McMaster University

FINAL ASSESSMENT REPORT

Institutional Quality Assurance Program (IQAP) Review

Master of Financial Math

Date of Review: April 9-10, 2024

In accordance with the University Institutional Quality Assurance Process (IQAP), this final assessment report provides a synthesis of the external evaluation and the internal response and assessments of the Master of Financial Math program. This report identifies the significant strengths of the program, together with opportunities for program improvement and enhancement, and it sets out and prioritizes the recommendations that have been selected for implementation.

The report includes an Implementation Plan that identifies who will be responsible for approving the recommendations set out in the Final Assessment Report; who will be responsible for providing any resources entailed by those recommendations; any changes in organization, policy or governance that will be necessary to meet the recommendations and who will be responsible for acting on those recommendations; and timelines for acting on and monitoring the implementation of those recommendations.

Executive Summary of the Review

In accordance with the Institutional Quality Assurance Process (IQAP), the Master of Financial Math submitted a self-study in March 2024 to the Vice-Provost and Dean of Graduate Studies to initiate the cyclical program review of its program. The approved self-study presented program descriptions, learning outcomes, and analyses of data provided by the Office of Institutional Research and Analysis. Appendices to the self-study contained the CVs for each full-time member in the department.

Two arm's length external reviewers and one internal reviewer were endorsed by the Dean, Faculty of Science, and selected by the Vice-Provost and Dean of Graduate Studies. The review team reviewed the self-study documentation and then conducted a site visit to McMaster University on April 9-10, 2024. The review included interviews with the Deputy Provost; Vice-Provost and Dean of Graduate Studies, Associate Dean, Grad Studies and Research, Director of the program and meetings with groups of current students, faculty, and support staff.

The Director of the program and the Dean of Science submitted responses to the Reviewers' Report (September 2024). Specific recommendations were discussed and clarifications and corrections were presented. Follow-up actions and timelines were included.

- **Strengths**: The MFM program has several areas of strength that distinguish it from similar Master's programs at other universities and contribute to the achievement of McMaster's strategic priorities. The program has a very strong group of faculty teaching and supervising its students, and dedicated administrators supporting its continuing operations. The curriculum is well-thought out and comprehensive. A great strength of the program is its strong industrial content and its excellent relationship with its alumni and other contacts in the local financial industry. Students and alumni both commented on how this aspect of the program truly makes it stand out among its peers.

- **Opportunities for Improvement and Enhancement, including appropriateness of resources:** The key area that the program needs to address is the level of faculty involvement, especially in light of the recent and prospective loss of teaching and administrative resources. Aside from this, the program could benefit from a review of its curriculum related to computational methods in finance, with a possible restructuring to add greater emphasis and more effectively teach applications of machine learning to finance and insurance. The program could also explore the possibility of adding some optionality to its curriculum, rather than having only a set of common required courses. Finally, the MFM could benefit from reviewing the expectations regarding computer programming skills for students entering the program.

Recommendation #1: We recommend continuing with the current admission requirements and encourage seeking ways to help streamline the interview process. Suggestions include i) having staff conduct short interviews to screen candidates to be selected for longer interviews with faculty; and ii) having candidates submit a short video recording where they outline their qualifications for the program and/or discuss some other topic.
Department's Response and Actions to be Taken: If the program were to have continued, it should have been possible to have staff pre-screen applicants for basic competency and communication skills. It is reasonable to have applicants submit 10-minute videos. In these videos, candidates could explain their reasons for applying to the MFM program, describe how it will contribute to the Canadian financial industry, and articulate why they prefer the McMaster program to other programs. This process would have helped us assess their ability to communicate effectively and their understanding of the program's value.
Dean's Response: We recognize the time commitment associated with screening potential students, and opportunities for streamlining the admissions process are welcome suggestions. If the program were to be continued, we would be supportive of initiatives such as video applications that enable initial screening of candidates. We would also further suggest that an evaluation rubric be created to assist staff with this process and to provide as much consistency in the evaluation as possible.

