Is there a relationship between the NBT, NSC and first year performance in selected problematic service courses?

An analysis of the 2011, 2012 and 2013 first year cohorts.

Presentation outline

- Objectives.
- Background.
- Methodology.
- Results.
- Discussion.
- Conclusion.
- Opportunities for future research.

Objectives

- To assess the nature of the relationship between NBT/NSC performance and first year performance.
- To develop regression models which predict course outcomes for students enrolled in the problematic service courses.
- To recommend suggestions for improving the course outcomes in the problematic service courses.

Background

- Previous academic performance is known to be the most significant predictor of University performance (Mckenzie and Schweitzer, 2010).
- UCT uses NBTs and NSC results for selection and placement of students.
- Not much attention has been paid to analysing the problematic service courses at UCT.

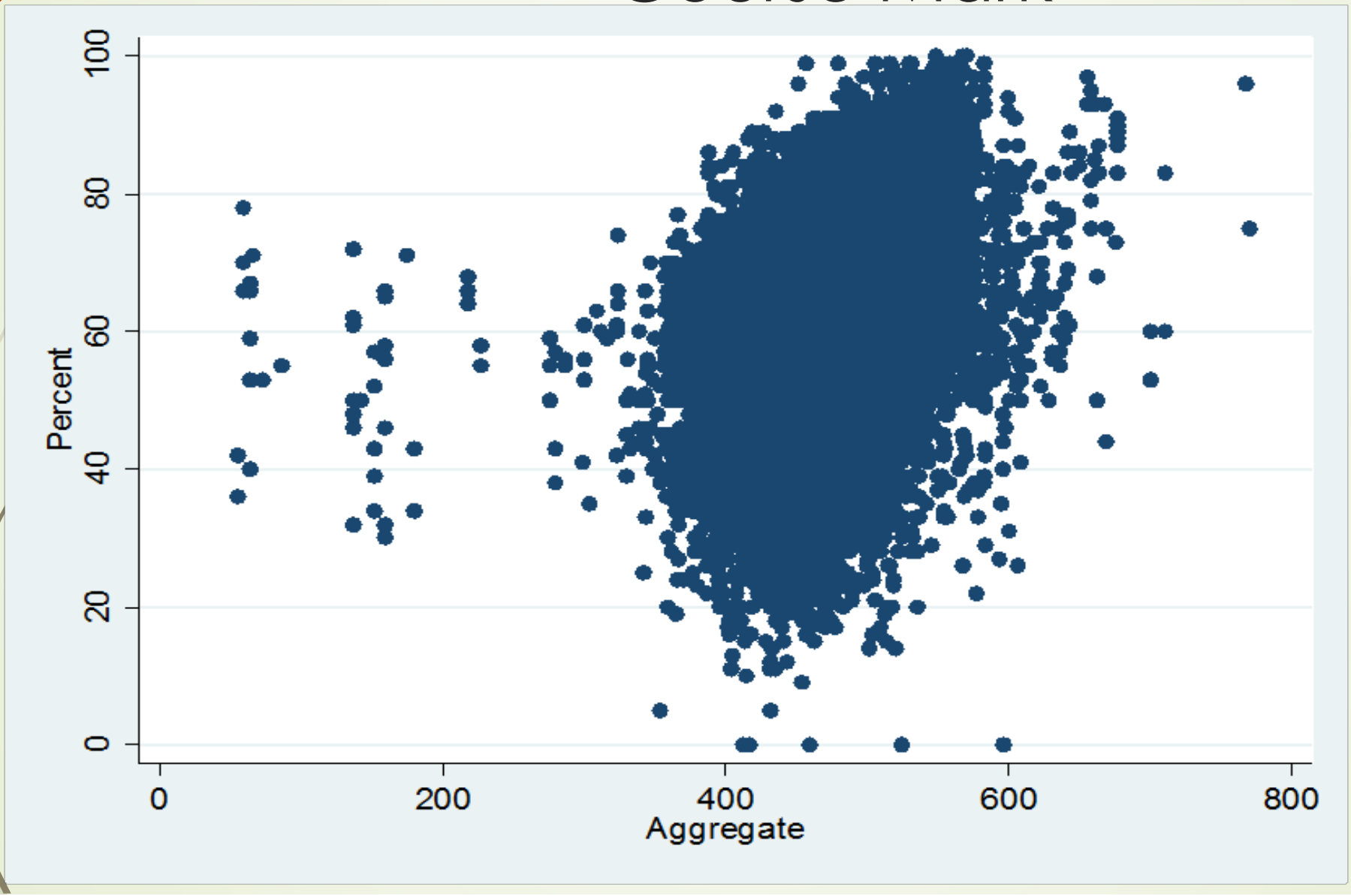
Methodology

- Data analysis software packages used:
  - STATA 14.
  - MS Excel.
- Statistical tests used:
  - Multiple linear regression.
  - Chi square test of association.
  - Box and Whisker plots.
- Regression model diagnostics were done using the following:
  - Linktest.
  - Omitted Variable Test.
  - Residual Plots.
  - Variance Inflation Factors.

