



FOR CONFIRMATION

PUBLIC

CLOSED SESSION

TO: Executive Committee

SPONSOR: Professor Cheryl Regehr, Vice-President and Provost

CONTACT INFO: 416-978-2122, provost@utoronto.ca

PRESENTER: See above

CONTACT INFO:

DATE: June 2, 2015 for June 15, 2015

AGENDA ITEM: 4(c.)

ITEM IDENTIFICATION:

Proposal for a new professional graduate degree program Master of Financial Insurance (M.F.I),
Faculty of Arts and Science

JURISDICTIONAL INFORMATION:

Section 5.3.1. of the Terms of Reference for the Academic Board states that academic program proposals coming from the Board's committees, including the new graduate programs and degrees, require Executive Committee confirmation.

GOVERNANCE PATH:

1. Committee on Academic Policy and Programs [for recommendation] (May 12, 2015)
2. Academic Board [for approval] (June 1, 2015)
3. **Executive Committee [for confirmation] (June 15, 2015)**

PREVIOUS ACTION TAKEN:

The proposal for the Master of Financial Insurance received approval from the Faculty of Arts and Science Faculty Council on April 17, 2015.

HIGHLIGHTS:

This is a proposal for a three session, full-time only professional Master of Financial Insurance which will confer a new degree. The 5.5 FCE program consists of a series of highly cross-disciplinary courses (4.5 FCE) focused on real-world problems, drawing on insurance, finance, statistical and mathematical tools and methods and an internship (1.0 FCE). “Finsurance” is a burgeoning field in which sophisticated finance-insurance hybrid products are being developed to meet the needs of an aging global population. In this program students will acquire expertise in valuing, hedging, and managing the combined financial and insurance risks embedded in such complex products. Potential applicants will have a Bachelor’s degree in fields such as Statistics, Actuarial Science, Economics, Mathematics or any discipline where there is a significant quantitative component. Applicants will need to demonstrate significant exposure to Statistics, Computer Science and Mathematics, including coursework in advanced calculus, computational methods, linear algebra, probability and statistics.

The program is cohort based and the curriculum consists of a series of highly cross-disciplinary courses focused on real-world problems, drawing on insurance, finance, statistical and mathematical tools and methods. Courses projects and assignments are designed to integrate the material and to apply the material to a practical setting. Students will benefit from the participation of industry professionals who will teach several courses, providing real-world insights and access to problems and participate in bi-weekly seminars providing insight into diverse problems faced by professionals. The summer internship in the final session is designed to give students real-world experience and prepare them for full-time employment.

The proposed program was developed in consultation with the Master’s of Mathematical Finance program, the Department of Economics and the Rotman School of Management.

The program was subject to external appraisal on February 24, 2015 by Jose Garrido, (Concordia University) and Frederi Viens, (Purdue University). The external reviewers asked for a number of clarifications that were addressed in the Dean’s response to the review report. The final proposal received approval from the Faculty of Arts and Science Faculty Council on April 17, 2015.

FINANCIAL IMPLICATIONS:

Any new/additional financial obligations resulting from this program will be met at the Faculty/Divisional level.

RECOMMENDATION:

Be It Confirmed

THAT the proposed Master of Financial Insurance program, which will confer the new degree M.F.I., as described in the proposal from the Faculty of Arts and Science dated April 2015, be approved effective September 1, 2016.

DOCUMENTATION PROVIDED:

- *Proposal for a new Master of Financial Insurance, Faculty of Arts and Science*



University of Toronto New Graduate Program Proposal

Name of Proposed Program:	Master of Financial Insurance
Degree Name and Short Form:	Master of Financial Insurance (MFI)
Program Name:	Financial Insurance
Professional Program (yes/no)	Yes
Unit (if applicable) offering the program: i.e., site of academic authority. Where a program is housed elsewhere (in physical terms), this should also be indicated.	Statistical Sciences
Faculty / Academic Division:	Arts and Science
Faculty / Academic Division Contact:	Sandy Welsh, Vice-Dean, Graduate Education & Program Reviews
Graduate Unit Contact:	Sebastian Jaimungel, Associate Chair - Graduate
Anticipated start date of new program:	September 2016
Version Date:	April 2015

New Graduate Program Proposal

**Professional Master’s in Financial Insurance in the
Department of Statistical Sciences
Faculty of Arts and Science**

Table of Contents

Table of Contents.....	2
1 Executive Summary.....	3
2 Program Rationale	5
3 Need and Demand	12
4 Admission Requirements	13
5 Program Requirements.....	14
6 Program Description	18
7 Fields/Concentrations [Optional]	18
8 Degree Level Expectations, Program Learning Outcomes and Program Structure.....	19
9 Assessment of Learning	23
10 Consultation.....	24
11 Resources:.....	25
11.1 Faculty Complement.....	25
11.2 Learning Resources.....	28
11.3 Financial Support for Graduate Students	29
11.4 Space/Infrastructure.....	29
12 Quality and Other Indicators	30
13 Governance Process:.....	31
Appendix A: Courses	32
Appendix B: Graduate Calendar Copy	35
Appendix D: Library Statement.....	38
Appendix E: Student Support Services.....	42

Acknowledgments

Appendix F: External Appraiser Report

Appendix G: Dean's Response to the External Appraiser Report

Appendix H: Vice Provost, Academic Programs Response to the External Appraiser Report

1 Executive Summary

This proposal is for a new one-year professional master

s program, the Master of Financial Insurance (MFI) offered by the Department of Statistical Sciences. It aims to address a critical training need in financial insurance (finsurance) and to produce students who will become leaders in the finsurance industry worldwide.

Industrialized, and developing, societies are increasingly coping with an aging population. Appropriate financial support for the elderly is a critical component for the wellbeing of the economies of these societies. For example, with many baby-boomers entering retirement in North America managing retirement income becomes an important challenge for the finance and insurance industry as well as for individuals. A multitude of sophisticated finance-insurance hybrid products are being developed to meet the needs of this aging global population. Yet there is very limited supply of graduates who have the required expertise to value, hedge, and manage the combined financial and insurance risks embedded in these products. This program will train students at the interface of finance and insurance and aims to fill the gap in this burgeoning industry demand, an industry that will ultimately have a global scale.

This proposed one-year program (3 sessions, 12 months) will draw heavily on the expertise of the Department of Statistical Sciences (DoSS) and to a lesser extent the Department of Economics (DoE) and the existing Master of Mathematical Finance (MMF) program. Course work will be conducted during the fall and winter sessions and students will complete an internship during the summer session. Courses will be highly cross-disciplinary and will draw on insurance, finance, statistical and mathematical tools and methods. Students will have the opportunity to work on real-world driven problems, in teams as well as individually, and will be required to write reports and make presentations.

The designation Master of Financial Insurance (MFI) is consistent with two other somewhat related programs at the University of Toronto: the Master of Financial Economics (MFE) and the Master of Mathematical Finance (MMF) programs.

The impetus for the proposed program comes from two overlapping directions. The first is from student demand. The second is from industry. The DoSS recently launched a new PhD field in Actuarial Science and Mathematical Finance within the PhD in Statistics and since its launch, there has been a significant increase in student inquiries into a similar program at the MSc level. The proposed program, although not developed as a feeder into this new PhD field, will attract some of those same students, as many of them are interested in professional training rather than a research based program like the PhD. Moreover, the DoSS has had ongoing discussions with its Actuarial Science industry advisory board. Members of the board are supportive of the creation of this program and feel that it will fill an important gap in academic training.

The program fits very naturally within the DoSS's academic plan. As mentioned above, the unit

launched an extremely successful new PhD field in Actuarial Science and Mathematical Finance in 2011 with the first cohort of students arriving in Sept, 2012. The department recently revamped its undergraduate Actuarial Science program to incorporate a significant financial component in its curriculum, drawing it closer to a financial-insurance undergraduate degree. As well, the DoSS has graduate teaching capacity and increased strength in the area of Mathematical Finance. As such, the proposed program is a natural extension of the unit's offerings and fits neatly into its academic planning. Overall, the University of Toronto's Department of Statistics Sciences is ideally positioned to develop a state-of-the-art and successful MFI due to its existing academic expertise, industry connections and economies of scale (with the DoSS, the MMF program and the Dept. Economics).

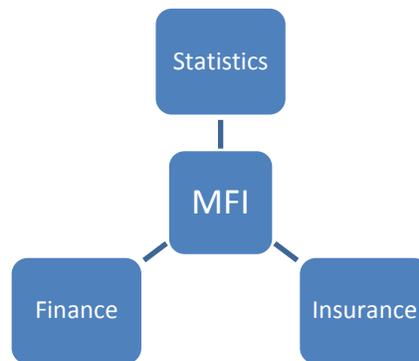
The proposed program aims to admit 10 students in the first year of admission and ramp this up to a long run enrollment of approximately 30 new students each year after four to five years.

2 Program Rationale

With many baby-boomers entering retirement in North America, and with the increasing size of the aging population worldwide due to economic and social development, managing retirement income is an important issue for the finance and insurance industry as well as for individuals. At the same time, with corporations stepping away from defined benefit pensions, individuals are increasingly responsible for managing the risks associated with securing their retirement income. Consequently, new products are being designed and offered to retirees that are substantially more sophisticated and complex than standard annuities. Many of these new products differ from traditional ones because of their blend of features from both finance and insurance. For example, classical annuities, which provide a stream of cash-flows to retirees up to death, are being augmented to include both guaranteed incomes and equity participation, thus intimately connecting them to the financial markets. The valuation, hedging, risk analysis and management of such hybrid products demand novel and innovative tools combining expertise in finance, actuarial science, probability theory, statistics and numerical methods. A multitude of sophisticated finance-insurance hybrid products are being developed to meet the needs of this aging global population. Yet there is very limited supply of graduates who have the required expertise to value, hedge, and manage the combined financial and insurance risks embedded in these products. This program will train students at the interface of finance and insurance and aims to fill the gap in this burgeoning industry demand, an industry that will ultimately have a global scale.

2.1 How Program Addresses Current State of the Discipline

The MFI is founded on three pillars: Statistics, Finance and Insurance (as shown in the figure below).



There are very few professional actuaries who have a solid training in finance and similarly, there are very few finance professionals who are trained in managing insurance risks. Moreover, there are even fewer professionals trained at the interface of finance and insurance. This is the first program at the University of Toronto, and Canada wide, which aims to train students at this interface and provide the depth and breadth for its graduates to be able to develop an enterprise wide perspective of a firm's risk.

Undergraduate students in actuarial science, statistics and economics programs receive training in their traditional areas of study. Although students in one concentration may take courses in another, the undergraduate programs do not fully develop the connections between these areas. Moreover, there are many new models, tools and methods, and the need to understand how these integrate with real-world problems, which cannot be taught at the undergraduate level. The proposed MFI aims to complement and reinforce these students' existing competencies and provide them with substantive understanding/ competency in the interface of finance and insurance and the resulting enterprise-wide risk management issues.

