

# Adaptive Formative Assessment in Econometrics for Undergraduate Students

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## Introduction.

In this article, the intended learning outcomes and currently employed methods of assessment and feedback in two undergraduate modules will be reviewed – the modules in question being two “quantitative” modules - *Introduction to Econometrics* and *Applied Statistical Methods*. In the process, some key academic literature on formative assessment will be examined and recommendations made for enhancements to the learning process in these particular modules. The enhancements consist of a series of diagnostic and adaptive formative assessment activities that were originally inspired by the deliberations that occurred during a group project undertaken as part of a professional learning and teaching course at London Metropolitan University. The ideas produced in that forum were later refined by the author in discussion with colleagues and are presented here.

## Module learning outcomes and current methods of assessment.

The undergraduate modules in question are, at the time of writing, delivered as semester-long sequences of lectures, seminars and computer lab sessions<sup>1</sup>. Those forms of learning and teaching activity reflect the strong emphasis placed on the content of the three intended learning outcomes that are shared by both modules. They may be summarised as follows:

1. Knowledge and understanding of econometric techniques
2. Ability to apply these techniques to problems of economics and social sciences;
3. Familiarity with dedicated econometric software to implement these techniques and interpret the achieved computational results.

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<sup>1</sup> While the length of the modules may vary in future, the structure is likely to remain broadly the same

Learning outcomes (1) and (2) can only be achieved on the basis of regular practice in problem solving that involves dealing with abstract mathematical models. Therefore, a high level of diversity of student mathematical background presents an important challenge in the teaching econometrics at London Metropolitan University. Whereas some students have studied Mathematics to 'A' level and are familiar with advanced techniques, a substantial part of the student group struggles with very basic algebraic and statistical methods. This problem is even more pronounced among students that take the *Applied Statistical Methods* module. Furthermore, success in meeting learning outcome (1) is also a function of regular attendance and reading of the required literature. In summary then, three elements define student performance on these modules:- regular problem solving, attendance and regular – appropriate - reading. Forms of assessment that engage students in 'keeping up' with the syllabus for these modules, a syllabus that develops and unfolds weekly, should support those three elements.

The current specification for the modules in question provides for assessment consisting of two components: (a) coursework in the form of an applied computational assignment that is due in week 9, carrying a weight of 40% and (b) a final written closed-book exam with a weight of 60%. So, whereas the coursework provides some opportunity for giving feedback to students prior to the final exam - thus exhibiting some element of formative assessment - albeit in a very limited way - the final exam is clearly and only summative. There is, therefore, complete lack of alignment between the requirements of the modules for continuous and formative forms of assessment and the actual assessment regime that allows for only very limited formative engagement.

Again, a closer examination of the three elements of student performance as indicated above, would suggest that a well-aligned assessment regime for these modules needs to contain not only formative feedback opportunities but also, right at the outset, some form of diagnostic assessment in order that formative opportunities may be targeted. However, the current module specification does not allow for substantial diagnostic or formative assessment.

In practice, I have made several attempts to mitigate this lack of alignment by offering a diagnostic multiple-choice test on mathematical and statistical prerequisites in the first seminar session combined with short problem-oriented quizzes in later sessions – these are, essentially, opportunities for formative feedback. Unfortunately, most students showed their unwillingness to engage in these tests in any active way, believing (quite correctly) that the test results would not have any impact on their final mark. This experience arguably shows the need for a closer connection between formative and summative assessment.

## **Formative assessment.**

In accordance with the Quality Assurance Agency for Higher Education (QAA) code of practice for student assessment, cf. QAA (2006)<sup>2</sup>, the assessment process has four main purposes: pedagogy, measurement of student knowledge, marking and certification. The currently implemented methods of assessment in econometrics with their focus on summative feedback meet the latter three purposes. However, the pedagogic purpose, namely providing students with formative feedback in order to identify and improve their achievement is not embedded in the currently employed assessment framework.