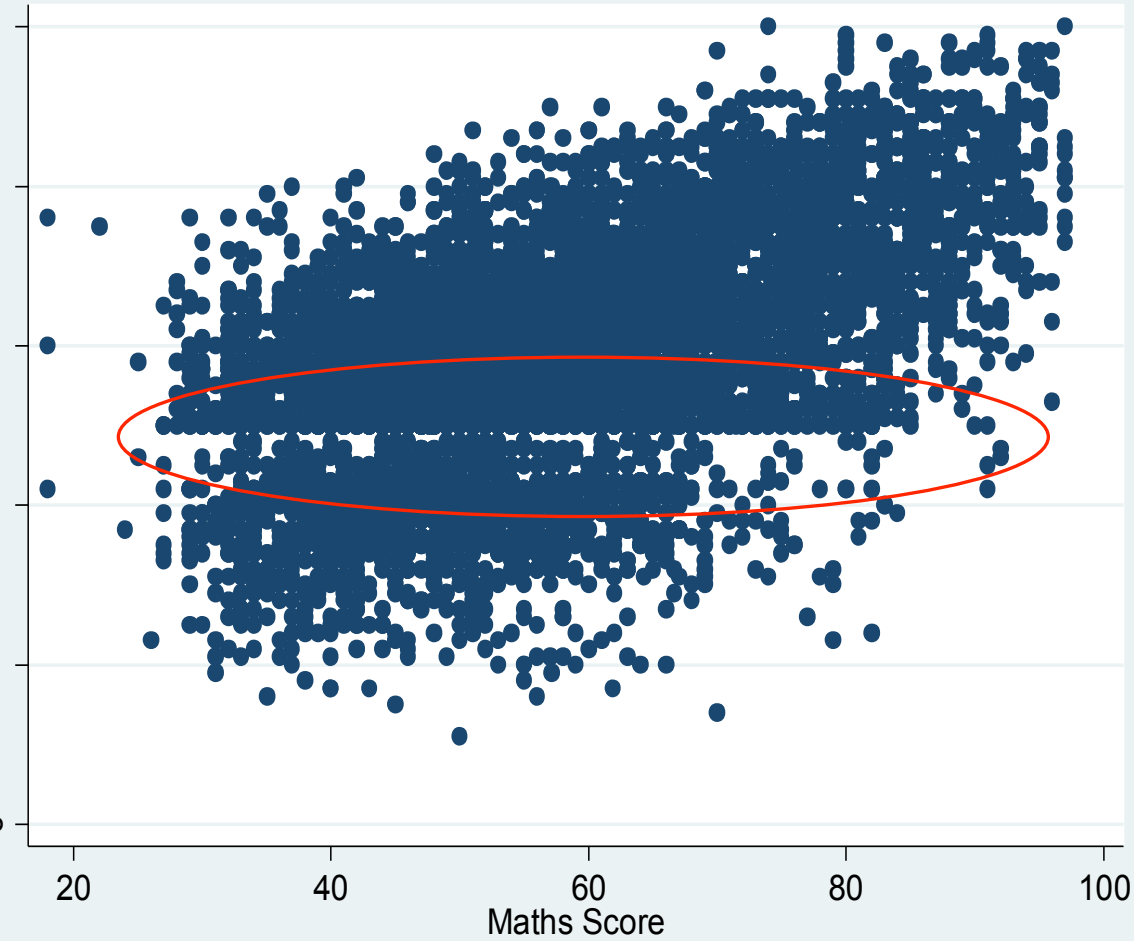
Results: Data description

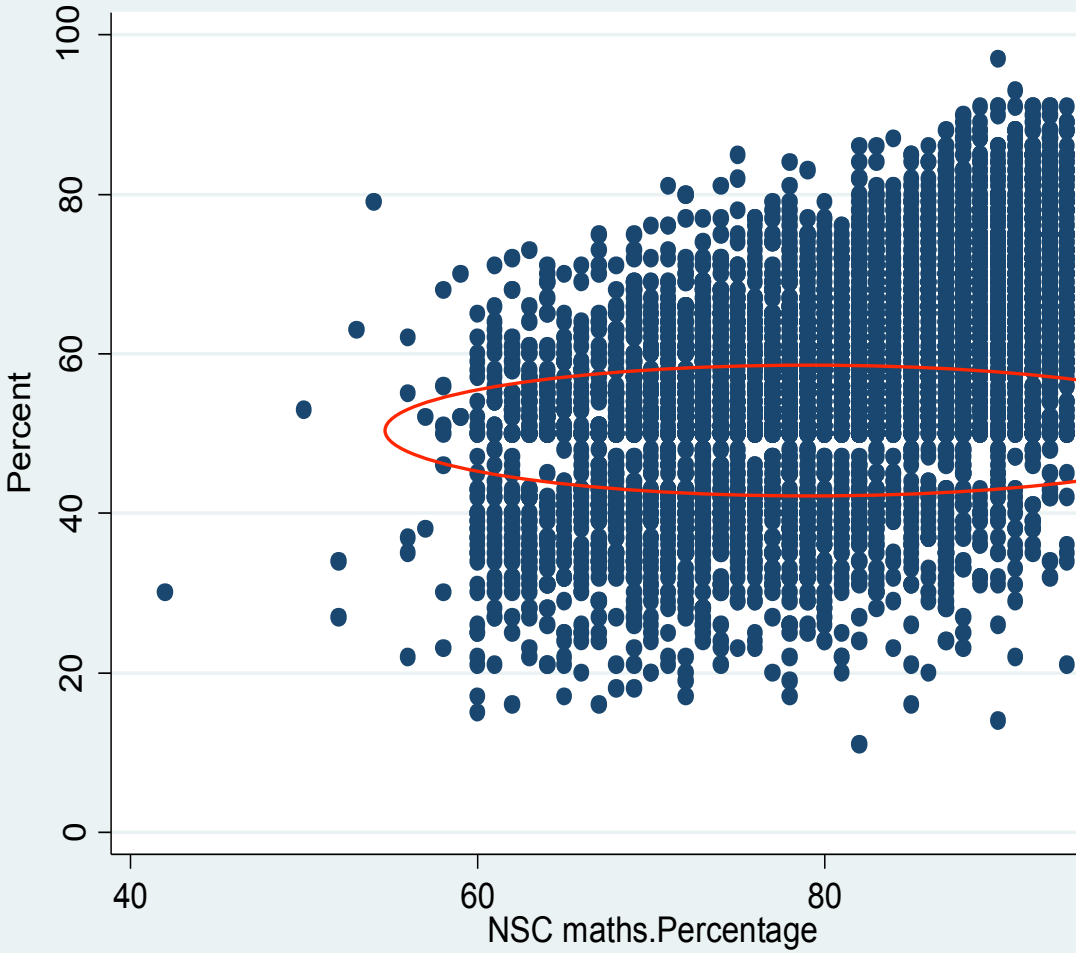
- 38 courses with consistently poor pass rates across 2011, 2012 and 2013 academic years were selected for the study.
- 29067 student final course marks from 38 courses.
- Of the 38 courses, 1 course with the highest number of students per faculty was selected for regression analysis.