Recommendation #2: It may be useful to track student outcomes grouped by some variable(s) of interest such as undergraduate major or domestic/international status.
Department's Response and Actions to be Taken: The program can track student outcomes based on the area of their undergraduate studies, their performance in the program (academic) and their citizenship status. We are also able to track the outcome using the internship placements, internship evaluations plus employability post-graduation.
Dean's Response: The program has enjoyed a strong and on-going relationship with its alumni. While recognizing the need for confidentiality when tracking student outcomes across variables, knowledge of student outcomes is beneficial. McMaster's Alumni Office as well as the Institutional Research and Analysis (IRA) office may be positioned to help with analysis and insight of student outcomes.

Recommendation #3: Review the content of the computational courses in the program. Consider whether students would be better served with a full course on machine learning, deep learning, and data analytics offered in the Winter term, after they have learned foundational material in quantitative finance and statistics.
Department's Response and Actions to be Taken: If the program were to have continued, MFM 703 and MFM 713 could have been merged into a computational course offered in the winter semester. Non-MFM students may have been allowed to enroll if there were sufficient interest. MFM students would have completed an additional final project focused on success in the financial industry. Course materials would have been updated to reflect the combined curriculum.
Dean's Response: The Faculty of Science is supportive of moves to update program and curriculum content in all our graduate programs so that our students are best able to respond to industry and career needs. The Office of the Associate Dean (Graduate) would work with the program in updating and reviewing course and curriculum content. If the program were to continue, the addition of any new courses to the program curriculum would need to be carefully reviewed and weighed given additional teaching needs and balanced with current courses and cohort development.

Recommendation #4: Review the content and presentation of machine learning and data analytics throughout the program. Consider ways in which these tools and techniques could be incorporated into the Winter courses on Portfolio Theory and Optimization (MFM 711), Credit Risk Modeling (MFM 712), and Risk Management (MFM 714).
Department's Response and Actions to be Taken: MFM 703 and MFM 713 will continue to cover the core machine learning and data analytics used in financial applications. In MFM 711 deep learning settings can be developed to solve problems in portfolio optimization; they can be flexible enough to include several portfolios objectives such as Sharpe Ratio, mean-variance, and others. Regarding MFM 712 deep learning techniques and machine learning methods can be employed to assess credit risk. Neural networks and decision tree techniques can be applied to different problems in risk management (MFM 714).
Dean's Response: As with recommendation #3, the Faculty of Science is supportive of moves to update program and curriculum content in all our graduate programs so that our students are best able to respond to industry and career needs. The Office of the Associate Dean (Graduate) will work with the program in updating and reviewing course and curriculum content.

Recommendation #5: Consider whether the program could incorporate an elective course, particularly for students who have a strong foundation in one of the areas covered by the current required courses (e.g. a student with an undergraduate degree in statistics might be able to take an elective instead of the required course MFM 704 on the Statistics of Financial Data).
Department's Response and Actions to be Taken: While we appreciate the recommendation to offer elective courses for students with strong foundational knowledge, we believe that maintaining the core structure of the program serves the best interests of our students. Our discussions have highlighted several key considerations: 1. Student Preference: Most of our students prefer to take MFM 704 on the Statistics of Financial Data, even if they have a background in statistics. This preference is driven by their interest in the unique financial mathematics perspective the course offers and their desire to learn alongside their peers.

2. Course Atmosphere: Having a diverse cohort with varying levels of statistical knowledge enriches the classroom experience, fostering a collaborative learning environment where students can support each other.
3. Resource Constraints: Introducing electives would require significant changes to the program structure, potentially necessitating the removal of existing courses. Given the constraints on faculty and resources, this approach is not feasible at this time.