Formative assessment is defined as the assessment that gives students feedback and thereby enables students to see how well they are progressing, see Norton (2009). Alternatively, Black and Wiliam (1998) define formative assessment as all those activities undertaken by teachers and by their students that provide information to be used as feedback to modify the teaching and learning activities in which they are engaged. Summative assessment on the other hand, involves measuring what has been learned up to the point of assessment – it's scope is wider and more diffuse. Atkin et al. (2001) argue that almost all theories of learning that bear on formative assessment are “consistent with the teacher helping the student operate within a framework of three guiding questions:

1. Where are you now? (assess, or help the student to self-assess, current levels of understanding and performance)
2. Where are you going to? (identify and communicate the required learning and performance goals)
3. How can you get there? (help the student with strategies and skills to reach the goal by bridging the gap between 1. and 2.)”

Sadler (1989) shows that formative assessment provides a link between the second point, the assessment in general, and the third point, actions of the teacher. This framework can be seen as what underpins the concept of combining formative and summative assessment across the modules and it is that which is a recommendation for how greater alignment can be created in the modules in question. The implications of this, for practice, are discussed in the following section.

## **Proposal of an adaptive formative assessment and the implications for future teaching practice.**

In order to overcome the issues of lack of alignment identified earlier, it is proposed that diagnostic as well as adaptive formative assessment should complement the

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<sup>2</sup> Now UK Quality Code for Higher Education; Chapter B6: Assessment of students and accreditation of prior learning (2011) - <http://tinyurl.com/c9a6po7>

current assessment methods. If that were to happen, assessment in the modules (*Introduction to Econometrics* and *Applied Statistical Methods*) would be organised as follows.

Firstly, students would be required to take part in a diagnostic exercise in the first seminar session. That would help the module leader, tutors and students to identify what activities, content etc. would be necessary to close gaps in mathematical knowledge and understanding within a short period of time. Following this initial diagnostic assessment, students with lower scores would obtain detailed, targeted guidance from the module leader and tutors. Chappuis (2005) indicates that the essential step in making formative assessment work is to keep students in touch with what they can do to close the gap between where they are now and where they need to be. The diagnostic exercise is a requisite initial step of this adaptive formative assessment process.

Starting from week 2, students would be required to participate in periodic formative assessment activities that could take various forms:

- (i) submission of short problem sets that are marked and returned the following week,
- (ii) multiple-choice quizzes that can be attempted on WebLearn and marked automatically,
- (iii) empirical problems to be solved in computer lab sessions with immediate feedback from the tutor.

The first two forms can be considered as possible substitutes for each other. In the case of large student groups, assessment of written work on a weekly basis, that reflects the process of deep learning can become time-consuming and thus unfeasible. For that reason, multiple-choice quizzes might be a better option even though they have been subject to some criticism on the grounds that their design and preparation are time-intensive and it is difficult to assess deeper learning in that way, (Brown et al. – 1997 - p. 84)

One additional form of formative assessment that could be introduced has received no discussion in the literature, and it is this:- students could be offered an opportunity to suggest problems or questions for the final written exam for consideration by the module leader. This would help motivate students to actively engage in the learning process and persuade them, perhaps, to engage in reflection on feedback received. If those were to happen, it would have a significant effect on learning and communication among students as well as between students and teachers.

The grades for the components of the formative assessments need not necessarily enter the calculation of the final grade of the module (although it remains a possibility). However, in order to encourage students to participate in such

assessment activities on a regular basis, they would be required to attempt at least 75% of the formative assessments activities and reflect on their outcomes in order to take part in the summative assessment (coursework and final exam).

## Summary and Conclusion

Based on the main features of formative assessment, it is proposed that the current assessment activities (and thus the learning environment of students) be expanded to include a series of diagnostic and adaptive formative assessments aimed at increasing student attendance, involvement and understanding. This would be achieved through continuous assessment in the form of short written or computer-based assessments during the teaching term. If the assessment were computer-based, then students could be provided with immediate feedback. The assessment would not be marked but students' participation and reflection on received feedback would be a prerequisite for their participation in the final exam. The series of assessments would be 'adaptive', since each new assessment will reflect the outcome of those previous.

The proposed system of assessment will motivate the students to engage in the learning process without the intimidation of the grading process and improve communication between students and teachers, thereby creating new opportunities for regular student feedback and self-assessment of module leaders and tutors.

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