Results: Scatter Plot: NSC Aggregate and Course Mark

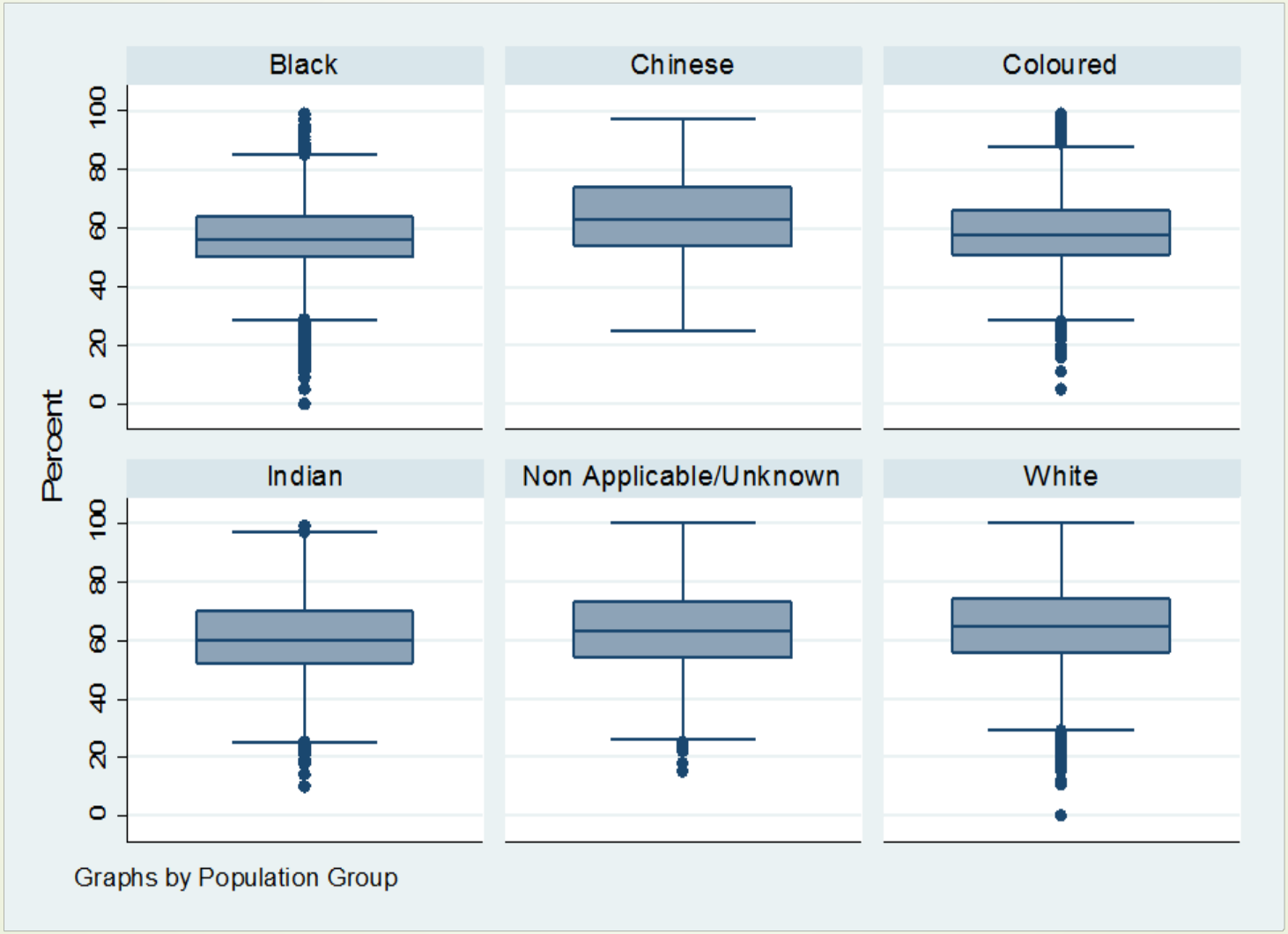


Commerce Faculty: Scatter Plot NBT Maths Score/NSC Maths against Course Mark





Results: Overall Performance by Population Group (Using the median and std deviation)



Results: Data Description – Selected Problematic Courses for Regression Analysis

ulty	Course Description	Course Code	Number o students i sample
nmerce	Mathematics 1000	MAM1000W	988
ineering	Chemistry for Engineers	CEM1008F	615
nce	Chemistry 1000	CEM1000W	1018
lth Sciences	Physics 1025	PHY1025F	682
nanities	Introduction to Psychology Part 1	PSY1004F	1291

Regression Models: Variables Used

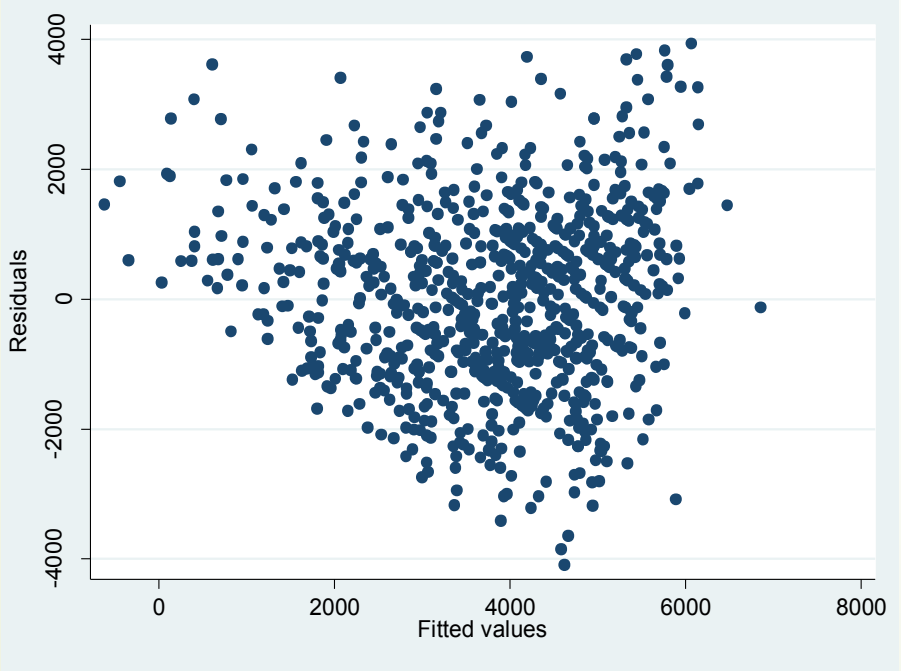
Variable	Description
Alscore	NBT Academic Literacy Score.
Qlscore	NBT Quantitative Literacy Score.
Mathsscore	NBT Mathematics Literacy Score.
NSC maths	National Senior Certificate Mathematics Score.
NSC English	National Senior Certificate English Score.
Aggregate	National Senior Certificate Score.
Regfac	Faculty of registration.
Population group	Population group e.g. Black, White, Indian, Coloured, Chinese, Unknown/Not Applicable (International).