Dean's Response: Elective courses are acknowledged as an important way to provide flexibility and timeliness in course offerings. However, we support the program's decision not to add an elective course. As noted in the program response, cohort building includes students taking the same courses. Current financial and resource constraints also means that we are not in a position to add additional course options unless electives were drawn from other existing courses in Math and Statistics. We would also support the program looking at course options outside of the unit (i.e., Business) or elsewhere in Ontario via the Ontario Visiting Graduate Scholar program.

The review includes several recommendations around course content and offerings. If the program were to continue, we would also look to leverage the DeGroote School of Business' Master of Finance graduate program where there may be the opportunity to share resources and learning.

Recommendation #6: Given the structure of the program, we recommend investigating the use of integrated assessments across courses. For example, a project or assignment that integrates material from different courses and counts for part of the grade in those courses.

Department's Response and Actions to be Taken: A project that integrates material from different courses is the industrial project. The completion of the industrial project at the end of the program, requires a good understanding of topics and concepts from different courses. Other examples of such projects are already in place in other courses; for instance, in MFM 711 the course project integrates material from MFM 701. Had the program continued, additional integrated assessments between courses might have been explored.

Dean's Response: The MFM program already has several integrated assessment opportunities. The program would have been encouraged to explore other options had it continued.

Recommendation #7: Hire a new faculty member to replace Dr. Lozinski as director of the MFM program when he retires. This new position should begin as soon as possible (ideally by January 1, 2025). We reiterate that hiring this replacement is essential for the ongoing health and survival of the MFM program.

Department's Response and Actions to be Taken: We concur that a replacement for Dr. Lozinski is required for the survival of the MFM program. Unfortunately, current budget constraints have compelled a decision by the university to forego hiring such a replacement. As a result, the program will be suspended after the current cohort completes their studies in August of 2025.

Dean's Response: The Faculty Appointment Advisory Committee (FAAC) accepted applications for faculty (Teaching Stream) appointments during the spring of 2024, and the MFM program submitted a proposal for a hire. Given the current budget environment and the cost to the Faculty of Science in running the MFM program, the decision was made by the Dean of Science to pause intake to the program (starting fall 2025) and not hire into the MFM position. This decision to pause intake was a difficult decision but is reflective of the current fiscal environment faced by the Faculty and the

broader university. Current students in the program continue to receive full support and we have been in communication with them regarding the pause.

Recommendation #8: Investigate whether there are additional teaching resources that can be used to help the MFM program weather the loss of Professor Grasselli's contributions to teaching and supervision for the duration of his secondment to the provost's office. In particular, determine whether any of the resources the faculty receives as a consequence of this secondment can be directed to the mathematics department (and the MFM program in particular) to help mediate the impact of the absence of Professor Grasselli.

Department's Response and Actions to be Taken: While Dr. Grasselli has been seconded to the Provost's office as Deputy Provost, compensatory funds are provided to the Faculty. It would be reasonable to use some of these funds to supply a teaching resource to cover Dr. Grasselli's teaching responsibilities in the program. But with the exceedingly difficult financial situation that the Faculty is dealing with, that may not be something that can be arranged. Were the program to have continued, discussions regarding this would also continue.

Dean's Response: The Dean's office provides funds to Math & Stats to cover the cost of instructors to teach the classes Dr. Grasselli was responsible for.

Recommendation #9: Try to get more faculty involved in teaching in the program, which will allow for easier coverage of faculty absences due to sabbaticals or secondments, for example.

Department's Response and Actions to be Taken: Engaging more faculty in the Master in Financial Mathematics program is indeed an idea worth pursuing, especially to ensure consistent coverage during faculty absences. The program could leverage the interdisciplinarity DNA of our Department and expand faculty involvement.

Proposed Actions:

1. Exploration for MFM Program: We recognize the potential benefits of applying this recommendation to the MFM program. By considering faculty such as Katherine Davies, Sharon King-Yu, or Pratheepa as effective Statistics and Data Science instructors, we can enhance support and provide additional teaching resources within the MFM program.
2. Leverage Faculty Expertise: Identify opportunities to integrate faculty with diverse expertise in all programs, thereby enhancing cross-disciplinary learning and teaching efficiency.
3. Professional Development: Provide targeted professional development opportunities to potential faculty members interested in contributing to the MFM program.