The proposed Master of Financial Insurance is designed to fill this need.

In summary, this program will give students:

- A comprehensive understanding of the interaction between financial and insurance assets and liabilities
- Statistical, mathematical and computational tools for modeling, developing and analysing the value and risks embedded in hybrid finance-insurance products
- The ability to build an enterprise wide perspective of a firm's risks

2.2 Degree Nomenclature and Program Name

The proposed program is Financial Insurance and the proposed degree nomenclature is Master of Financial Insurance (MFI). This unique professional degree designation best describes the content of the program and distinguishes itself from existing financial and actuarial science

degrees. The proposed MFI degree nomenclature also is consistent with other unique finance-related degree designations at U of T, including the professional Master of Mathematical Finance (MMF) program and the professional Master of Financial Economics (MFE) designations (see Section 2.6.2 for further information on these programs). The MMF and MFE degree are recognized by industry, as indicated by the successful employment rates of graduates. The proposed program's specific domain is financial insurance and MFI is an appropriate designation.

Existing Canadian degree nomenclature for finance-related degrees include Master of Science in Finance (SFU), Master of Finance (MFin, U of T), Master of Quantitative Finance (MQF, Waterloo), MSc in Business Administration with a Finance Specialization (UBC) and Master of Financial Risk Management (SFU) are not appropriate for the proposed MFI. These programs do not provide training on insurance related topics, with most offering no courses on the intersection of finance and insurance. It is not appropriate to use the degree nomenclature found in some Business Schools, such as the MBA in Risk Management & Insurance at the University of Wisconsin and the Wharton School of Business, as these programs are management-based and do not provide a similar level of quantitative training. The closest degree in name only was the Master of Science with a specialization in Risk Management and Insurance (MS RMI) at Georgia State University.¹ Although this program had an overall focus on finance and insurance, it focused on the theory and practice of risk and did not provide advance quantitative training.

The MFI is preferred over existing degree nomenclatures; MFI is parsimonious and specifically mentions "finance" and "insurance", the cornerstones of the program.

2.3 Mode of Delivery

Courses will be taught in a face-to-face seminar format in a dedicated state-of-the-art smart classroom enabled with video conferencing tools and break out rooms. Course projects and assignments are designed to integrate the material and to apply the material to a practical setting

For example, several courses (e.g., STA 2503H Applied Probability for Mathematical Finance, STA 2530H Applied Time-Series Analysis and STA 2551H Financial Insurance Case Studies) will require students to work in small groups to complete mini-projects throughout the course. Typical projects will require students to incorporate the theory from lectures into a viable and implementable computer model related to real-world problems, understand the actuarial and/or financial implications of their findings, write detailed reports, and deliver presentations. The break out rooms and common space will greatly facilitate the learning outcomes as it will

¹ Currently admissions are suspended to the Georgia State MS RMI program due to students selecting the MBA over the program, according to consultations with the Director of the Georgia State program (April 28, 2014). This confirmed our assessment that the MFI is indeed distinct as it is not a business degree in risk management, but a focused program to create highly skilled experts in finance & insurance and statistics.

provide students with space to collaborate. For example, break out rooms allow teams to work in a confidential setting or for students to practice delivering presentations. The small group work and projects are central to student gaining mastery over the financial insurance knowledge base (Depth and Breadth of Knowledge), acquiring necessary financial and insurance modeling skills (Research and Scholarship) and practicing written and communication skills (Level of Communication Skills).

Students will be required to take part in a biweekly Financial Insurance seminar series (Credit/No Credit) where industry professionals will discuss the latest developments in finance and insurance valuation, hedging and risk management. These seminars will be conducted in the state-of-the-art classroom, allowing presenters to deliver talks from across the world (without the need for the presenter to physically be in the classroom) and interact seamlessly with the class. These seminars will play an important role in tying in the theory delivered in the classroom to real-world issues and problems. As such, this seminar format supports the following DLEs and associated learning outcomes: Depth and Breadth of Knowledge, Research and Scholarship, Professional Capacity/Autonomy, and Level of Communication Skills.

An internship will be required for all MFI students. The internship will provide a strong experiential learning component within the program, and will help students improve their communication skills through interaction with industry professionals, the completion of a detailed report, and the presentation of their findings. The internship is closely aligned to all of the DLEs and learning outcomes for the MFI program. It provides an applied opportunity in which students must demonstrate the breadth and depth of their financial insurance knowledge, utilize their financial insurance research skills, apply their knowledge through the critical and comprehensive assessment of real-world financial insurance problems, demonstrate their professional capacity by providing a holistic perspective on risk assessment, and communicate complex financial insurance models to a range of audiences.

For further information, see also Section 7: DLEs, Program Learning Outcomes and Program Structure and Section 8: Assessment of Learning.

2.4 Supporting the University's Mission and Faculty's Academic Plan

Within the University's strategic plan, key phrases like **sustain** humanity, **promote** healthy communities, **advance** the knowledge economy, **enable** technologies, and **build** livable societies, are all aligned with the proposed program. Professional training in financial insurance *is* a leadership opportunity for international talent. Graduates will support aging populations locally, nationally and internationally by helping them care for themselves. This in turn will directly impact the health, sustainability, livability and wellbeing of these communities. Training students in new methodologies at the interface of finance and insurance will provide them with a competitive edge in bringing cutting edge research knowledge into practice. Such training in an area of such critical need advances the knowledge economy in ways that are

profound for aging societies as well as the individuals within those societies.

Canadian Banks and the Canadian Insurance Industry weathered the 2008 economic crisis better than most other banks and insurance companies. Part of this was due to Canadian businesses and regulatory bodies being more conservative. Financial and insurance modeling and understanding, however, were also key pieces in moderating the effect further. MFI students will receive training to help them understand the kinds of risks that banks and insurance companies can be exposed to in times of crisis and therefore be well prepared to deal with, and potentially avoid, situations like this in the future.

The MFI will support the strategic objectives of the University by developing **global leadership**, by **addressing questions of local, provincial national and international importance**, and by **maximizing the application of research**.

The MFI is also closely aligned with objectives outlined in the Faculty of Arts & Science Academic Plan, 2010-15. The plan prioritizes the establishment of new masters programs as part of their objective to leverage its excellence in research and graduate education, with an explicit mention of supporting the continued growth of graduate-professional education in the Faculty. The plan also emphasizes the need to expand the number and range of experiential learning opportunities for students. The MFI, as a new professional masters program with an internship component, supports the objectives laid out in the FAS Academic Plan.

2.5 Distinctiveness

2.5.1 Distinguishing features of the program

The program trains students at the interface of finance and insurance – a new field that has gained prominence in the last five years. Existing programs focus on either insurance or finance but misses the connection and nuances that exist at their interface.

The program will have several courses taught by industry professionals. The proposed program contains both theoretical and applied courses and is key to producing graduates that can both build new statistical/mathematical models and have the practical know-how to implement them in real-world settings. Having industry professionals teach in the program is essential in developing students' intuition and to provide real-world insights and access to problems and ways of thinking that academics lack. A capstone course (STA2551H – Financial Insurance Case Studies) on financial-insurance case studies is being developed in consultation with industry professionals to reflect cutting edge problems faced by the industry and will provide a unique experiential learning for the students.

A significant portion of course assessments will be based on computer labs and mini-projects where students will work in teams to simulate the kinds of projects they will receive in the real work place. Projects have the typical format of taking a theoretical concept and applying to a particular case-study, developing the appropriate statistical model, implementing the methodology in a language such as Matlab, and writing up a technical report on the

findings.

Students will be provided with a dedicated state-of-art smart classroom equipped with video conference tools, a tablet with pen enabled console, and horseshoe seating – similar to an MBA classroom. Moreover, the program will require dedicated open and closed spaces for students to work on team and individual projects/homework.

The program also aims to hold a biweekly invited seminar series where industry professionals will either visit onsite, or deliver talks through video conferencing tools. Unlike academic seminars, the seminar series will provide students with insight into problems that industry professionals face and will range from technical talks to holistic and blue-sky thinking.

One key measure of success for the program will be in its job placements. The internship portion of the program is specifically designed to give students real-world experience and make them ready and attractive for full-time employment. To ensure placement success, the program will have an internship coordinator to liaise with industry, assist with interview skills and resumes creation and other career-related programming.

2.5.2 Distinction from other programs

University of Toronto programs

At the University of Toronto, there are three professional masters programs that have a nominal relationship to the proposed MFI program: (i) the Masters in Finance (MFin) offered by the Rotman School of Management; (ii) the Master of Financial Economics (MFE) offered jointly by the Department of Economics, Faculty of Arts & Science and the Rotman School of Management; and (iii) the Master of Mathematical Finance (MMF) program offered by the Faculty of Arts & Science (structured as a Non-Departmental Unit). As discussed below, the proposed MFI is also distinct from the existing MSc and PhD programs in Statistics within the Department of Statistical Sciences (DoSS).

The **MFin** program is a full-time program for currently employed finance professionals with at least two years of experience. The program is aimed to train students in finance theory and application, at a higher level than a Chartered Financial Analyst (CFA), and essentially consists of the finance components of an MBA program. It is not at the same mathematical level or focus as the proposed MFI program.

The **MFE** program is a joint degree offering between Economics and the Rotman School of Management and focuses on the economics behind financial models. It accepts students trained in Economics, is not mathematical and/or statistical in focus, and has no course components directly related to insurance and/or financial insurance. There is one course in common with the proposed program, ECO 2506, which MFE students may take as an optional course.

The **MMF** program is designed to train students in Financial Engineering, and has a heavy focus

on risk management of financial products. However, there is no content on traditional insurance or the hybrid financial/insurance products. Moreover, most graduates go on to function in roles that have little to do with insurance. Although the MFI program structure is modeled on the highly successful MMF, the proposed program has minimal overlap with the MMF. Our proposed program involves the creation of 2.0 FCEs in new courses (not including the internship course), 0.5 FCE from the MMF program and 0.5 FCE each from the Department of Economics and Department of Statistical Sciences. The sequence of courses required for our students do not significantly overlap with those of the MMF.

The director of the MMF is aware of the industry's demand for the financial insurance expertise the proposed program is designed to instill as well as the availability of internship positions for students. Currently, this demand occasionally is met by an MMF student with pre-existing expertise in Actuarial Science or past experience in the insurance industry. However the MMF program itself does not provide the appropriate training.

The proposed MFI program also does not overlap with the U of T DoSS' existing MSc program as there is almost no overlap in courses; STA2503H, is required for the MFI but is only an elective in the MSc. The existing PhD field in Actuarial Science and Mathematical Finance is designed to meet industry, academia and student demand for a research stream in probability, statistics, finance and insurance. However, there is still need for a professional masters degree like the MFI to fill a number of roles that do not require the rigour of PhD training but do require a substantial amount of technical knowledge and industrial know-how.

