Proposal for a Graduate Certificate in Mathematical Finance (for all student except those registered in MS program in Statistics)

Graduate Program in Mathematics

Summary

The Master’s Program in Mathematical Finance (MSMF), operated by the Graduate Program in Mathematics, proposes to establish an internal Certificate in Mathematical Finance, offered to qualified Rutgers graduate students, except for those enrolled in the traditional M.S. in Statistics program. (This exception is due to a request by the Graduate Program in Statistics in consideration of the possible impact on their FSRM and MSDS (Statistics) master’s degree programs.) A certificate would be earned by a student who has completed five courses (fifteen credits) from a menu of courses, with three of those courses taken in addition to the courses required for their current Ph.D. or M.S. degree programs.

Rationale

The number of students taking MSMF courses who are not already enrolled in premium tuition master’s degree program (like FSRM, MQF, SDS, MSMF, etc.) is relatively small, with the potential exception of students enrolled in the traditional M.S. in Statistics program. Should the demand to take our proposed Certificate in Mathematical Finance increase among students not enrolled in a premium tuition master’s degree program, the question of tuition revenue sharing would need to be addressed.

Goals for the Certificate in Mathematical Finance

The knowledge of mathematical finance is useful for professionals working in technical fields in the financial industry. There is strong industry demand for graduates with expertise in this area. In response to this demand, we seek to provide Rutgers graduate students who have taken our MSMF program prerequisite courses or equivalents with a certificate that can be tailored to their specific needs and will enhance their career opportunities.

Existing Degree and Certificate Programs at Rutgers

There are other certificate and degree programs offered by other graduate programs at Rutgers and all those we are aware of are listed below. The rationale for offering Graduate Certificate in Mathematical Finance is as follows:

a) The certificate is internal and intended to enhance the credentials of Rutgers students in a way that would not be possible within their current degree programs;

b) The management of the certificate program by the Graduate Program in Mathematics and regular contact with graduate programs whose students have traditionally taken MSMF courses in the past will
ensure that the certificate program is well integrated with the students' current degree programs, addresses their needs, and ensures the quality of content and the provision of relevant courses.

*Related degree programs at Rutgers*

Master's Degree in Financial Statistics and Risk Management (Graduate Program in Statistics)

Master's Degree in Mathematical Finance (Graduate Program in Mathematics)

Master's Degree in Quantitative Finance (Graduate Program in Business)

*Quality of the Program and its Offerings*

The Graduate Program in Mathematics has run the MSMF program successfully for many years. The courses are well designed and the faculty in the graduate program are experts in the area.

*Menu of Courses and Certificate Requirements*

Any of the five required courses in MSMF program, or equivalent courses (approved by the managing committee). Three of the five are in addition to the courses required by the Ph.D. and M.S. degree programs in which the students are currently enrolled. There are no restrictions on which two courses may be double counted as part of a student's master's degree program in their major field and the Mathematical Finance Certificate.

The prerequisites and syllabi of all courses are determined by the graduate programs offering those courses.

*Additional Credit Burden on Students and Impact on Time to Degree Completion*

Most students who are pursuing a standard ten-course (30-credit) master's degree program should be able to complete their degree and certificate within two academic years by

1. Following a 4-3-3-3 or 4-4-3-2 regular semester-course schedule (with no summer courses), or
2. Following a 4-3-2-2 regular semester-course schedule with one mid-program summer semester course.

Master's degree students who are pursuing a twelve-course (36-credit) master's degree program should be able to complete their degree and certificate within two academic years by pursuing a more intensive program over four regular semesters (for example, 4-4-4-3), four regular semesters plus one mid-program summer semester with 1 or 2 courses, or five regular semesters (for example, 4-3-3-3-2).

Students will delay graduation until they have completed both their master's degree program and certificate requirements.
If the proposed certificate structure (two courses double counted with three courses in addition to the students’ master’s degree requirements) proves too burdensome in practice for most students (after one trial year), we will modify the structure so that three courses may be double counted with two courses in addition to their master’s degree requirements.

Sample Pathways

Below are sample pathways for students from 10 and 12 course master’s degree programs who wish to complete our certificate and who have already taken the prerequisites for our courses, namely one-semester courses on

- Multivariable calculus
- Linear algebra
- Ordinary differential equations
- Partial differential equations
- Probability (calculus-based)
- Computer programming (one or more of C, C++, Java, MATLAB, Python, R)

These prerequisite courses are typically taken by undergraduate students in Computer Science, Economics, Engineering, Mathematics, Physics, and Statistics prior to admission to Rutgers.

The current list of MSMF core and elective courses (including those offered by other graduate programs by agreement) available to students from other graduate programs who wish to complete our certificate is provided at

http://finmath.rutgers.edu/academics-finmath/finmath-courses

Two-year 4-3-3-3 sample pathway for certificate plus ten-course master’s degree program

1. Fall I – 4 MS major courses
2. Spring I – 3 MS major courses
3. Fall II – 1 MS major course, 1 shared MS major / MF certificate course, and 1 MF certificate course: Math 643:573 Numerical Analysis I, Math 643:621 Mathematical Finance I

The two courses in blue in this sample pathway are shared between the MS major degree program and the MF certificate program.

Two-year 4-4-4-3 sample pathway for certificate plus twelve-course master’s degree program

1. Fall I – 4 MS major courses
2. Spring I – 4 MS major courses
3. Fall II – 2 MS major courses, 1 shared MS major / MF certificate course, and 1 MF certificate course: Math 643:573 Numerical Analysis I, Math 643:621 Mathematical Finance I

The two courses in **blue** in this sample pathway are shared between the MS major degree program and the MF certificate program.

The preceding sample pathways can naturally be customized according to the background of individual students and MSMF faculty members will be available to provide this advice.

Ph.D. students have considerably more flexibility in their course schedules, so we do not provide sample pathways for them.

**Admission and Certificate Requirements**

Students enrolled in a Ph.D. or M.S. degree program who have completed their first year with a GPA of 3.0 or higher, continue to maintain that GPA, and have taken the prerequisite courses will be eligible to earn the Certificate in Mathematical Finance. Most students who wish to earn the certificate would be able complete the additional requirements in one further semester. Students would be required to complete the five courses designated for the certificate with grade B or higher.

**Resources**

Rutgers graduate students who have been approved for the certificate program will have the second highest priority in securing seats in the courses offered by MSMF program, with the highest priority given to students enrolled in the MSMF program.