Dean's Response: Faculty nimbleness in teaching is always encouraged and expected. While we recognize that not all faculty members would be able to teach specialized financial courses, there should be an ability for many faculty within the Math and Statistics Department to teach courses in statistics, numeracy, and emerging topics such as Machine Learning. Opportunities for drawing upon courses elsewhere in the university that cover topics that can be applied to the MFM program could also be explored. Leveraging these opportunities would ensure best use of instructional resources.

Recommendation #10: Evaluate the programming content of the MFM program, with a view to increasing the programming skills of graduates (particularly with regards to tools used in machine

learning and data analytics, e.g. python (numpy, pandas), and SQL). Set clear expectations for programming skills for students entering the program (either make these required for admission, or required before the program starts with references to some supplemental material provided to students who need to improve their programming skills between admission to the program and commencement of their course work).
Department's Response and Actions to be Taken: With our vision of modernizing to meet the contemporary coding demands of the industrial landscape, which is shifting towards a data-driven focus, we will integrate Python and PyTorch into each of our courses to maximize coding fluency and proficiency among all MFM candidates. We have already introduced a summer coding package and additional Python tutorials to ensure that all students are up to speed by the end of the first month of their entrance into the MFM program. We will continue to focus on producing data-proficient graduates in the MFM program. Course content has been standardized. Attendance is mandatory.
Dean's Response: The program has been proactive in increasing student's computational and programming skills. It has recognized that these skills are demanded in the workplace and have worked to ensure that students already in the program have these skills. As with recommendation #3, the Faculty of Science is supportive of moves to update program and curriculum content in all our graduate programs so that our students are best able to respond to industry and career needs, and the Associate Dean Graduate office will assist the program in updating its content.

Recommendation #11: Evaluate the structure and content of the weekly meetings with students regarding current issues in the financial industry. Consider ways in which the meetings could be re-organized in order to make them more beneficial for students (an internal frank and open discussion with current students and alumni regarding the strengths and weaknesses of these meetings may help in planning these changes).
Department's Response and Actions to be Taken: The recommendation is well taken. We will endeavour to broaden the variety of activities in the weekly meetings. Alumni and industry partners have expressed willingness to work with the students in this regard. Other formats and topics for discussion will be explored.
Dean's Response: The Dean's office fully supports opportunities to engage students and ensure that they are career ready upon graduation. If and when the program restarts in the future, we will look for how best to engage students and ensure that they receive information that is relevant to them. There may also be an opportunity for the Faculty's Science Careers and Cooperative Education (SCCE) office to provide support.

Recommendation #12: Consider turning MFM 712 into one or two half-courses (and consider combining MFM 703 and MFM 713 into a single course, more focused on machine learning and data analytics and their applications in finance).
Department's Response and Actions to be Taken: MFM 712 can be turned into one half-course, while the material of the other half could be moved to MFM 701 and the topics course as follows: some interest rate models (Vasicek, Hull White, CIR) can be covered in MFM 701, and more advanced topics in fixed income can be covered in the topics course, MFM 714, or in an elective course. MFM 703 and MFM 713 can be turned into a single two semesters course. But such significant changes will not be explored while the program is suspended.
Dean's Response: We thank the reviewers for these recommendations. If the program were not paused, the structure of courses could be reviewed, and program courses / offerings revamped. The Faculty of Science would be supportive of moves to update program and curriculum content in all our

graduate programs so that our students are best able to respond to industry and career needs within the context of limited financial resources to mount new courses.

Recommendation #13: Determine areas (such as in the computational courses and risk management course) where more content on insurance could be introduced into the program.