To summarize, the proposed Master of Financial Insurance is distinct from existing programs U of T programs (e.g. MMF or MSc in Statistical Sciences) for the following main reasons:

1. The content of the proposed program is not a simple extension or modification of any existing program.
2. The proposed program only overlaps existing programs by the equivalent of one-half course each (MMF, Economics, and Statistical Sciences)
3. It does not fit within the timing structure of any existing program. The MMF begins in August, has module based courses, and has an internship component from January to April. The DoSS does not have any internship component. Our proposed program will begin at the standard calendar date and requires a summer internship.

Canadian and US programs

The proposed MFI is distinct from existing Actuarial Science professional and doctoral stream Masters programs in Canada and Ontario (e.g. Waterloo, Western, Windsor, SFU, etc.). These programs serve as the training grounds for the professional Society of Actuarial (SOA) exams and prepare students for careers as actuaries. The University of Toronto meets these training needs through its current undergraduate specialist program in Actuarial Science in the Faculty of Arts & Science. Although these programs provide training in mathematics, statistics,

economics and finance, they do not provide cohesive training at the interface of finance and insurance. As outlined in the academic rationale, the proposed professional MFI is quite distinct.

The MFI is also distinct from existing MBA or professional masters program in Risk Management. SFU's Master of Financial Risk Management includes only one course explicitly related to insurance, "Perspectives on Risk and Insurance". MBA programs, such as the University of Wisconsin's MBA in Risk Management & Insurance, focus on the risk management from a business case perspective and are not centred on mathematical / statistical modeling one. Compared to the MFI, it targets a significantly different pool of students; those who have undergraduate business degrees or MBA degrees.

3 Need and Demand

There is a clear demand for a professional MFI program from two main perspectives.

First, the Department of Statistical Science's Actuarial Science Industry Advisory Board (consisting of VPs and Managing Directors from Canada's largest insurance companies, pension plans, and consulting firms; the president of the Canadian Institute for Actuaries; and a member of the board of Directors of the Society of Actuaries) all confirm that the supply of students trained at the interface of finance and insurance is well below the demand. The demand stems from various sectors of the insurance industry as well as the banking industry (which in recent years have lines of business that are intertwined with insurance products in addition to the more traditional purely financial products). This demand is not localized to Toronto; internationally, in all major cities of commerce where there are insurance and finance firms, the demand exists. Because of this, the members of the advisory board strongly support the creation of an MFI program at U. Toronto.

Second, the DoSS receives a number of inquiries from both domestic and international applicants who are interested in pursuing a professional Masters in Actuarial Science and Mathematical Finance (ASMF). The university currently serves students who are interested solely in Mathematical Finance through its MMF program, however, those interested in insurance and its interface with finance have no options. Indeed, a large number of applicants to the DOSS's MSc program identify ASMF as their key area of interest. Many of these students are our top applicants. Students can potentially be employed in roles including (but not limited to): risk management, variable annuity valuation and hedging, life insurance financial projections and reporting, capital adequacy modeling and testing, pension adjustments and plan valuations, property and casualty insurance, and reinsurance. We anticipate starting salaries to be in the range \$70-80K with starting titles including (but not limited to): actuarial consultant, model risk specialist, model vetting analyst, pension analyst, quantitative analyst, and research analyst.

Third, in addition to domestic students, the MFI program expects to attract a highly qualified

pool of international students A large portion of the international student applicants to the departments MSc are interested in ASMF. Given constraints on the admissions of international students to the MSc, the department is not able to admit many of these extremely strong international students. Anecdotal evidence shows that a number of both successful and unsuccessful (who we do not admit due solely to funding constraints) candidates to our MSc would be willing and able to fund themselves for a professional Master degree focused on finance and insurance. In addition, data from cognate U of T professional masters programs shows a continued upward trend in international student enrolment. For example, the existing U of T Masters of Mathematical Finance has increased from 21% in 2000 to 43% in 2013 and the U of T Masters of Financial Economics has increased the percentage of international students in their program from 8% in 2005-06 to 18% in 2013-14. In the first five years of the program, we expect the percentage of international students applying and admitted to the proposed MFI program will fall in the 25-35% range and may increase gradually as knowledge of the program grows.

Table 1 presents the Graduate Enrolment Projections for the MFI. We project enrolments of 10 in the first two years with a gradual increase to 30 students per year (steady state) in year 5. Enrolments in the first years of the program are based on our assessment of internship possibilities and the time needed to ensure the appropriate infrastructure and networks are developed to support the internship and other components of the program.

Table 1: Graduate Enrolment Projections

Year in program	Academic year						
	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020		
1	10	10	20	25	30		
Total	10	10	20	25	30		

4 Admission Requirements

Students entering the MFI program at the University of Toronto will register in the Department of Statistical Sciences. The admissions criteria listed below are consistent with the criteria in the DoSS’s MSc in Statistics program and the Master of Mathematical Finance program. Their criteria are a useful guide as both programs routinely admit students from related fields who have proven to be well prepared for completing the rigours of the program requirements and attaining the program-level learning outcomes.

Below are the admissions requirements for the program as they will appear in the University of Toronto School of Graduate Studies Calendar (see also Appendix B).

Minimum Admission Requirements

Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the graduate unit's additional admission requirements stated below.

Admission to the program is on a competitive basis. For an applicant to be successful, they must have:

- A Bachelor's degree from a recognized university in a related field such as Statistics, Actuarial Science, Economics, Mathematics, or any discipline where there is a significant quantitative component. Studies must include significant exposure to Statistics, Computer Science and Mathematics, including coursework in advanced calculus, computational methods, linear algebra, probability and statistics.
- An average grade equivalent of at least a University of Toronto B+ in the final year or over senior courses; applicants who meet the SGS grade minimum of mid-B and demonstrate exceptional ability through workplace experience may also be considered.
- Three letters of reference.
- A letter of intent (limited to 500 words) explaining their interest in financial insurance, objectives in taking the program., and how their background is appropriate.
- Applicants whose primary language is not English and who graduated from a university where the language of instruction and examination was not English, must demonstrate facility in English using one of the official methods as outlined in the *SGS Calendar*.
- Selected applicants may be required to attend an interview. Admission to the program is competitive. Achievement of the minimum admissions standards does not guarantee admissions into the program. Those accepted into the program will normally have achieved a standing considerably higher than the minimum B+ standing or have demonstrated exceptional ability through appropriate workplace experience.

Explanation of Alternative Admissions Requirements

As noted above, applicants with an average grade equivalent below a B+ in the final year or over senior courses, but who meet the SGS grade minimum of a mid-B over these courses, may be considered for admission . This information will be assessed through information provided in the applicant's letter of intent. Applicants in this category will also be required to attend an interview with the Admissions Committee.

5 Program Requirements

The MFI is designed as a 12 month (3 term) program requiring a total of 5.5 FCEs, including 9 half courses (4.5 FCEs) and an industrial internship (1.0 FCE). Students will proceed through the

program as a cohort, following a common course of study. The course of study will be fully integrated and computer-laboratory intensive. Course projects and assignments will be designed to integrate material across courses and to utilize material within various practical settings. Excellent communication and presentation skills will be emphasized in both the oral and written components of the projects. Appendix B contains the calendar entry for the program requirements.

The majority of the core courses 0.5 full course equivalent (FCE) or half courses, which run for twelve (12) weeks and meet for three (3) hours per week (excluding tutorials / computer labs). STA2550H+ (Financial Insurance Seminar Series) is a twelve week course (0.5 FCE) extended over two terms. The internship course, STA2560Y, consists of a 3.5 month summer internship between May-August (1.0 FCE). All courses are required and there are no options in the selection of courses.

The table below illustrates the time-line and collection of courses that students must complete each term.

Term	Course	Short Description
Term 1: Fall	Applied Probability for Mathematical Finance (STA 2503 H - 0.5 FCE)	Discrete time modelling, stochastic calculus, financial derivatives: equity, interest rate and commodities, stochastic volatility and jumps
	Applied Time-Series Analysis ** (STA 2530 H - 0.5 FCE)	Time series modelling including AR, MA, ARMA, ARCH, GARCH, VAR, co-integration, non-linear models, quantile regression, volatility forecasting
	Numerical Methods for Finance (MMF 2021 H – 0.5 FCE)	Monte Carlo methods, simulating SDEs, control variates, Brownian bridges, PDEs and finite difference methods
	Life Insurance Mathematics ** (STA 2535 H – 0.5 FCE)	Life insurance and annuity valuation, premium reserving, multiple decrements, multiple life insurance, expense loading, pension mathematics
	Financial Insurance Seminar Series ** (STA 2550 H+ – 0.5 FCE)***	Current topics in finance and insurance, e.g., pensions, valuation, risk management, regulation and accounting
Term 2: Winter	Insurance Risk Management ** (STA 2540 H – 0.5 FCE)	insurance & annuity guarantees, asset-liability management, regulatory and economic capital, insurance securitization, longevity bonds & derivatives, reinsurance, CAT bonds & options
	Financial Insurance Case Studies ** (STA 2551 H – 0.5 FCE)	Industrial case studies, e.g., Solvency II, Pension Benefits Act, valuing and managing complex annuity riders

	Non-Life Insurance Mathematics ** (STA 2536 H – 0.5 FCE)	probability and stochastic loss models and estimation, Bayesian statistics and credibility theory, generalized linear model and predictive modelling, stochastic claim reserving
	Economics of Risk Management (ECO 2506 H – 0.5 FCE)	Portfolio risk, market, credit, interest rate, currency, country risk, counterparty, and operational risks
	Financial Insurance Seminar Series ** (STA 2550 H+ – 0.5 FCE)***	Current topics in finance and insurance: e.g., pensions, valuation, risk management, regulation and accounting.
Term 3: Summer	Industrial Internship (STA 2560 Y – 1.0 FCE)**	Projects related to the finance-insurance field

**** indicates a new course developed specifically for this program. Course descriptions are found in Appendix A.**

***** The Financial Insurance Seminar Series (STA2550H+) is a 0.5 FCE course extended over two terms.**

An internship will be required for all MFI students. The internship will provide a strong experiential learning component of the program and will help students improve their communication skills through interaction with industry professionals, the completion of a detailed report, and the presentation of their findings. Students must complete the following:

1. Internship project proposal: each student will submit a project proposal to the Program Director along with the name of the advisor by April 15. The proposal will be evaluated and modifications will be made if necessary. Final approval is required by May 15.
2. Interim report: each student will submit an interim report to the Program Director by July 7 describing progress in the first half of the summer term.
3. Final report and presentation: students will submit a final report describing the details of the project including: the context of the problem, the methods of analysis, the results and interpretation of their analysis. Students will also present their project to an audience consisting of the Program Director, their peers and industry participants.

An evaluation rubric will be developed to evaluate the interim and final reports as well as the oral presentations. A rubric designed specifically for the Industry participants will be developed

to provide students with detailed and meaningful feedback and aid in consistency of evaluation.

