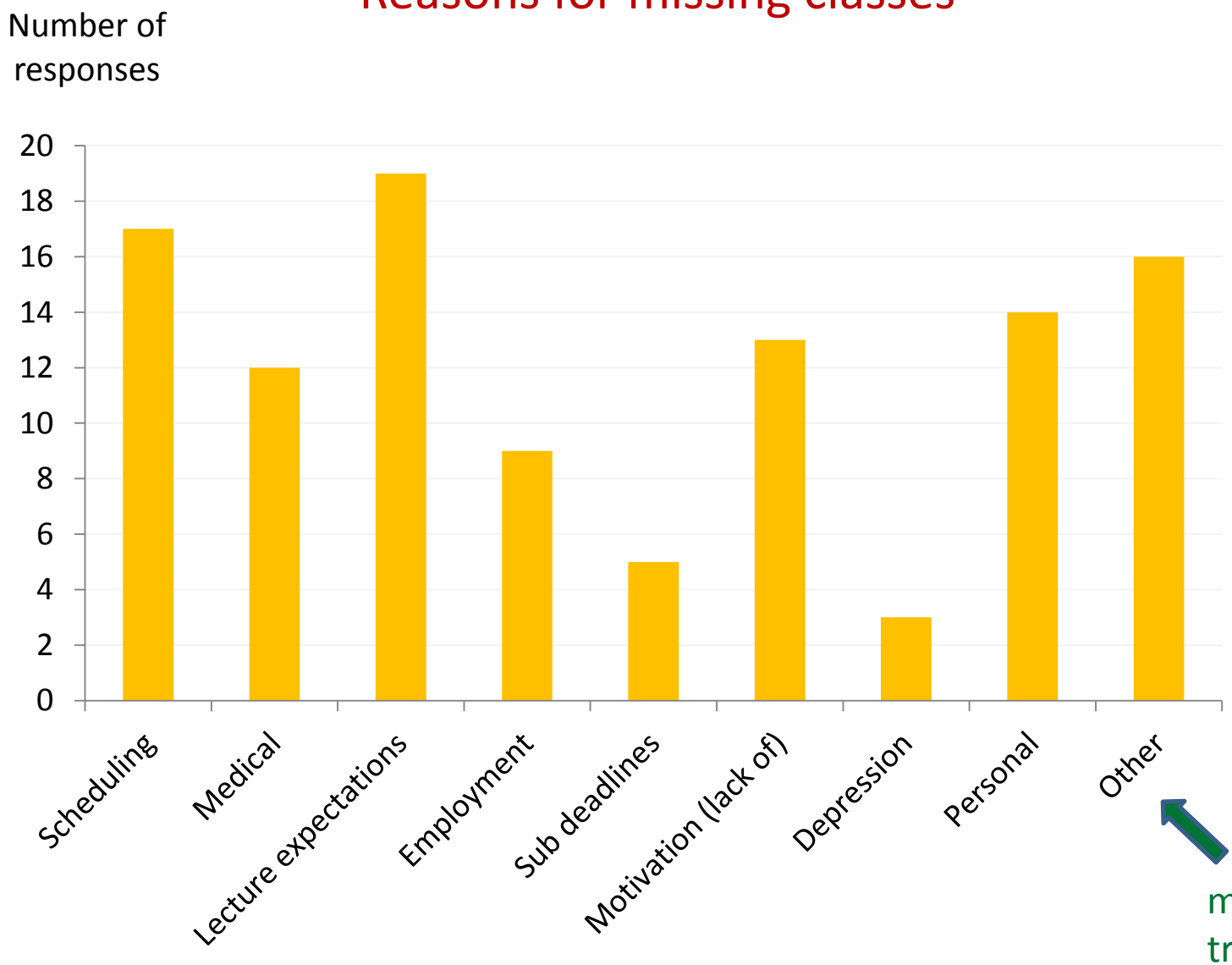
76 respondents




Number of students
Change in motivation between start of course and 6 months later
35
13
4
0
-1
-10
-13
-3
-2
-1
0
1
2
3
Degree of change


15
10
5
0
-5
-10
-15
Lower…
Higher…
Number of students
Degree of change
1
2
3

Reasons for missing classes

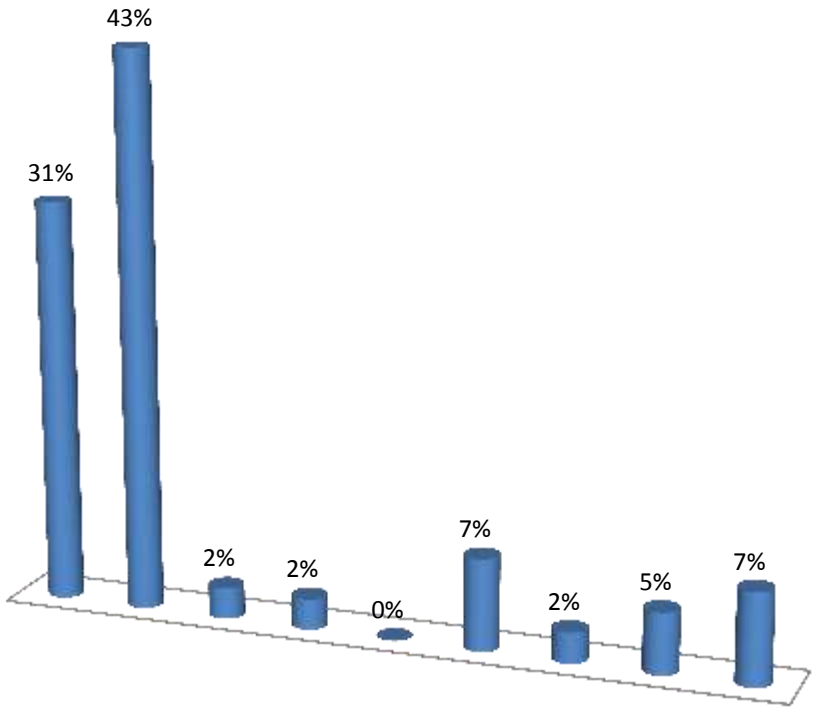


mainly travel time, delays

'My problem with Maths lectures is'

I have no substantial concerns	13	31%
They are delivered too quickly	18	43%
They are too slow	1	2%
They teach me nothing new	1	2%
They are just dull	0	0%
I can't understand them	3	7%
Lectures just don't suit me	1	2%
I don't like the lecturer	2	5%
Other	3	7%

42 respondents



Students' comments

Train delays

Content repeat from A levels

Travel distance

Travel costs

Just started own business

Stopped studying due to laziness

Homesick [*international student*]

Don't like 9am lectures

Observations from mini surveys and talking to students

Students hate scattered timetables

They often find lectures are delivered too quickly

Personal, medical, financial problems are common

They want lots of support, academic and pastoral (even though they don’t turn up to meetings with tutor)