Department's Response and Actions to be Taken: We recognize the importance of integrating more insurance content into our program, and we have several strategies to achieve this goal:

1. Leverage Undergraduate Program: By leveraging our existing Undergraduate program in Actuarial and Financial Mathematics, we can incorporate relevant insurance topics into the MFM curriculum. This will provide students with a broader understanding of financial mathematics applications across different sectors.
2. New Course with Industry Guest Speakers: We are excited to introduce a new course in the Undergraduate Program, that will feature guest speakers from the insurance and financial industries. This course will provide students with practical insights and real-world applications, bridging the gap between theory and practice. MFM students could be offered access to this course.
3. Seek Synergies: Explore synergies between the MFM and AFM programs, identifying opportunities for collaboration and shared learning experiences. This approach will not only enhance the content on insurance but also foster interdisciplinary connections between financial mathematics and actuarial science.
4. Curriculum Integration: We have already started integrating more insurance-related material into the statistical course and the special topics course since this year. This approach allows us to gradually introduce essential insurance concepts to our students.

Dean's Response: The opportunity to leverage teaching and learning links with the undergraduate program in AFM would be of benefit to both the AFM and MFM programs and would be encouraged if the MFM program were to continue. If, however, new courses such as computation, risk management, or insurance were to be added to the MFM program, program leadership will need to think carefully about what courses are required versus elective and the ideas of cohort building that were previously raised in this review.

Recommendation #14: The program should consider establishing an Advisory Board consisting mainly of alumni and a diverse set of individuals, thus formalizing an important program support. The Advisory Board's role would be to perform functions that alumni are already doing on an ad-hoc basis, such as advising on curriculum, arranging, or serving as guest lecturers, and mentoring current students. A formal Advisory Board strengthens the consultative and inclusive aspects of assessing the program and implementing changes. Formalizing an Advisory Board can also benefit members of the board as a professional service activity that many employers demand of their employees. Furthermore, we think that key person risk can be reduced as the Advisory Board can serve as a vehicle to maintain and cultivate industrial contacts.

Department's Response and Actions to be Taken: This is a very good idea, and if the program were to continue, would be implemented for the betterment of the program. There are several appropriate alumni and industry partners who would be very happy to serve on such a committee, and who would provide invaluable guidance and insight. It was envisioned that such a committee would meet three times a year. The summer meeting would provide industrial expertise and insight on topics that should be included in the topics course, and other curriculum priorities from an industrial perspective.

The fall meeting would provide insights and guidance into industrial opportunities and industry site visits. The winter meeting would review the ongoing status of employment of the students and identify measures to be taken to secure appropriate industrial projects for those students who would not yet have appointments.
Dean's Response: When appropriately structured and utilized, an Advisory Board could directly support the program by providing a direct link between instructors and alumni. Given that program alumni are already highly engaged in the program, this would galvanize the relationship and would not require additional faculty resources.

Recommendation #15: Consider creating an Associate Director position that takes on some of the duties of the Program Director. This can help alleviate some of the pressure on the Director and partially mitigate key person risk.
Department's Response and Actions to be Taken: The decisions in the MFM program are taken in a collegial, conciliar fashion by the members of the academic committee. An Associate Director position can be created to help alleviate some of the pressure on the Director and partially mitigate key person risk.
Dean's Response: While Associate Directors can reduce some of the burden and duties associated with the position of the Program Director, there is the potential that it may reduce teaching roles. Of course, any reduction in teaching comes with the need for a sessional instructor or someone else to fill the teaching shortfall. The Dean's office would work carefully with the program if this role was to be considered in the future.