The Program Director will provide general academic oversight, including the quality of the internship experience and the consistency of the internship evaluation process.

Internship projects may originate from a variety of industry partners including: insurance companies, pension plans, consulting firms, investment banks, and hedge funds. The Program Director, assisted by an industrial liaison in collaboration with the Master of Mathematical Finance program (MMF), will assist students in internship placement. Partner companies will typically conduct interviews with students they are interested in hiring and it is ultimately the student's responsibility to secure an internship placement. The program anticipates most students will complete an internship, however, in rare cases, it may be more appropriate for a student to complete a project-based experience, for example, those already having financial insurance work experience.

To assist with internship placements, the MFI will work with the internship placement office of the existing U of T MMF program. The MMF has considerable experience over the last fourteen years in placing students in internships for the finance industry and has an extremely high success rate – one of the highest of all similar finance programs North America wide. The proposed MFI program will be able to leverage this success without competing for placements since the timing of internships of the MMF and the proposed MFI program are staggered with the MMF internships occurring from January to April and the proposed MFI internships occurring from May and August. The DoSS also has deep ties to industry through its Actuarial Science Industrial Advisory Board and the program is working with the Board to establish internships for the initial year(s) of the program. Industry partners will provide students with a stipend of about \$18,000 CAD for a three and half (3.5) month internship. Based on discussions with the Advisory Board and the MMF program internship, ten internships should be feasible for the first year of the program. This number of internships will increase each year in line with enrolment projections.

Moreover, the proposed program will make use of the MITACS Accelerate program, which provides partial funding for graduate students conducting internships that enhance connections, and transfer of knowledge between academia and industry, to increase its attractiveness for potential industry partners. The DoSS, as well as the MMF program, has experience in managing these types of internships and the DoSS (in collaboration with the Department of Mathematics and Statistics at York University) currently has a MITACS accelerate cluster proposal (18 internship units over 3 years), with a focus on a financial insurance related project, under evaluation – with initial indications that the proposal will be successful.

In rare cases, it may be more appropriate for a student to complete a project-based experience, for example, those already having financial insurance work experience. An academic advisor will be assigned by the Program Director to supervise a project structured to meet the same learning outcomes of the internship. The Program Director will be responsible for ensuring that the projects, industrial or academic, support the program learning outcomes and related

graduate degree level expectations. Examples of projects include (i) investigating how individuals should optimally decide when to annuitize their wealth taking into account the stochastic nature of interest rates and equity markets; (ii) analyzing the effect of jumps in the valuation and hedging of guaranteed income benefits for life; and (iii) developing a sensitivity analysis of catastrophe bonds and options to uncertainty in the underlying model and its effect on risk measures.

Please see Appendix [B] for proposed calendar copy.

Please see Appendix [A] for a full list of the course numbers and titles, indicating clearly whether they are new / existing.

6 Program Description

The MFI professional program will be offered as a full-time program.

The full-time program will normally be completed in one full academic year. Students must complete a total of 4.5 FCE of on-campus course work in each of the Fall and Winter sessions.

The program contains an internship component from May – Aug (Summer session) worth 1.0 FCE. Those in the full-time program will enter the internship immediately after course work is completed at the end of the Winter session.

The required course work can be completed during the regular academic year. The course load of four courses per term (plus the seminar series) is in line with the workload in the DoSS current MSc program and is within the norm for most professional Master's programs. The internship component is completed during the summer and does not overlap with course work.

Whereas the Province's Quality Assurance Framework requires that students complete a minimum of 2/3 courses at the graduate level, the University of Toronto requires graduate students to complete all of their course requirements from amongst graduate level courses. This proposed program complies with this requirement.

7 Fields/Concentrations [Optional]

This program will not have any fields.

8 Degree Level Expectations, Program Learning Outcomes and Program Structure

Table 2: Master's DLEs

MASTER'S DEGREE LEVEL EXPECTATIONS (based on the Ontario Council of Academic Vice Presidents (OCAV) DLEs)	MASTER'S PROGRAM LEARNING OBJECTIVES AND OUTCOMES	HOW THE PROGRAM DESIGN AND REQUIREMENTS SUPPORT THE ATTAINMENT OF STUDENT LEARNING OUTCOMES
<p>EXPECTATIONS: <i>This Master of Financial Insurance (MFI) is awarded to students who have demonstrated:</i></p>		
<p>1. Depth and Breadth of Knowledge A systematic understanding of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of the academic discipline, field of study, or area of professional practice.</p>	<p>Depth and breadth of knowledge is defined in MFI professional program as an ability to assimilate and distill complex financial and actuarial data and models into informed business decisions.</p> <p>This is reflected in students who are able to:</p> <ul style="list-style-type: none"> • Develop, analyze and simulate statistical models for financial and insurance assets and liabilities • Understand actuarial premium and reserving principles and apply stochastic models to both life and nonlife insurances • Value and assess risks of equity-linked insurance products containing financial and mortality risks • Explain the issues surrounding Solvency II (and it's successors) • Understand financial insurance risks including (but not limited to): market risk, credit risk, counterparty risk, operational risk, life and non-life insurance risk, health insurance risk. • Develop quantitative skills for risk measurement and management 	<p>The program design and requirement elements that ensure these student outcomes for depth and breadth of knowledge are:</p> <p>STA 2503H – Applied Probability for Mathematical Finance</p> <p>STA 2530H – Applied-Time-Series Analysis</p> <p>MMF 2021H – Numerical Methods for Finance</p> <p>STA 2535H – Life Insurance Mathematics</p> <p>STA 2540H – Insurance Risk Management</p> <p>STA 2551H – Financial Insurance Case Studies</p> <p>STA 2536H – Non-Life Insurance Mathematics</p> <p>ECO 2506H – Economics of Risk Management</p> <p>STA 2550H+ – Financial Insurance Seminar Series (Credit/No Credit)</p> <p>STA 2560Y – Industrial Internship</p>

MASTER'S DEGREE LEVEL EXPECTATIONS (based on the Ontario Council of Academic Vice Presidents (OCAV) DLEs)	MASTER'S PROGRAM LEARNING OBJECTIVES AND OUTCOMES	HOW THE PROGRAM DESIGN AND REQUIREMENTS SUPPORT THE ATTAINMENT OF STUDENT LEARNING OUTCOMES
<p>2. Research and Scholarship</p> <p>A conceptual understanding and methodological competence that i) Enables a working comprehension of how established techniques of research and inquiry are used to create and interpret knowledge in the discipline; ii) Enables a critical evaluation of current research and advanced research and scholarship in the discipline or area of professional competence; and iii) Enables a treatment of complex issues and judgments based on established principles and techniques; and, on the basis of that competence, has shown at least one of the following: i) The development and support of a sustained argument in written form; or ii) Originality in the application of knowledge.</p>	<p>Research and Scholarship is defined in the MFI professional program as case-study based coupled with real-world industry specific experience.</p> <p>This is reflected in students who are able to:</p> <ul style="list-style-type: none"> • Define and describe a variety of financial insurance models, methods and case studies. • Be able to place the analysis of results into the broader context of enterprise wide risk-management. • Formulate financial and insurance models, spanning both sets of risks, which are tailored to new product designs. • Communicate models and their analysis to non-experts verbally and in written form. 	<p>The program design and requirements that ensure these student outcomes for research and scholarship are:</p> <p>STA 2503H – Applied Probability for Mathematical Finance</p> <p>STA 2530H – Applied Time-Series Analysis</p> <p>MMF 2021H – Numerical Methods for Finance</p> <p>STA 2535H – Life Insurance Mathematics</p> <p>STA 2540H – Insurance Risk Management</p> <p>STA 2551H – Financial Insurance Case Studies</p> <p>STA 2536H – Non-Life Insurance Mathematics</p> <p>ECO 2506H – Economics of Risk Management</p> <p>STA 2550H+ – Financial Insurance Seminar Series</p>
<p>3. Level of Application of Knowledge</p> <p>Competence in the research process by applying an existing body of knowledge in the critical analysis of a new question or of a specific problem or issue in a new setting.</p>	<p>Application of Knowledge is defined in the MFI professional program as competence in applying an existing body of knowledge in the critical analysis of a new question or of a specific problem or issue in a new setting.</p> <p>This is reflected in students who are able to:</p> <ul style="list-style-type: none"> • Demonstrate expertise in financial and insurance risk management and valuation 	<p>The program design and requirements that ensure these student outcomes for level and application of knowledge are:</p> <p>STA 2560Y - Industrial Internship: As part of their internship experience, students will be required to apply their knowledge of financial insurance in an industrial setting. The required written report on the internship experience is designed for students to connect their course work with</p>

MASTER'S DEGREE LEVEL EXPECTATIONS (based on the Ontario Council of Academic Vice Presidents (OCAV) DLEs)	MASTER'S PROGRAM LEARNING OBJECTIVES AND OUTCOMES	HOW THE PROGRAM DESIGN AND REQUIREMENTS SUPPORT THE ATTAINMENT OF STUDENT LEARNING OUTCOMES
	<ul style="list-style-type: none"> Critically and comprehensively assess problems arising in the financial insurance context from both the asset and liability components 	<p>their industrial experience. The oral report in front of faculty, industry experts and students will require students to discuss and critically assess their success at applying their academic knowledge to financial insurance problems they encountered in their internship.</p> <p>For students completing a project instead of the internship, the criteria above hold, except that the project is supervised by a faculty member at U of T. The project will be of a similar scope and will be required to have a significant applied nature. The report and oral report will be subject to the same level of rigour and professionalism as those completed in an industrial setting.</p>
<p>4. Professional Capacity/Autonomy</p> <p>a. The qualities and transferable skills necessary for employment requiring i) The exercise of initiative and of personal responsibility and accountability; and ii) Decision-making in complex situations; b. The intellectual independence required for continuing professional development; c. The ethical behavior consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and d. The ability to appreciate the broader implications of applying knowledge to particular contexts.</p>	<p>Professional Capacity/Autonomy is defined in the MFI professional program as the qualities and transferable skills necessary for employment requiring: the exercise of initiative and of personal responsibility and accountability; and decision-making in complex situations; the intellectual independence required for continuing professional development; the ethical behavior consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and the ability to appreciate the broader implications of applying knowledge to particular contexts.</p> <p>This is reflected in students who are able to:</p> <ul style="list-style-type: none"> Prepare written reports and deliver oral presentations to 	<p>The program design and requirements that ensure these student outcomes for professional capacity/autonomy are:</p> <p>STA2551H – Financial Insurance Case Studies</p> <p>STA2560Y – Industrial Internship</p> <p>STA 2550H – Financial Insurance Seminar Series</p>

MASTER'S DEGREE LEVEL EXPECTATIONS (based on the Ontario Council of Academic Vice Presidents (OCAV) DLEs)	MASTER'S PROGRAM LEARNING OBJECTIVES AND OUTCOMES	HOW THE PROGRAM DESIGN AND REQUIREMENTS SUPPORT THE ATTAINMENT OF STUDENT LEARNING OUTCOMES
	expert (quantitative teams) and non-expert audiences (upper management) <ul style="list-style-type: none"> • Provide a holistic perspective on risk assessment 	
5. Level of Communications Skills The ability to communicate ideas, issues and conclusions clearly.	Communications Skills is defined in the MFI professional program as the ability to communicate ideas, issues and conclusions clearly. This is reflected in students who are able to: <ul style="list-style-type: none"> • Construct a credible argument and present it in appropriate formats • Construct detailed research reports and executive summaries • Deliver professional presentations to expert (quantitative teams) and non-expert audiences (upper management) 	The program design and requirements that ensure these student outcomes for level of communication skills are: <ul style="list-style-type: none"> STA2551H – Financial Insurance Case Studies STA2560Y – Industrial Internship STA 2550H – Financial Insurance Seminar Series STA 2503H – Applied Probability for Mathematical Finance

9 Assessment of Learning

9.1 Student Achievement and Learning Outcomes

Student performance in the program will be assessed through a variety of methods including reports, presentations, assignments, case studies, and exams. Students will receive letter grades for their performance in each course, including the internship course. The mark for the internship course will be based on the written reports and presentation.