Regression Model Output

Faculty	All Faculties	Commerce	Engineering	Science	Health	Humanitie
Models	**Model 1**	**MAM1000W**	**CEM1008F**	**CEM1000W**	**PHY1025F**	**PSY1004**
Observations	23,086	812	525	599	644	310
Adjusted R-squared	**0.294**	**0.453**	**0.342**	**0.434**	**0.552**	**0.441**

Model Diagnostics: MAM1000W

Omitted-Variable bias using the ovtest command



Linktest: regressing percent on predicted and predicted squared

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. linktest
```

Source	SS	df	MS	Number of obs	=	8
				F(2, 809)	=	403.
Model	1.4724e+09	2	736207645	Prob > F	=	0.00
Residual	1.4765e+09	809	1825100.12	R-squared	=	0.49
				Adj R-squared	=	0.49
Total	2.9489e+09	811	3636154.49	Root MSE	=	13

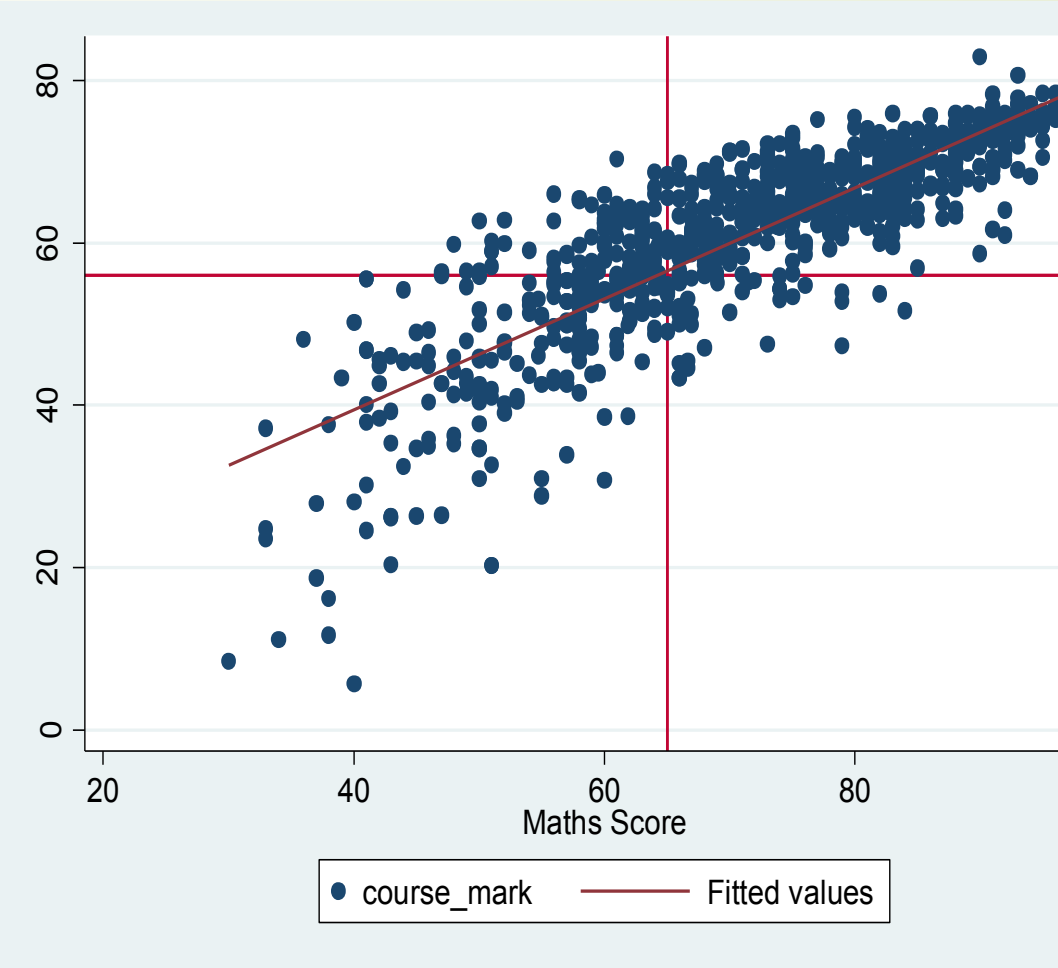
percent2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interva
_hat	-.2898416	.1532156	-1.89	0.059	-.5905886	.01090
_hatsq	.0001906	.000022	8.67	0.000	.0001474	.00023
_cons	1839.218	258.3678	7.12	0.000	1332.068	2346.3

Regression Model Output

- **Mathematics 1000 (MAM1000W), Chemistry for Engineers (CEM1008F) and Chemistry (CEM1000W)** models showed that **NBT Mathematics, NSC Mathematics and the NSC Aggregate** have **statistically significant positive relationships** with the **course mark** ($p<0.01$).