Recommendation #16: Evaluate the professional development content of the program, with a view towards strengthening the orientation towards the financial industry (particularly in terms of the preparation of resumes and cover letters). Look for opportunities to involve mentors with experience in the financial industry (faculty, alumni, etc.) in the professional development aspects of the program (for example, by having them provide comments on students' resumes and cover letters early in the program).
Department's Response and Actions to be Taken: It is a good idea to use the mentors in supporting students' efforts in producing strong resumes and cover letters. Alumni have also volunteered to do additional resume reviews and mock interviews. The use of these volunteer resources will be expanded in this fashion.
Dean's Response: Drawing on the experience of alumni to help support student development is beneficial to the students, and we would support this initiative. In addition, the Faculty's Science Careers and Cooperative Education (SCCE) office provides extensive support for students in developing student's career goals and tools. SCCE supports the career development of our graduate students by providing a number of workshops related to career development and growth. Workshops have included career advising, exploration, and information sessions, networking, cover letter and resume critiques, mock interviews, and more. Our Graduate Student Association group (SciGSA) also offers a career night for graduate students from across the faculty. While both of these are focused on the broader group of graduate students within the faculty, we are committed to creating and offering opportunities for graduate students to work toward employment opportunities and we continue to support the program in further advancing opportunities for career development of our students.

Recommendation #17: Include a brief information session on professional accreditations available in the finance industry in the professional development material.

Department's Response and Actions to be Taken: We can host information sessions led by top industry partners in Toronto's financial sector to inform MFM students about key professional accreditations they might consider adding to their MFM degree.

1. **CPA (Chartered Professional Accountant)**
   - **Description**: The CPA designation is the standard accounting credential in Canada. It encompasses financial accounting, management accounting, and auditing. CPA Canada administers this certification, which is recognized across various sectors, including finance and business.

2. **CFA (Chartered Financial Analyst)**
   - **Description**: The CFA designation is awarded by the CFA Institute and is widely respected in investment management and financial analysis. It focuses on investment analysis, portfolio management, and ethical standards. CFA charter holders are often employed in roles such as financial analysts, portfolio managers, and research analysts.

3. **CFP (Certified Financial Planner)**
   - **Description**: Awarded by the Financial Planning Standards Council (FPSC), the CFP designation is for financial planners. It covers financial planning, investment planning, retirement planning, and estate planning. CFP professionals are equipped to help clients with comprehensive financial planning.

4. **CMA (Certified Management Accountant)**
   - **Description**: The CMA designation, now part of the CPA designation, focused on management accounting. It emphasized strategic management and financial performance management, which are critical in guiding business decisions.

5. **FCSI (Fellow of the Canadian Securities Institute)**
   - **Description**: This is a prestigious designation awarded by the Canadian Securities Institute (CSI). It recognizes advanced knowledge and experience in the financial services industry. FCSI is often held by senior financial professionals and advisors.

6. **CIIA (Chartered Institute of Investment Analysts)**
   - **Description**: Now part of the CFA Institute, this designation focused on investment analysis and financial research. It was previously awarded by various national institutes, including the Canadian Institute of Financial Analysts.

7. **CIPM (Certificate in Investment Performance Measurement)**
   - **Description**: Offered by the CFA Institute, the CIPM designation is focused on investment performance measurement and evaluation. It is valuable for professionals involved in performance analysis and reporting.

8. **FRM (Financial Risk Manager Certification) **
- **Description**: Offered by the Global Association of Risk Professionals, the certification proves the ability to assess, measure, and monitor risk in real-world situations. Those who earn the certification gain transferrable knowledge applicable across industries and functional roles. They are in a strong position to improve their job performance and advance their careers, while networking with a global

network of risk managers.
Dean's Response: While specific to the program (as opposed to the broader graduate student population as noted in Recommendation #16), the Dean's office would support information sessions such as these to further prepare our students for their careers over both the short- and long-term.

McMaster University

Implementation Plan

In the chart below, please outline the recommendations made by reviewers, briefly outline the actions you plan to take, who will be responsible for leading the action, and a timeline for completion.

