Stevens Institute of Technology

School of Business

**AACSB
ASSURANCE OF LEARNING**

**Master of Science in**

**Financial Engineering**

 **(FE)**

**LEARNING GOAL # 3**

**Students will achieve mastery of the foundational computational methods required for derivative pricing in Financial Engineering.**

**Responsibility: Sveinn Olafsson**

May 2022

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# 1. INTRODUCTION: LEARNING GOAL #3

*Students will achieve mastery of the foundational computational methods required for derivative pricing in Financial Engineering.*

This goal is assessed in the “practicum” course FE 621 Computational Methods in Finance which is a required course in the FE curriculum. This learning goal requires students to think analytically and to synthesize material from other courses in the curriculum.

The assessment takes place in the form of assignments and exams throughout the semester.

# 2. LEARNING OBJECTIVES AND TRAITS

|  |  |
| --- | --- |
| **FE 3:** | **Learning Goal, Objectives and Traits** |
| GOAL | Students will achieve mastery of the foundational computational methods required for derivative pricing in Financial Engineering. |
| **Objective 1:** | *Students will demonstrate the capability of implementing modern financial derivative pricing models.*  |
| **Traits** |   |
| Trait 1: | The students will implement various tree approximation methods. |
| Trait 2: | The students will implement PDE discretization methods to calculate derivative prices.  |
| Trait 3: | The students will demonstrate understanding of transformation methods to solve PDE’s as well as calibrate stochastic processes to real data. |
| Trait 4: | Students will demonstrate the ability to approximate derivative prices using Monte Carlo simulations. |
| Trait 5: | The students will demonstrate the ability to write, compile, and execute computer programs to solve the problems in the course.  |

# 3. RUBRICS

|  |
| --- |
|  **FE LEARNING GOAL - 3: RUBRIC 1** |
| **FE 3** | Students will achieve mastery of the foundational computational methods required for derivative pricing in Financial Engineering. |
| **Objective 1** | *Students will demonstrate the capability of implementing modern financial derivative pricing models.*  |
|   | **Trait** | **Poor** | **Good** | **Excellent** | **Score** |
|   | **Value** | **0** | **5** | **10** |  |
| Trait 1: | The students will implement various tree approximation methods. | Poor understanding of tree approximation methods | Sufficient understanding of tree approximation methods | Excellent understanding of tree approximation methods |   |
| Trait 2: | The students will implement PDE discretization methods to calculate derivative prices.  | Poor understanding of finite difference methods | Sufficient understanding of finite difference methods | Excellent understanding of finite difference methods |   |
| Trait 3: | The students will demonstrate understanding of transformation methods to solve PDE’s as well as calibrate stochastic processes to real data. | Poor understanding of transformation methods and calibration | Sufficient understanding of transformation methods and calibration | Excellent understanding of transformation methods and calibration |   |
| Trait 4: | Students will demonstrate the ability to approximate derivative prices using Monte Carlo simulations. | Poor understanding of Monte Carlo Methods | Sufficient understanding of Monte Carlo Methods | Excellent understanding of Monte Carlo Methods |   |
| Trait 5: | The students will demonstrate the ability to write, compile, and execute computer programs to solve the problems in the course.  | Inability of writing a functional computer program  | Ability of writing a functional computer program  | The computer programs works with a variety of data and it solves all the problems accurately |  |
| **Criterion: Does not meet expectations: 0-19; Meets: 20-34 ; Exceeds: 35-50** |

# 4. ASSESSMENT PROCESS

|  |  |  |
| --- | --- | --- |
| **Where & when measured?** | **How measured?** | **Criterion** |
| Assessed in the spring in FE 621 *Computational Methods in Finance*.  | Assignments, exams, and quizzes over the course of the semester.  | Passed at 60% |

The FE program assesses these skills in FE621 Computational Methods in Finance. This takes place by looking at students exams and homeworks.

# 5. RESULTS OF LEARNING GOAL ASSESSMENT - INTRODUCTION

The results of the initial learning goal assessments carried out to date are included below.

**Explanation of Direct Measurements**

Each learning goal has a number of learning objectives, and performance on each objective is measured using a rubric that, in turn, contains a number of desired “traits.” Students are scored individually on each trait.

The grading sheets for each student are used to develop a Summary Results Sheet for each learning goal objective. A selection of these summaries is included below.