- **Physics 1025** model showed that **Quantitative Literacy, NBT Mathematics, NSC Mathematics and the NSC Aggregate** have statistically significant positive relationships with the course exam mark ($p<0.01$).
- **Intro to Psychology Part 1 (PSY1004F)** regression model showed that **NSC English and NSC Aggregate Score** had statistically significant positive relationships ($p<0.01$) with the course outcome.
- **NSC Aggregate** showed a statistically positive relationship for all 5 courses assessed.

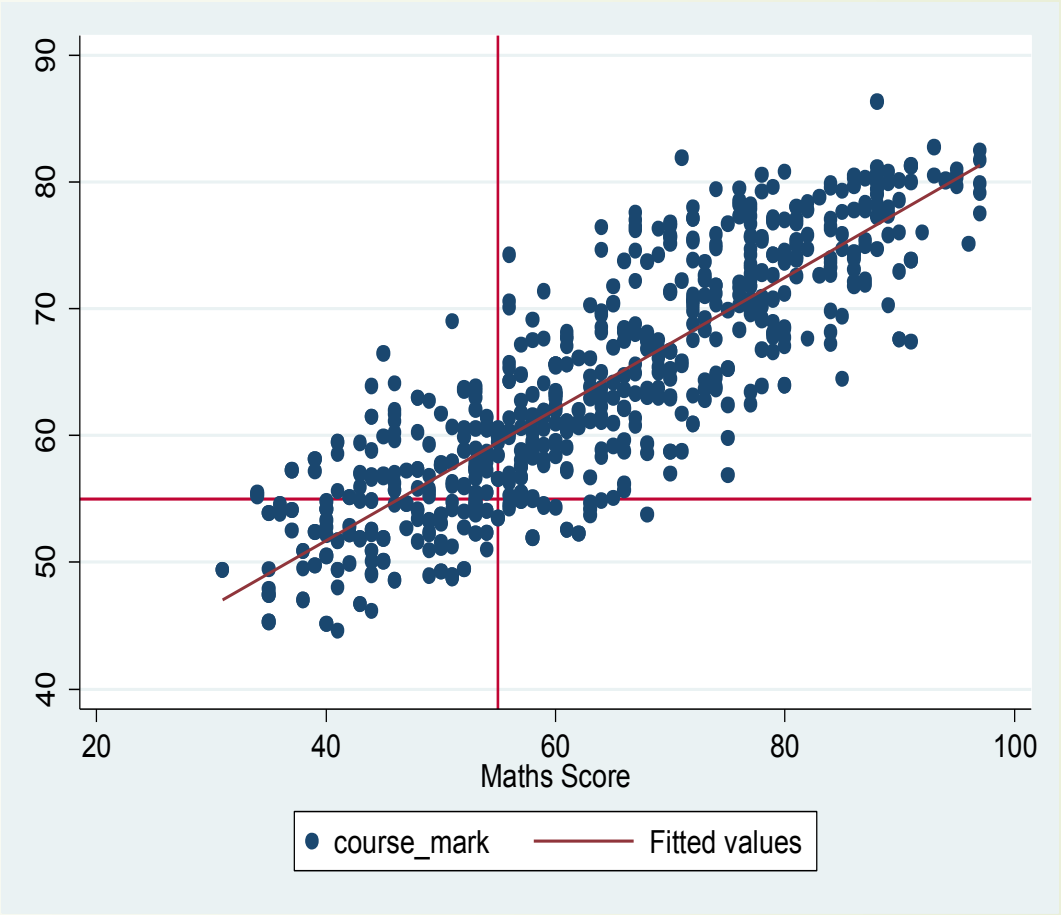
Results: Predicted Course Marks for MAM1000W

Taking **55%** as the significant pass mark, the predicted exam mark from the **MAM1000W regression model** showed that students with an NBT maths score of **less than 65% are more likely to fail**.



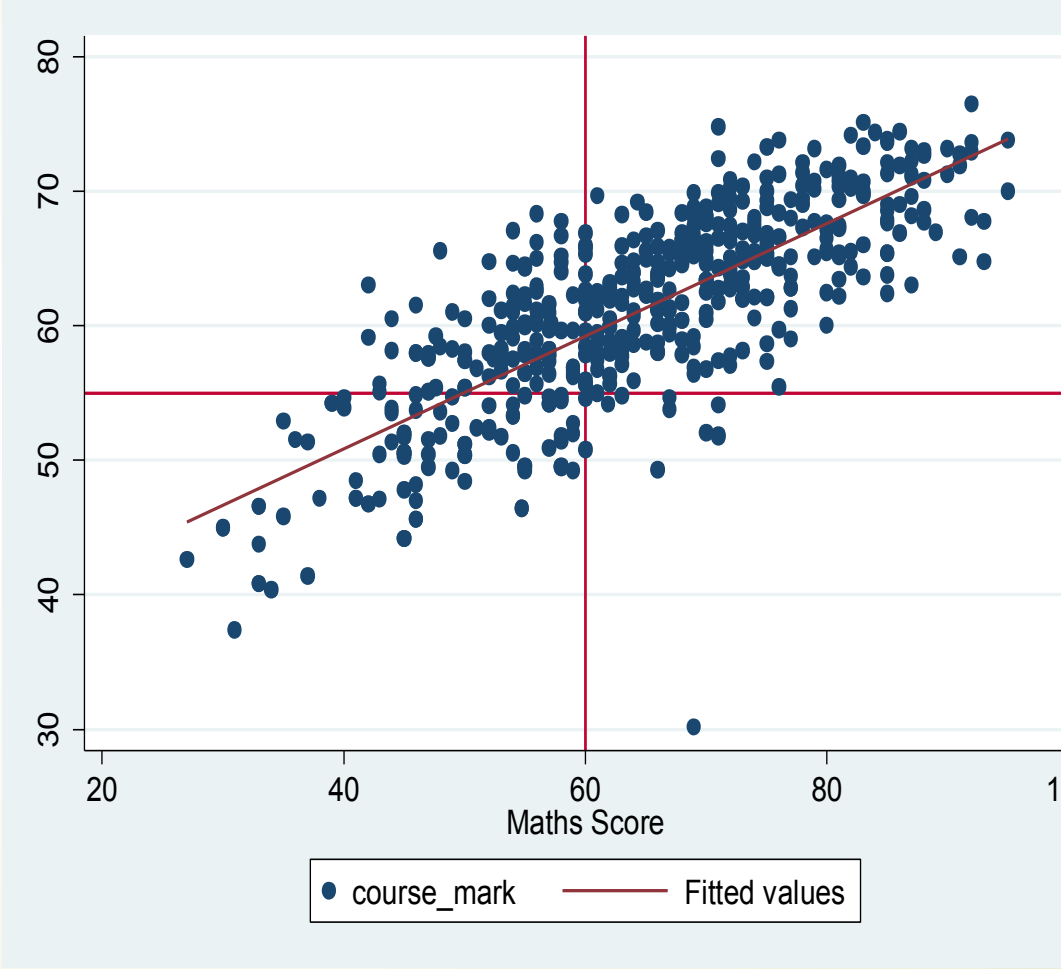
Results: Predicted Course Marks for PHY1025

Taking **55%** as the significant pass mark, the predicted exam mark from the **PHY1025 regression model** showed that students with an **NBT maths score** of **less than 55% are more likely to fail**.