Recommendation	Action(s) to be Taken	Responsibility for Leading Action	Timeline for Completing Action
1. We recommend continuing with the current admission requirements and encourage seeking ways to help streamline the interview process. Suggestions include i) having staff conduct short interviews to screen candidates to be selected for longer interviews with faculty; and ii) having candidates submit a short video recording where they outline their qualifications for the program and/or discuss some other topic.	If the program were to have continued, such streamlining initiatives would have been very welcome.	N/A	N/A
2. It may be useful to track student outcomes grouped by some variable(s) of interest such as undergraduate major or domestic/international status.	If the program were to have continued, we would have a summary report/Excel spreadsheet with student Data from the past few years, including and not limited to: Undergrad Degree, domestic/international status. We could have added Grades and performance in the program to the spreadsheet with the above information. Additionally, we would have added their	Hanadi Attar-Elbard	N/A

	internship or mentorship status during the program. We would have also followed up, post-graduation, on employment status (database already exists)		
3. Review the content of the computational courses in the program. Consider whether students would be better served with a full course on machine learning, deep learning, and data analytics offered in the Winter term, after they have learned foundational material in quantitative finance and statistics.	If the program were to continue, we could further integrate deep learning and elementary statistical methods our courses.	Anastasis Kratsios	N/A
4. Review the content and presentation of machine learning and data analytics throughout the program. Consider ways in which these tools and techniques could be incorporated into the Winter courses on Portfolio Theory and Optimization (MFM 711), Credit Risk Modeling (MFM 712), and Risk Management (MFM 714).	Explore deep learning techniques to solve problems in portfolio optimization.	All faculty	Winter 2025
5. Consider whether the program could incorporate an elective course, particularly for students who have a strong foundation in one of the areas covered by the current required courses (e.g. a student with an undergraduate degree in statistics might be able to take an elective instead of the required course MFM 704 on the Statistics of Financial Data).	If the program were to have continued, we would consider personalized academic advising for the minority of students with advanced statistical knowledge to explore opportunities for further specialization or independent study projects, ensuring that their educational needs	N/A	N/A

	are met without altering the program's core structure.		
6. Given the structure of the program, we recommend investigating the use of integrated assessments across courses. For example, a project or assignment that integrates material from different courses and counts for part of the grade in those courses.	If the program were to have continued, implementing integrated assessments across courses could be developed further.	N/A	N/A
7. Hire a new faculty member to replace Dr. Lozinski as director of the MFM program when he retires. This new position should begin as soon as possible (ideally by January 1, 2025). We reiterate that hiring this replacement is essential for the ongoing health and survival of the MFM program.	No action can be taken. Until the financial situation changes, we are unable to replace Dr. Lozinski	N/A	N/A
8. Investigate whether there are additional teaching resources that can be used to help the MFM program weather the loss of Professor Grasselli's contributions to teaching and supervision for the duration of his secondment to the provost's office. In particular, determine whether any of the resources the faculty receives as a consequence of this secondment can be directed to the mathematics department (and the MFM program in particular) to help mediate the impact of the absence of Professor Grasselli.	If the program were to have continued, discussions would be held with the Dean and the Chair regarding the appropriate use of the funds from Dr. Grasselli's secondment for covering his teaching responsibilities	N/A	N/A
9. Try to get more faculty involved in teaching in the program, which will allow for easier coverage of faculty absences due to sabbaticals or secondments, for example.	If the program continued, the above-mentioned initiatives would let us evaluate the feasibility of expanding faculty involvement and ensure that any changes align	N/A	N/A

	with our academic strategy.		
10. Evaluate the programming content of the MFM program, with a view to increasing the programming skills of graduates (particularly with regards to tools used in machine learning and data analytics, e.g., python (numpy, pandas), and SQL). Set clear expectations for programming skills for students entering the program (either make these required for admission, or required before the program starts with references to some supplemental material provided to students who need to improve their programming skills between admission to the program and commencement of their course work).	If the program were to continue, each course would have shifted largely to Python placing a strong emphasis on cultivating the deep learning skills of our students.	N/A	N/A
11. Evaluate the structure and content of the weekly meetings with students regarding current issues in the financial industry. Consider ways in which the meetings could be re-organized in order to make them more beneficial for students (an internal frank and open discussion with current students and alumni regarding the strengths and weaknesses of these meetings may help in planning these changes).	The program Director will reach out to select alumni and industry partners to arrange special one-off sessions to discuss appropriate industry topics. If possible, this may be done in smaller groups to better facilitate discussion at a personal level. The specific topics for discussion will depend on the particular knowledge of the volunteers that we recruit.	David Lozinski	We will pilot a couple of these in Fall 2024. The results will be reviewed, lessons learned, and additional sessions with appropriate modifications and improvements attempted in the winter term.
12. Consider turning MFM 712 into one or two half-courses (and consider combining MFM 703 and MFM 713 into a single course, more focused on machine learning and data analytics and their applications in finance).	Vasicek, Hull White, and CIR interest models from MFM 712 will be covered in MFM 701.	Traian Pirvu	Fall 2024