The first table in the Summary Results Sheet for a learning objective/trait gives the counts of students falling in each of the three categories:

* Does Not Meet Expectations
* Meets Expectations
* Exceeds Expectations

The right-hand column in the table is used to record the average score of the students on each trait. This table provides an indication of the relative performance of students on each trait.

The second table on each sheet provides the counts of students who fall in each of the above three categories for the overall learning objective.

The person doing the assessment provides explanatory comments and recommendations on the bottom of the Results Summary Sheet. The recommendations improve content or pedagogy changes for the next time the course is given.

**Explanation of Indirect Measurements**

N/A 6. Assessment Spring 2022:

## The direct measurement is the written assignment

1. N/A

# RESULTS OF ASSESSMENT: Spring 2022

**LEARNING GOAL # 3:** Students will achieve mastery of the foundational computational methods required for derivative pricing in Financial Engineering.

**LEARNING OBJECTIVE #1:**
*Students will demonstrate the capability of implementing modern financial derivative pricing models.*

**ASSESSMENT DATE: 05/15/22**

**ASSESSOR: Sveinn Olafsson**

**NO. OF STUDENTS TESTED: 20 (on campus) + 31 (online)**

**COURSE: FE 621**

|  |  |  |
| --- | --- | --- |
|  | **Number of Students** |  |
| **Learning Goal Traits** | **Not Meet Expectat-ions** | **Meet Expectat-ions** | **Exceed Expectat-ions** | **Avg. Grade on Trait** |
| The students will implement various tree approximation methods. | 1 / 4 | 15 / 19 | 4 / 8 | 8.2 / 7.9 |
| The students will implement PDE discretization methods to calculate derivative prices.  | 1 / 4 | 15 / 19 | 4 / 8 | 8.2 / 7.9 |
| The students will demonstrate understanding of transformation methods to solve PDE’s as well as calibrate stochastic processes to real data. | 1 / 4 | 15 / 19 | 4 / 8 | 8.2 / 7.9 |
| Students will demonstrate the ability to approximate derivative prices using Monte Carlo simulations. | 1 / 4 | 15 / 19 | 4 / 8 | 8.2 / 7.9 |
| The students will demonstrate the ability to write, compile, and execute computer programs to solve the problems in the course.  | 1 / 4 | 15 / 19 | 4 / 8 | 8.2 / 7.9 |
| **Average Grade (Maximum 10)** | 8.2 / 7.9 |

**Criterion: Does not meet expectations: 0-6; Meets: 7-8; Exceeds: 9-10**

|  |  |  |  |
| --- | --- | --- | --- |
|   | **Not meet Expectations** | **Meets Expectations** | **Exceeds Expectations** |
| **Total Students by Category***(Based on Average score across all traits)* | **1 / 4** | **15 / 19** | **4 / 8** |
| **Students meeting or exceeding expectations:** | **19 / 27** |

**COMMENTS: The ability of students to present their thoughts and numerical results in a clear and understandable way is lacking.**

**REMEDIAL ACTIONS:**

# 7. Outcomes from Previous Assessments:

The following table shows the average scores on each goal objective.

|  |  |
| --- | --- |
|  | Objective 1*Students will demonstrate the capability of implementing modern financial derivative pricing models.* |
| *Spring 2022* | 8.2 (in-class) / 7.9 (online) |

# 8. Close Loop Process – Continuous Improvement Record

Assurance of Learning

Assessment/Outcome Analysis

Close Loop Process - Continuous Improvement Record

**Program:** Master of Science in Financial Engineering

**Goal 3:** Students will achieve mastery of the foundational computational methods required for derivative pricing in Financial Engineering.

**Goal Owner:** Sveinn Olafsson

**Where Measured:** In the courseFE621 Computational Methods in Finance

**How Measured:** Relevant assignments and quizzes are graded and the student’s scores is determined from the relevant questions

**Closing the Loop: Actions taken on specific objectives**

|  |  |
| --- | --- |
| **Objective 1** | *Students will achieve mastery of the foundational computational methods required for derivative pricing in Financial Engineering.* |
| **When Assessed:** | *Spring 2022* |
| **Remedial****Action** | Reduce emphasis on derivatives pricing. Consider applications in risk management, trading, and asset allocation. Increase emphasis on Monte Carlo simulation. Emphasize the importance of presenting numerical results using graphs and tables in a clear and readable manner.  |
| **Outcome from previous assessment** |  |