Learning Outcomes	Computer Assisted Assignments	Projects	Exam	Internship
1. Depth and Breadth of Knowledge				
Display expertise in at least one area related to financial insurance	✓	✓	✓	✓
Critically assess a problem that is complex and has alternative design approaches		✓		✓
Adjust communications to address different audiences		✓		✓
Identify key debates that result from conflicting stakeholder views	✓	✓	✓	
2. Scholarship				
Conceptualize, design, implement a financial-insurance project	✓	✓		
Make informed judgments on complex issues in the context of financial insurance	✓	✓		
Articulate those strategies and judgments		✓		✓
3. Application of Knowledge				
Assess a complex problem from the viewpoints of stakeholders	✓	✓	✓	
4. Professional Capacity				
Complete the degree requirements in a timely manner	✓	✓	✓	
Demonstrate project management skills	✓	✓	✓	
5. Communication Skills				
Communicate Complex ideas effectively	✓	✓		✓
Prepare reports and presentations that outline the problem, options and solutions	✓	✓		✓

9.2 Program Assessment

The program director will evaluate the program's success using a number of measures including

1. Conducting regular course evaluations which assesses the instruction quality as well as the courses' content and deliver modes.
2. Speaking with internship supervisors to ensure that students are being well prepared for working on real world projects.
3. Setting up an industry advisory board to ensure the program stays in pace with the markets, industry demands and regulatory bodies.
4. Keeping an alumni network to learn from their experiences within the program and where the program can improve in terms of both industry preparation as well as content.

10 Consultation

This program has been developed in consultation with the *Master's of Mathematical Finance program (MMF)*, the *Department of Economics* and *The Rotman School of Management*.

Preliminary meetings between the group began in mid-2012.

Individuals involved in the discussions from the Department of Statistical Sciences included:

- Prof. James Stafford, Department Chair
- Angela Fleury, Department Manager
- Prof. Sheldon Lin, Acting Chair
- Prof. Sebastian Jaimungal, Associate Chair, Graduate Studies

At the Master of Mathematical Finance (MFF) program discussions also included:

- Prof. Luis Seco, Director, MMF program
- Ms. Petra Jores, Program Coordinator, MMF program

At the Economics Department discussions also included:

- Prof. Arthur Hosios, Chair, Department of Economics
- Prof. Angelo Melino, Director, Master in Financial Economics (MFE)

At the Rotman School of Management discussions also included:

- Alexandra MacKay, Academic Director, Master of Finance (MFin) program

11 Resources:

11.1 Faculty Complement

The academic foundation for this program rests on the expertise in finance, insurance, statistics and economics within the Faculty of Arts and Science, and in particular in the DoSS where the program will reside. This expertise ranges from risk theory in actuarial science to stochastic modeling in mathematical finance to time-series analysis and statistical methodologies. Two members of the department were core members of the NCE funded MITACS insurance project – a multi-year industry-academic collaboration on industrial motivated problems at the interface of finance and insurance. One of the members is the program director of the SIAM activity group on Financial Mathematics and Engineering. Research in time-series analysis extends to non-linear and non-parametric estimation and inference as well statistical methods in financial econometrics. Members of the department have published extensively in various aspects of statistics, insurance and finance. The diversity of research undertaken and the expertise held in the Department can easily sustain the proposed program.

The professors who will be core participants in this program are highlighted in Appendix B demonstrating the depth and breadth of research conducted in the Department of Statistical Sciences at the University of Toronto. The corresponding curricula vitae demonstrate their significant and collective expertise.

The program plans to hire industry professionals to teach 2.0 FCEs of applied courses. These individuals will have relevant professional designations, e.g., Fellow of the Society of Actuaries (FSA) and/or financial insurance industry experience. Pending appropriate approvals, these individuals will be appointed as Adjunct Professors who will also hold Associate (Restricted) membership in the U of T School of Graduate Studies. With the University of Toronto's proximity to the country's largest financial district, there is a wealth of readily available, highly qualified, industry professionals who would be able and willing to act in these roles. More specifically, a few of the current members of the DoSS' industry advisor board have expressed their interest in taking on a teaching role in the program.

Table 3: Faculty Complement (please list alphabetically)

Name	Home Department / Unit	Rank	Graduate Faculty Membership Status (e.g., Associate/ Full privileges)	Commitment to other programs (please list)	Nature of contribution to this program (CI, TS, C/PS)*
Tenured					
Badescu, Andrei	Statistical Sciences	Associate Professor	Full	MSc, PhD, Statistical Sciences	CI STA 2535, 2536, 2550, 2560
Broverman, Samuel, ASA ²	Statistical Sciences	Full Professor	Full	MSc, PhD, Statistical Sciences	CI STA 2503, 2535, 2536, 2550, 2560
Jackson, Kenneth	Computer Science	Full Professor	Full	MSc, PhD, Computer Science MMF	CI MMF 2021
Jaimungal, Sebastian	Statistical Sciences	Associate Professor	Full	MSc, PhD, Statistical Sciences MMF	CI MMF 2021, STA 2503, 2530, 2550, 2560
Knight, Keith	Statistical Sciences	Full Professor	Full	MSc, PhD, Statistical Sciences	CI STA 2530
Lin, X. Sheldon, ASA ¹	Statistical Sciences	Full Professor	Full	MSc, PhD Statistical Sciences	CI STA 2503, 2535, 2536, 2550, 2560
Tenure-Stream					
Zhou, Zhou	Statistical Sciences	Assistant	Associate	MSc, PhD,	STA 2530

² ASA is an Associate of the Society of Actuaries

Name	Home Department / Unit	Rank	Graduate Faculty Membership Status (e.g., Associate/ Full privileges)	Commitment to other programs (please list)	Nature of contribution to this program (CI, TS, C/PS)*
		Professor		Statistical Sciences	
Non-Tenure Stream (i.e., CLTA)					
Teaching Stream					
Sessional Lecturer**	Statistical Sciences	2.0 FCEs – Adjunct Professor	Graduate Faculty membership: Associate (Restricted)	N/A	CI
Others (please specify – i.e., Adjunct, status only, clinical faculty, visiting or other)**	Statistical Sciences	Adjunct Professor	Graduate Faculty Membership: Associate (Restricted)	N/A	CI

* CI: course instructor; TS: thesis supervisor; C/PS: clinical or practice supervisor

** Those hired as Sessional Instructors will be industry professionals. The program will also request appointment as Adjunct Professor for these individuals. There may be additional industry professionals appointed as Adjunct Professors as the program develops.

11.2 Learning Resources

Program Director: The MFI requires a Program Director. Professor Sebastian Jaimungal will serve as the founding Program Director. The Director will receive a 1.0 FCE course release starting in the January prior to the program start date (tentatively set at January 2015). This will allow the Director to oversee admissions for the program, develop new courses, and to develop internship opportunities. Once the program begins, a yearly course release of 0.5 FCE will be provided to the Director to fulfill these duties.

Department of Statistical Sciences Faculty Course Release: Since the MFI utilizes existing faculty, course release (0.5 FCE per course) will be necessary to cover courses currently taught by these faculty. The budget of the MFI is structured to provide stipendiary course release to the home unit for courses taught by these faculty.

Access to Courses in Existing Programs: Students in the MFI will need access to three existing courses, STA2503H, MMF2021H, and ECO2506H. In years 1 and 2, the MFI program has secured access for MFI students in the existing sections of these courses. Once the MFI reaches an enrolment of 15 students per year, separate sections of STA2503H and MMF2021H will be needed. The MFI academic and financial plan is designed to accommodate the costs of access to existing courses in year 1 and 2 and additional sections as the enrolment grows in year 3+.

Industry professional adjunct faculty: 2.0 FCEs will be taught by industry professionals. Pending appropriate approvals, these individuals will be appointed as Adjunct faculty and Associate (Restricted) members of the U of T School of Graduate Studies (pending approval by SGS).

Financial Insurance Seminar Visiting Speakers: Industry professionals are a core component of the required Financial Insurance Seminar. Current plans are to invite one industry professional per month to speak at the seminar. Honorariums and travel costs will be borne by the program.

Teaching Assistants: Two existing courses, STA2503H and MMF2012H, utilize teaching assistants. The MFI program will provide additional TA funding proportional to the number of MFI students in the course. In years 3+, when MFI enrolment growth requires additional sections of these courses, the MFI will provide needed Teaching Assistant support.

Administrative Support: The program requires 1.0 FTE administrative Graduate Program Coordinator. The Graduate Program Coordinator would be housed within the Department of Statistical Sciences. Estimated start for this position is January 2015, prior to the September start date. The program also requires a 0.50 FTE Internship Assistant for years 1-2 of the program and growing to 0.60 FTE by year 3.

Please see the following Appendices

Appendix D: Library statement confirming the adequacy of library holdings and support for student learning

Appendix E: Standard statement concerning student support services

11.3 Financial Support for Graduate Students

The MFI is a self-funded professional masters program and does not provide funding to students. Financial support is not anticipated other than scholarships typically available to graduate students.

The industrial internship will provide students with about 18,000 CAD of funding that will assist in offsetting the program's cost to the student.

Moreover, the proposed program will make use of the MITACS Accelerate program, which provides partial funding (7,500 CAD) for graduate students conducting internships that enhance connections between, and transfer of knowledge from, academia and industry, to increase its attractiveness for potential industry partners. The DoSS, as well as the MMF program, has experience in managing these types of internships and the DoSS (in collaboration with the Department of Mathematics and Statistics at York University) currently has a MITACS accelerate cluster proposal (18 internship units over 3 years), with a focus on a financial insurance related project, under evaluation – with initial indications that the proposal will be successful.