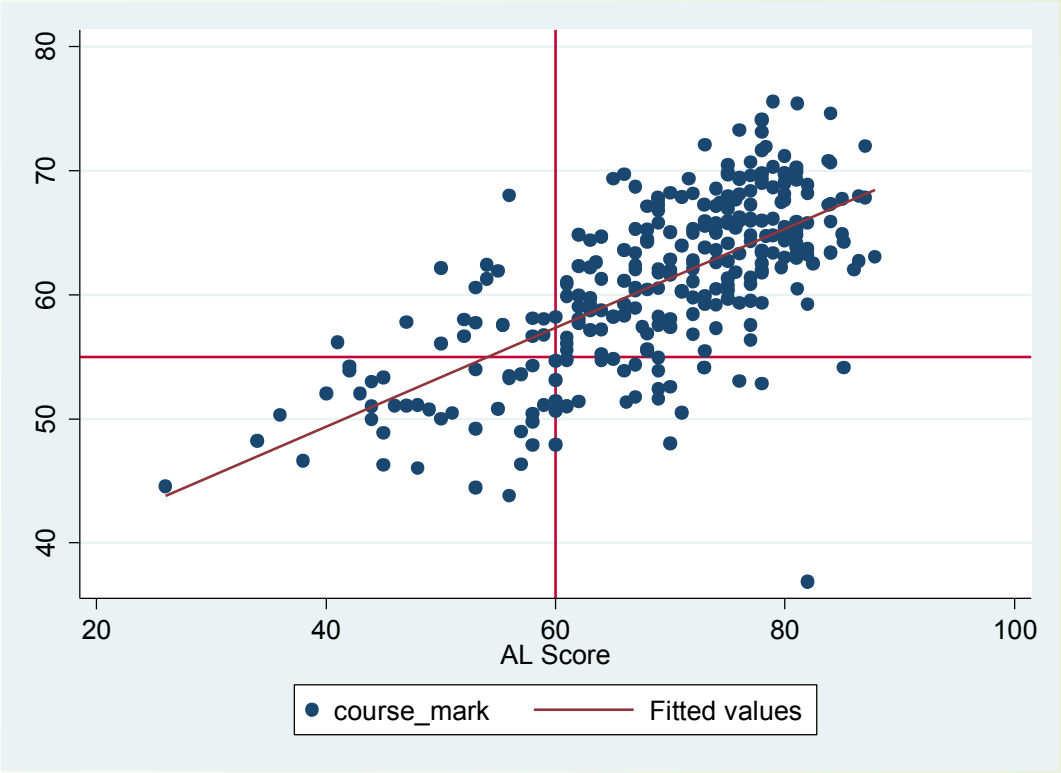
Results: Predicted Course Marks for CEM1008F

Taking **55%** as the significant pass mark, the predicted exam mark from the **CEM1008F regression model** showed that students with an **NBT maths score** of **less than 60% are more likely to fail**.



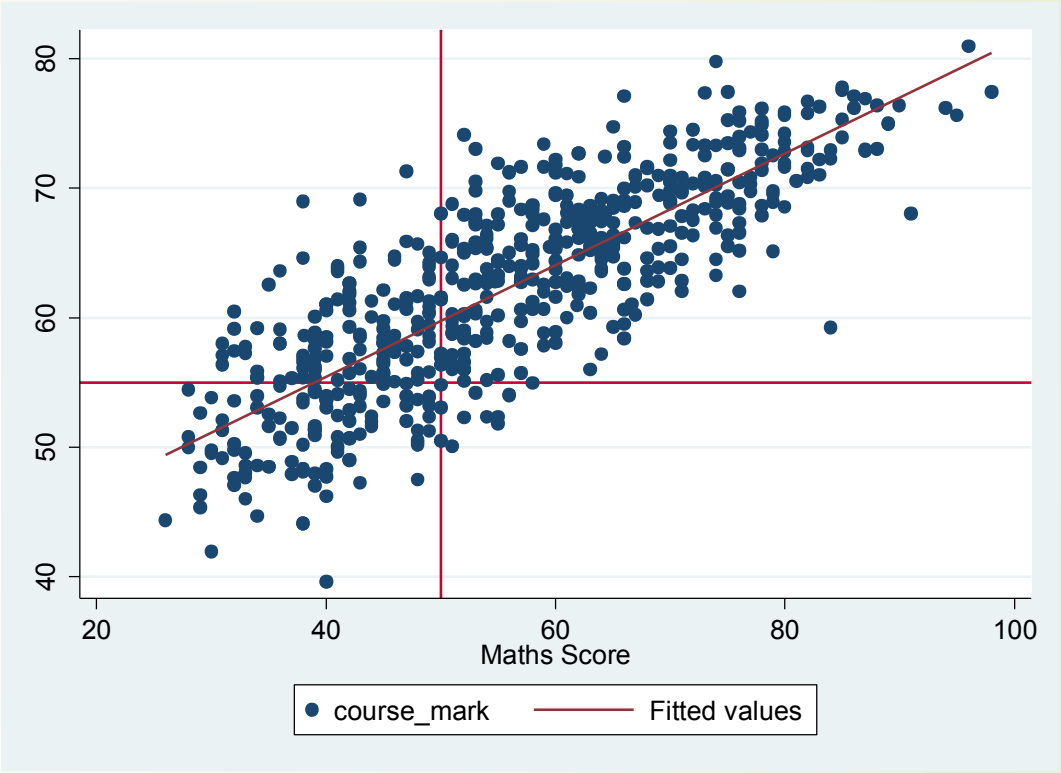
Results: Predicted Course Marks for PSY1004F

Taking **55%** as the significant pass mark, the predicted exam mark from the **PSY1004F regression model** showed that students with an **NBT AL score** of **less than 60% are more likely to fail**.



Results: Predicted Course Marks for CEM1000W

Taking **55%** as the significant pass mark, the predicted exam mark from the **CEM1000W regression model** showed that students with an **NBT maths score** of **less than 50% are more likely to fail**.



Discussion

- NBT Maths and NSC Maths are important predictors of performance in problematic in Commerce, Science and Engineering Faculty service courses.
- Students with less than 60% (or NBT proficiency level) in NBT/ NSC maths should be discouraged from taking these challenging courses.
- Regression models could explain about 40% of the variation in course mark suggesting that other social variables needed in all the models.

Conclusion

- There is a strong relationship between NBT, NSC and First year performance in problematic courses.
- Performance in NBT Mathematics and NSC Mathematics is a useful predictor of first year performance in selected quantitative service courses.
- Additional social variables such as integration into university, self-efficacy, and employment responsibilities need to be investigated to broaden the understanding of student performance in problematics courses.
- Students with poor NBT and NSC scores should be encouraged to enrol in foundation extended degree programmes and/or slower paced versions of courses such as Mathematics 1.

Areas for further research

- Include social variables such as integration into university, self-efficacy, and employment responsibilities.
- Use a short survey or focus group discussion with students in theses courses.
- Course combinations for students doing these problematic courses need to be investigated to see if they have an effect on the performance trends observed.
- Curriculum review.

The End

Questions