13. Determine areas (such as in the computational courses and risk management course) where more content on insurance could be introduced into the program.	If the program were to have continued, implementing the above-mentioned strategies would allow us to enhance our curriculum further, equipping our students with the skills and knowledge needed to excel in both the financial and insurance industries. We will continue to include a module on insurance in the winter term.	N/A	N/A
14. The program should consider establishing an Advisory Board consisting of alumni and a diverse set of individuals, thus formalizing an important program support. The Advisory Board's role would be to perform functions that alumni are already doing on an ad-hoc basis, such as advising on curriculum, arranging, or serving as guest lecturers, and mentoring current students. A formal Advisory Board strengthens the consultative and inclusive aspects of assessing the program and implementing changes. Formalizing an Advisory Board can also benefit members of the board as a professional service activity that many employers demand of their employees. Furthermore, we think that key person risk can be reduced as the Advisory Board can serve as a vehicle to maintain and cultivate industrial contacts.	Had the program not been suspended, we would have certainly arranged to have established such an advisory board. We have many viable alumni and industry partners who would have been happy to sit on such a board, and who would have provided invaluable guidance and direction. It would be envisioned that the committee would meet three times a year, at a downtown location. Had such a committee been established, it would have been appropriate to	N/A	N/A

	budget for appropriate refreshments for the members at such a meeting. The most successful, but pricey, format may have been to gather committee members for a dinner at a downtown restaurant over which such matters could be discussed. But one agenda item at the first meeting of the board would have been to determine the optimal and most cost-effective format of such meetings.		
15. Consider creating an Associate Director position that takes on some of the duties of the Program Director. This can help alleviate some of the pressure on the Director and partially mitigate key person risk.	This could have been explored if the faculty group had been appropriately restaffed. But for the upcoming final year, the Director would simply be encouraged to better delegate many of the supervisory tasks.	David Lozinski	Ongoing
16. Evaluate the professional development content of the program, with a view towards strengthening the orientation towards the financial industry (particularly in terms of the preparation of resumes and cover letters). Look for opportunities to involve mentors with experience in the financial industry (faculty, alumni, etc.) in the professional development aspects of the program (for example,	Following the basic work on students' resumes by the SCCE Professional Development specialist, students' mentors would be asked to review and provide feedback to their mentees about their	David Lozinski SCCE Professional Development specialist	Fall 2024

by having them provide comments on students' resumes and cover letters early in the program).	resumes. Additionally, another professional resume session would be arranged with an appropriate industry person associated with the program. The Director and the Professional Development specialist can also work with alumni and select industrial partners to create mock interview opportunities for the students, and/or "coffee chats" with alumni and other industry professionals.		
17. Include a brief information session on professional accreditations available in the finance industry in the professional development material.	Such an introductory session can be included in the professional development sessions run by David Lozinski.	David Lozinski	Fall 2024

McMaster University

Quality Assurance Committee Recommendation

McMaster's Quality Assurance Committee (QAC) reviewed the above documentation at the January 23, 2025, meeting. The committee recommends that the **Master of Financial Math** program should follow the regular course of action with an 18-month progress report and subsequent full external cyclical review to be conducted no later than eight years after the start of the last review.