11.4 Space/Infrastructure

Classroom space: When the program reaches steady-state (5 years from start of program) it will require a dedicated thirty (30) seat classroom with “horseshoe” seating and audio visual equipment including video conferencing. At that time, the program will require two breakout rooms with modular tables and seating to support the small group and project-based assignments. These items, including the AV and other information technology needs, are included in the approved budget for the MFI program.

The exact location of this dedicated space is still being determined within the overall medium to long-term (5-10 year) Faculty of Arts & Science Sector Master Plan and that aligns with its goal of grouping the physical sciences in this sector. There are several projects underway involving other academic units that may either free up additional space in the building currently housing the Department or in other Faculty existing space.

In the initial years of the program and prior to the program reaching steady-state, the MFI will use equivalent existing space either within U of T or close to campus. Several options are available including 1) sharing existing tiered/“horseshoe” classrooms and breakout rooms with other professional masters programs on the St. George campus, including recently renovated

spaces within the Faculty of Arts & Science; 2) partnering with the U of T Academic & Campus Events to access centrally bookable classrooms geared towards professional masters programs; and 3) renting space off-campus, similar to the U of T Masters of Mathematical Finance. The Faculty of Arts & Science Office of Infrastructure and Planning is leading the space and infrastructure plans for these classrooms and will ensure appropriate space is arranged prior to the arrival of the first cohort in Fall 2016. At the start of year three, the Dean's office along with the Department will assess the program's enrolment growth, budget status, projected space needs of the program and status of the Faculty's Sector Master Plan in order to assess the timeline, location and renovation plans for the dedicated classroom spaces discussed above.

The budget for the MFI includes both the cost of rental space in the initial years of the program and the cost of fully-renovating space within the Department of Statistical Sciences to create the classroom and breakout rooms.

Administrative Staff Space: The Faculty of Arts & Science Office of Infrastructure and Planning is overseeing the renovation of existing administrative staff space in the Department to accommodate the administrative staff needed for the program. This project is scheduled to be completed by end of May 2015, prior to the arrival of the first cohort of students in Fall 2016.

12 Quality and Other Indicators

Faculty expertise in the Department of Statistical Sciences ranges over a number of topics in finance, insurance, statistical theory and methods. Two faculty members have written several books on insurance. One of these books is the standard textbook that all Actuaries must study as part of the Society of Actuaries (SOA) examinations to become a Fellow of the Society of Actuaries (FSA). Another faculty member is writing a book on mathematical finance. The Actuarial Science and Mathematical Finance faculty members are widely published in leading journals and are highly regarded in international arenas as demonstrated by their roles in editorial boards of leading journals and invited talks at international conferences and workshops.

Two members of the faculty were core members of the NCE funded MITACS insurance project which was a multi-year industry-academic cross-University collaboration on topics related to the interface of finance and insurance. One of the members is the Program Director for the SIAM Financial Mathematics & Engineering activity group.

Two other faculty members are well known academic experts in financial time series and have developed cutting edge methods for analysis of such data.

In addition, the program will hire industry professionals who have relevant professional designations, e.g., Fellow of the Society of Actuaries (FSA), or are widely viewed as leaders in their field of expertise.

13 Governance Process:

	Levels of Approval Required
Consultation with Provost	
Decanal and Provostial Sign-Off	
	Graduate unit approval
	Faculty/Divisional Governance
Submission to Provost's Office	
	AP&P
	Academic Board
	Executive Committee of Governing Council
<i>Program may begin advertising as long as any material includes the clear statement that "No offer of admissions will be made to the program pending final approval by the Quality Council and the Ministry of Colleges Training and University (where the latter is required)."</i>	
	Ontario Quality Council
	Submitted to MTCU (in case of new graduate degrees and programs, new diplomas)

Appendix A: Courses

Courses below market with ** indicate those being developed specifically for this proposed program.

STA 2503 H: Applied Probability for Mathematical Finance (0.5 FCE)

This course features studies in derivative pricing theory and focuses on building basic financial theory and their applications to various derivative products. A working knowledge of probability theory, stochastic calculus, knowledge of ordinary and partial differential equations and familiarity with the basic financial instruments is assumed. The topics covered in this course include, but are not limited to: binomial pricing models; continuous time limits; the Black-Scholes model; the Greeks and hedging; European, American, Asian, barrier and other path-dependent options; short rate models and interest rate derivatives; convertible bonds; stochastic volatility and volatility derivatives; currency and commodity derivative.

Letter grade.

STA 2530 H : Applied Time-Series Analysis (0.5 FCE) **

An overview of methods and problems in the analysis of time series data related to finance and insurance. The course will focus on both theory and application with real datasets and will require writing reports. Topics include:

- Theory of stationary processes, linear processes
- Elements of inference in time domain with applications
- Spectral representation of stationary processes
- Elements of inference in frequency domain with applications
- ARMA, ARIMA, SARIMA, ARCH, GARCH
- State-space models

Letter grade.

STA 2535 H : Life Insurance Mathematics (0.5 FCE) **

This course will develop the mathematical theory of life insurance products. Beginning with basic life insurance and annuity valuation, the course will then introduce the concepts of premium reserving, multiple decrements, multiple life insurance, and expense loading. As well, topics in pension mathematics will be covered.

Letter grade.

STA 2550 H+ : Financial Insurance Seminar Series (0.5 FCE) **

New Graduate Program Proposal for the MFI professional program

This course extends over the fall/winter sessions and will feature invited guest speakers delivering both academic and practical seminars on current aspects of finance and insurance modeling, pensions, valuation risk management, regulation and accounting.

Pass/Fail grade.

STA 2540 H : Insurance Risk Management (0.5 FCE) **

This course features studies in the risks, and how to quantify and manage those risk, in financial and mortality linked insurance products. Topics include: hedging of guarantees embedded in equity-linked insurance and annuity products, asset-liability management, determination of regulatory and economic capitals, insurance securitization (life & P/C), longevity bonds and derivatives, reinsurance, catastrophe bonds and derivatives.

Letter Grade.

STA 2551 H : Financial Insurance Case Studies (0.5 FCE) **

This course takes cases from a variety of problems in the financial and insurance worlds and students will work in groups to develop both the theory and implementation of cases, write reports and deliver presentations on their findings. The course will be led by industry practitioners. Sample topics include: Solvency II, Pension Benefits Act, valuing and managing complex annuity riders.

Letter grade.

STA 2536 H : Non-Life Insurance Mathematics (0.5 FCE) **

This course will bring to life the stochastic models of non-life insurance mathematics, including probability and stochastic loss models and estimation, Bayesian statistics and credibility theory, generalized linear model and predictive modelling, stochastic claim reserving.

Letter grade.

STA 2560 Y : Industrial Internship (1.0 FCE) **

Students will complete an industrial internship or research project in the financial insurance area and write a report, present and defend it.

Letter grade.

ECO 2506 H : Economics of Risk Management (0.5 FCE)

This course will focus on the risks faced by the manager of a portfolio of financial assets. Such risks include credit, liquidity, interest rate, currency, systemic, country and sovereign risks. These risks frequently have lumpy and unpredictable characteristics. Elements of un-measurability often frustrate the empirical estimation of the potential impacts of such risks. The course will examine the various risk management techniques used by financial managers to address these problems, and the strengths and limitations of each of the techniques within an operational business setting.

Letter Grade.

MMF 2021 H: Numerical Methods for Finance (0.5 FCE)

Monte Carlo methods: randomness and pseudo random numbers, Gaussian distributions; simulating continuous-time processes; option pricing by simulation; variance reduction, antithetic sampling, control variates; quasi random sequences, Brownian bridge methods; PDEs and finite differencing; Green's functions' space discretization; time discretization; free boundary problems; solution methods for American options; multi-asset problems and exotic options.

Letter grade.

Appendix B: Graduate Calendar Copy

Statistical Sciences

Degree Program Offered

Financial Insurance – MFI

Overview

The Master of Financial Insurance is a full-time professional program focused on producing students who will become leaders in the financial insurance industry worldwide. The program stands on three pillars (i) statistical methods (ii) financial mathematics and (iii) insurance modeling. It provides students with education at the interface of these domains with sufficient depth and breadth so that students can provide both detailed analysis of specific financial-insurance risks as well as provide a bird's eye perspective on how the embedded risks affects the firm enterprise wide.

This program is particularly appropriate for students with backgrounds in statistics, actuarial science, economics and mathematics, but students with a quantitative background (such as those in physics and engineering) and sufficient statistical training are also encouraged to apply. The program welcomes applications from international students.

Contact and Address

Web: www.mfi.utoronto.ca

Email: info@mfi.utoronto.ca

Telephone: TBA

Fax: TBA

Department of Statistical Sciences
University of Toronto
Room 6018, Sidney Smith Hall
100 St. George Street
Toronto, Ontario M5S 3G3
Canada

DEGREE PROGRAMS

Master of Financial Insurance

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the graduate unit's additional admission requirements stated below.
- Successful applicants require:
 - A bachelor's degree from a recognized university in a related field such as statistics, actuarial science, economics, mathematics, or any discipline where there is a significant quantitative component. Studies must include significant exposure to statistics, computer science, and mathematics, including coursework in advanced calculus, computational methods, linear algebra, probability, and statistics.
 - An average grade equivalent to at least a University of Toronto B+ in the final year or over senior courses; applicants who meet the SGS grade minimum of mid-B and demonstrate exceptional ability through appropriate workplace experience will be considered.
 - Three letters of reference.
 - A letter of intent (maximum 500 words) explaining the student's interest in financial insurance, objectives for the program, and how the background is appropriate.
 - Applicants whose primary language is not English and who graduated from a university where the language of instruction and examination was not English must demonstrate proficiency in English using one of the official methods outlined in the *SGS Calendar*.
 - Selected applicants may be required to attend an interview.

Admission to the program is competitive, and achievement of the minimum admission standards does not guarantee admission into the program.

Program Requirements

- Students will proceed through the program as a cohort and will complete 5.5 full-course equivalents (FCEs).
 - 9 half required courses (4.50 FCEs) – see list below.
 - STA 2560Y *Industrial Internship*, a 3.5-month summer internship (1.0 FCE). Students must submit a project proposal to the program director and select an advisor by April 15. Students will propose a placement site to be approved by the department. The department will provide approval of the proposal by May 15. An interim report is required by July 7. Students must prepare a final written report and deliver an oral presentation on the internship project at the conclusion of the internship.

Required Courses

Fall session:

STA 2503H *Applied Probability for Mathematical Finance*

STA 2530H *Applied Time-Series Analysis*

MMF 2021H *Numerical Methods for Finance*

STA 2535H *Life Insurance Mathematics*
STA 2550H+ *Financial Insurance Seminar Series*

Winter session:

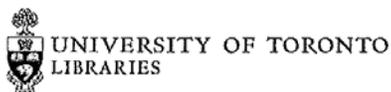
STA 2540H *Insurance Risk Management*
STA 2551H *Financial Insurance Case Studies*

STA 2536H *Non-Life Insurance Mathematics*
ECO 2506H *Economics of Risk Management*
STA 2550H+ *Financial Insurance Seminar Series (Credit/No Credit) (cont'd)*

Program Length: 3 sessions full-time (typical registration sequence: F/W/S)

Time Limit: 3 years full-time

Appendix D: Library Statement



**University of Toronto Libraries Report for
Master of Financial Insurance, Department of Statistical Sciences, 2013**

Context: The University of Toronto Library (UTL) system is the largest academic library in Canada and is currently ranked third among academic research libraries in North America, behind Harvard and Yale.¹ The research and special collections, together with the undergraduate libraries comprise almost 11.5 million print volumes, nearly 5.5 million microform volumes, more than 17,000 journal subscriptions, in addition to a rich collection of manuscripts, films, and cartographic materials. The system also provides access to more than 1 million electronic resources in various forms including e-books, e-journals, and online indices, and increasingly supports access via personal handheld devices.² There are numerous collection strengths in a wide range of disciplines reflecting the breadth of research and instructional programs at the University. The University of Toronto Library system has an annual acquisition budget of \$25 million. The strong collections, facilities and staff expertise attract unique donations of books and manuscripts from around the world, which in turn draw scholars for research and graduate work.

Major North American Research Libraries ³					
	2006-07	2007-08	2008-09	2009-10	2010-11
ARL RANK	UNIVERSITY	UNIVERSITY	UNIVERSITY	UNIVERSITY	UNIVERSITY
1	Harvard	Harvard	Harvard	Harvard	Harvard
2	Yale	Yale	Yale	Yale	Yale
3	Columbia	Toronto (3rd)	Columbia	Toronto (3rd)	Toronto (3rd)
4	Toronto (4th)	Columbia	Toronto (4th)	Columbia	Michigan
5	California, Berkeley	California, Berkeley	Michigan	Michigan	Columbia

Top 5 Canadian Universities in the ARL Ranking of Major North American Research Libraries					
	2006-07	2007-08	2008-09	2009-10	2010-11
	RANK/ UNIVERSITY				
	4/Toronto	3/Toronto	4/Toronto	3/Toronto	3/Toronto
	19/Alberta	12/Alberta	16/Alberta	11/Alberta	11/Alberta
	25/British Columbia	25/British Columbia	26/British Columbia	24/British Columbia	16/British Columbia
	33/Montreal	26/McGill	34/Montreal	31/Montreal	32/Montreal
	39/McGill	33/Montreal	40/McGill	37/McGill	38/McGill

Space and Access Services: The Library system provides a variety of individual and group study spaces for both undergraduates and graduates in the 10 central and 23 divisional libraries on the St. George, Mississauga, Scarborough and Downsview campuses. The Mathematical Sciences Library is open 40 hours per week from September through June and 37.5 hours per week from July to the end of August. 4 networked public computer terminals are available within the Mathematical Sciences Library and these provide access to the Library catalogue and online resources. The Library provides 36 for study and research. Study space and computer facilities are available twenty four hours, five days per week at one location, Robarts Library. Web-based services and electronic materials are accessible at all times from campus or remote locations, through the U of T based Scholars Portal and other leading edge digital services.

¹ Chronicle of Higher Education, "Library Investment Index at University Research Libraries, 2010 – 2011." In the Almanac of Higher Education, 2012.

² Figures as of 2010 taken from UTL's "What's new in E-Resources" page <http://main.library.utoronto.ca/eir/EIRwhatsnew.cfm> and UTL's annual statistics <http://discover.library.utoronto.ca/general-information/about-the-library/annual-statistics>

³ Association of Research Libraries Statistics.

Instruction & Research Support: The Library plays an important role in the linking of teaching and research in the University. To this end, information literacy instruction is offered to assist in meeting graduate degree level expectations in the ability to gather, evaluate and interpret information. These services are aligned with the Association of College and Research Libraries (ACRL) Information Literacy Competency Standards for Higher Education.⁴

Program Specific Instruction: Instruction occurs at a variety of levels for statistics students and is provided by the faculty liaison librarian for statistics. The Mathematical Sciences Library facilitates formal instruction integrated into the class schedule and hands-on tutorials related to course assignments. In class library instruction is offered in first year introductory statistics courses and one-on-one instruction is offered to all graduate students in Statistical Sciences. The Library, through its liaison librarians, customizes feeds of library resources, these appear prominently in Portal/Blackboard course pages. The Mathematical Sciences librarian creates online research guides in support of specific courses or areas of study and has created an online research guide for both graduate and undergraduate students in Statistical Sciences entitled *Statistics*.

Collections: Collections are purchased in all formats to meet the variety of preferences and styles of our current students and faculty. The material that will support the proposed Master of Business Insurance program is housed in the Robarts Library, the Business Information Centre at the Joseph L. Rotman School of Management, and in the Mathematical Sciences Library. Most of the collections are available online through the Library's licensed subscriptions. The University of Toronto is committed to collecting both print and electronic materials in support of a Master of Business Insurance program.

Journals: The Library subscribes to 25 of the top 25 journals listed in Journal Citation Reports (JCR)⁵ in subject area *statistics*, and 25 of the top 25 in the subject area *business/finance*. Key journals the Library subscribes to include:

- Insurance: Mathematics and Economics
- The Journal of Risk and Insurance
- Risk and Insurance
- ASTIN bulletin
- Scandinavian Actuarial Journal
- Mathematical Finance
- SIAM J. Financial Mathematics
- International Journal of Theoretical and Applied Finance
- Applied Mathematical Finance
- Quantitative Finance
- Journal of Applied Probability

All of the top 25 titles, as well as those listed above, are available electronically to staff and students of the University.

Monographs: The University of Toronto Library maintains comprehensive book approval plans with 53 book dealers and vendors worldwide. These plans ensure that the Library receives academic monographs from publishers all over the world in an efficient manner. For Statistical Sciences, monographs are purchased in electronic form where possible. The Library currently receives all current e-books directly from the following publishers: Springer, Elsevier, Wiley, and Oxford University Press.

⁴ Association of College & Research Libraries. *Information Literacy Standards*. ACRL, 2006.

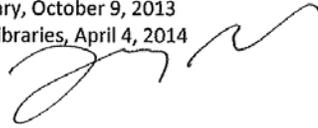
⁵ 2008 Journal Citation Reports® (Thomson Reuters, 2009)

Preservation, Digitization, and Open Access: The University of Toronto Library supports open access to scholarly communication through its institutional research repository (known as T-Space), its open journal and open conference services, and subscriptions to open access publications. In addition to acquiring materials in support of Statistical Sciences, the Library is also, in cooperation with the Internet Archive, digitizing its monograph holdings published before 1923. These books are available without charge to anyone with access to the Internet through the Scholar's Portal e-Book platform.

Key Databases: Subscriptions are maintained to major Statistical Sciences discipline-specific online indexes such as *Current Index to Statistics* and *MathSci Net*. In the area of business, the Library maintains subscriptions to all key databases including *Business Source Premier*, *ABI Inform*, and InfoTrac Insurance and Liability eCollection.

Prepared by: Bruce Garrod, Librarian, Mathematical Sciences Library, October 9, 2013

Submitted by: Larry Alford, Chief Librarian, University of Toronto Libraries, April 4, 2014



Appendix E: Student Support Services

Students at the University of Toronto have access to a range of services and co-curricular educational opportunities that complement the formal curriculum. Delivered through the Faculty of Arts and Science, the School of Graduate Studies, as well as university-wide through UofT Student Life, these services and programs support, engage and challenge students to reach their full potential as learners, leaders and citizens.

All graduate students at the University of Toronto have access to registrarial services and co-curricular programs at the School of Graduate Studies that assist students in meeting their academic goals.

Administrative staff at the School of Graduate Studies (SGS) provide **registrarial** services to graduate students including but not limited to recruitment, admission, orientation, registration, fees, program progress, awards/financial assistance and graduation.

The **Grad Room** is an accessible space on the St. George campus which provides University of Toronto graduate students with a lounge area and a multi-purpose space for academic, social and professional graduate student programming.

Grad Room is home to the **Graduate Professional Skills Program (GPS)**. GPS is a non-academic program presented by SGS consisting of a variety of offerings that provide doctoral stream students a range of opportunities for professional skills development. The program focuses on skills beyond those conventionally learned within a disciplinary program, skills that may be critical to success in the wide range of careers that graduates enter, both within and outside academe. GPS aims to help students communicate effectively, plan and manage their time, be entrepreneurial, understand and apply ethical practices, and work effectively in teams and as leaders.

The Office of **English Language and Writing Support (ELWS)** provides graduate students with advanced training in academic writing and speaking. By emphasizing professional development rather than remediation, ELWS helps students cultivate the ability to diagnose and address the weaknesses in their oral and written work. ELWS offers four types of instruction designed to target the needs of both native and non-native speakers of English: non-credit courses, single-session workshops, individual writing consultations, and website resources.

Students have access to comprehensive **physical and mental health care** on campus including a medical clinic, travel medicine services, immunization, contraception and sexual health education. Counselling and treatment options for psychological and emotional concerns include psychotherapy, group therapy and pharmacotherapy, as well as specialized assault counseling services.

Housing needs, including off-campus housing listings and resources for students living independently, are met through the Student Housing Service.

Students' career exploration and employment services are provided through a **Career Centre** offering resume and interview coaching, workshops, career resources, on and off-campus employment and volunteer listings, job shadowing, and career counseling.

Specialized services are provided for **international students** (orientation, advising, cross-cultural advising), students with **disabilities** (academic accommodations, advising), students with **children or other family responsibilities** (advising, resources, subsidized child care), **aboriginal students** (academic support, financial advising) and **lesbian, gay, bisexual and transgender** students (advising, referrals).

Participation in **campus life** and **experiential learning** are facilitated through Hart House (clubs, committees, events), the Centre for Community Partnerships (service learning), the Multifaith Centre (interfaith dialogue, events), and the Office of Student Life (leadership development, orientation, recognition and support for student groups, activities.) **Sport and recreational facilities and programs** are provided to all students through both Hart House and the Faculty of Kinesiology and Physical Education.

Report of External Review
Master of Financial Insurance (MFI) Program Proposal

of the
Department of Statistical Sciences
University of Toronto

Presented to
Prof. David Cameron
Dean, Faculty of Arts and Science

March 15, 2015

External Reviewers: Jose Garrido, *Concordia University, Canada*
Frederi Viens, *Purdue University, USA*

Date of Site Visit: February 24, 2015

Executive Summary

- MFI would be a unique program in North America offering graduate quantitative training at the intersection of Finance and Insurance. Given the professional nature of the program and its industrial internship requirement, UofT might be the only institution in North America where such a program can be offered in a single location, since Toronto is a capital for both the banking/financial markets and insurance sectors. As a relevant comparison, the only possibility in the United States where a geographic co-location could give rise to a similar program is the greater New York City area, if a program were able to draw on both the Wall Street financial center, and the insurance capital of Hartford, Connecticut. Such a hypothetical program would be much more challenging to operate in practice than the proposed MFI in its unique Toronto location.
- The Department of Statistical Sciences (DSS) already has the expertise in Finance and Insurance needed to deliver the academic part of MFI, if it were to be offered in September 2015. Moreover, UofT has extensive experience delivering successful professional Master programs in Mathematical Finance (MMF) and in Financial Economics (MFE), as well as the resources and the industry contacts.
- The MFI program is ambitious, so it will be important to give time to DSS to attract good students and only accept the top-ranking ones that could succeed in it.
- Following approval of MFI, the DSS will need to recruit an additional Finance and Insurance expert to help the current Faculty deliver the new program without affecting its current BSc, MSc and PhD offerings in the area of Actuarial Science. Possibly a second hire will be needed when the program reaches its steady state at 30 enrolled students.
- The September 2015 start date stated in the proposal is no longer realistic. The University should aim at a revised date of September 2016. . Such a date is easily achievable.

1. OUTLINE OF THE SITE VISIT

The site visit took place on Tuesday, February 24, 2015. During the course of the day the following groups were interviewed:

- Dean of the Faculty of Arts and Science (FAS), Prof. David Cameron, and Vice-Dean of Graduate Education and Program Reviews –FAS, Prof. Sandy Welsh
- Dean of the School of Graduate Studies (SGS), and Vice-Provost of Graduate Research and Education, Prof. Locke Rowe, and Vice-Dean of Programs - SGS, Prof. Elizabeth Smyth
- Vice-Dean of Research and Infrastructure –FAS, Prof. Jay Pratt, and Director of Infrastructure Planning –FAS, Ms. Lucy Chung
- Chair of the Department of Statistics Sciences (DSS), Prof. Jamie Stafford, Graduate Coordinator –DSS, Prof. Sheldon Lin, and MFI proposed Founding Director – DSS, Prof. Sebastian Jaimungal
- Master of Mathematical Finance (MMF) Director, Department of Mathematics, Prof. Luis Seco
- Faculty from DSS, Prof.'s Andrei Badescu, Sam Broverman, Keith Knight and Zhou Zhou
- Members of the DSS Actuarial Science Program Advisory, Mr. Ian Genno, FSA, FCIA, CERA and Director, Actuarial Division of the Office of the Superintendent of Financial Institutions (OSFI), and Mr. Howard Lyons, FSA, FICA and Principal, AON-Hewitt
- Director of Financial Services – FAS, Mr. Horatio Bot
- Graduate students, Mr.'s Tadeu Feirreira and Bill Huang

The temporary classrooms planned for MFI were visited, as well as the computing facilities and the offices of the DSS secretarial services. We were also shown the classrooms currently used by other professional Masters programs at U of T, such as the Master of Public Policy, that will serve as a model for the permanent facilities planned for MFI once it reaches its objective of 30 enrolled students.

The reviewers would like to take this opportunity to thank Ms. Teresa Nicoletti, Administrative Coordinator –FAS, for her kind hospitality and efficient work arranging the details of our review and site visit.

2. Terms of Reference

Program Evaluation Criteria:

1 Objectives

- University of Toronto (UofT) has extensive experience delivering professional Master programs in Mathematical Finance (MMF) and in Financial Economics (MFE), as well as the resources and the industry contacts. However, there does not exist a program anywhere in North America where training in insurance mathematics at the undergraduate or Master level includes a strong formal component on quantitative finance. This new Master of Financial Insurance (MFI) is consistent with the professional training already offered by UofT for the financial sector, while the actuarial expertise in the Department of Statistics Sciences (DSS) will help bridge the quantitative finance gaps in actuarial mathematics training by covering more exhaustively, with the MFI, the different specializations in this industrial sector, at the same time as achieving a certain synergy with the MMF and MFE programs. The MFI is precisely aimed at training professionals that work or will work at the intersection between Finance and Insurance.
- The MFI program syllabus is ambitious given its one year duration. The learning outcomes are clearly stated and appropriate for a graduate level degree in DSS and could be covered in one year provided that admissions be competitive so that incoming students be of high caliber.
- DSS has considered several names for this new program. The choice of Master in Financial Insurance seems an appropriate compromise, a short but descriptive nomenclature. The grammatical structure of the program name emphasizes the actuarial sector, and refers to the financial sector as a tool, which is appropriate given the detailed plans for the program's academic structure, and is helpful to differentiate the program from the myriad programs in North America which focus only on finance and provide little or no actuarial tools. To avoid possible confusion with other programs offered in business schools, the publicity for the program will have to emphasize the quantitative skills required from MFI students.

2 Admission requirements

- The program's admission requirements call for a significant quantitative background, such as that found in BA-BSc graduates in Actuarial Science, Mathematics or Statistics. Economics graduates with the right mathematical skills could also be considered, following an interview to ascertain the level of their quantitative skills.
- Given the ambitious program syllabus the admissions should be highly competitive; so as to attract the best qualified students. It will be important at the beginning that the University give the program time to attract a sufficient number of high caliber candidates, without pressure to accept lower ranking applicants just to meet fixed quotas. Keeping the number of admitted students low, with a steady state of 30 students per year as planned, will make it easy to ensure this high student quality. A good example is MMF launched in 1998 that now accepts only the top ranking candidates from a pool of about 500 annual applicants.

3 Structure

- The program is structured around 2 semesters of multidisciplinary theoretical training in Insurance, Financial Economics, Numerical Methods, Risk Management and Statistics, complemented by practical training in industry acquired through a summer internship, at the end of the program. The MFI learning outcomes and Degree Level Expectations are ambitious, which is perfectly appropriate for a graduate level degree with a strong quantitative component.
- The 1-year format is now standard in Ontario for Master programs, in particular professional ones. In this sense the program length proposed for MFI is reasonable. DSS plans to make qualifying studies available to students who have deficiencies in one of the prerequisite BA-BSc areas (Actuarial Science, Mathematics or Statistics) prior to entering MFI, for instance in the summer semester before. This will help ensure that the program requirements can be completed reasonably within the proposed 3-semester period.

4 Program Content

- The Life Insurance industry offers products that bear both insurance and financial risks. These require specialized risk management techniques. The same is true with respect to solvency issues for insurance companies in other sectors (like health insurance or property-casualty). The MFI curriculum will offer training on the current state of the discipline.
- MFI would be unique in North America, offering graduate quantitative training at the intersection of Finance and Insurance. Furthermore, given the professional nature of the program and its industrial internship requirement, UofT might be the only institution in North America in a position to offer such a program, as Toronto is a hub for both, the banking/financial markets and insurance companies. Another original feature of MFI is its emphasis on quantitative methods. This is common in graduate Actuarial Science programs, but not in Insurance Risk Management training, mainly offered in business schools. DSS can build on its current strengths and fill this gap for industrial problems at the intersection insurance and finance, specifically questions of financial risk management for insurance products.
- Increasingly, insurance companies are considering strategies – within regulatory confines -- for investing portions of their cash reserves into risky assets. This practice can include optimizing allocations with reinsurance providers or the acquisition of new contracts. Doing so in a safe fashion requires elements of stochastic optimization which are not part of any standard actuarial science training.
- The 10 one-semester courses are required from all students, and so is the summer internship. MFI will not offer elective courses to its students. Five of the required courses are new, developed specifically for MFI. Most of these are based on material covered in undergraduate courses already, extended to include graduate level material. The seminar course, offered over both the fall and winter semesters, will also be specific to Finance and Insurance methods; it will also represent an opportunity for the seminar organizer to introduce students to specialized state-of-

the-art methods, which they will be able to explore further in a professional setting after graduating. This will make up for the fact that the program's short three-semester completion time, which is now standard in Ontario, dictates a rigidity in the course requirements.

5 Mode of Delivery

- As stated above, the proposed mixed-mode of delivery, with 2 academic semesters followed by a summer internship, is in line with the intended program learning outcomes and Degree Level Expectations. This will give students the opportunity to develop team-work skills, while they acquire the necessary modeling and quantitative training. Putting these into practice during their industrial internship will help students hone their skills on the problems that await them after graduation. This formula has been very successful with the MMF program and should, in time, become a key asset of the MFI program.

6 Assessment of Teaching and Learning

- The MFI proposal contains details of methods for assessment of learning objectives. We think these objectives exceed the list we were provided for all relevant Degree Level Expectations. A particularly important point is the fact that securing and completing an industrial internship is not, in itself, sufficient for satisfying the program requirement: each student will give a written and oral presentation to the faculty, which will be graded with a letter grade. This fulfills requirements of assessing written and oral communication skills, including the ability to present material to audiences which may not be conversant in the internship topic. For professional Master degrees, the ability to put in practice some of the skills acquired in academic courses is essential; the internship and its report will help gauge this learning outcome.
- It is equally important for the MFI's leadership to assess the program's quality, including the quality of instruction. Here the proposal contains excellent plans, which go beyond routine techniques such as teaching evaluations. The program officials will get feedback from the industrial internship supervisors, and will seek advice from a network of alumni who can point to new elements which could be included in instruction. There are plans to use an advisory board who will also ensure that the program stays current on industrial developments. Setting up such a board is not necessarily easy. It will be worth revisiting all these plans at the end of the 5-year ramp-up period to see to what extent they have been followed.

7 Resources

- The DSS and the Faculty of Arts and Sciences is fully committed to making sure the proposed program is adequately supported. The administrators' good will and enthusiasm at both levels is strongly evident. We do not anticipate any difficulty with the needed human resources, whether academic, administrative, or support staff. For instance, it is expected that, depending on the Program Director's administrative duties, an appropriate amount of course release will be granted.

- While the long-term plan for the program's financial resources will depend on enrollment figures, the 5-year plan for supporting the program is financially sound. It should be emphasized that the program's primary purpose is not as a money-maker, but rather as an academic endeavor. Nevertheless, the plan is for the program to be financially self-sufficient in just a few years.
- One helpful element in this respect comes from the possible use of MITACS funds associated with faculty currently in the program, to create subsidies for top-performing students. As we understand it, a figure of \$ 7.5 K from MITACS grants plus \$ 10.5 K coming from a MITACS industrial partner, for a total of \$ 18K, would be available from current MITACS awards, which could provide a \$13 K subsidy for students, accompanied by a \$ 5 K grant for the supervising faculty. This way of offering some financial assistance to the most meritorious of students would be a good supplement for the program's early years, making it easier to attract a critical mass of students of the highest caliber early on.
- As explained in Section 8, while the quality and number of faculty who are proposed to teach and supervise in the program is entirely adequate, there is a slight bias towards areas of statistics which do not need to be so clearly emphasized in the program according to the planned curriculum. These include time series and econometrics specializations among the faculty. The field of actuarial risk management from a quantitative finance perspective is one which is, arguably, a new interdisciplinary field of research. We believe the program's philosophy is to draw on this emerging field, which is an exciting prospect, and which will require making an appropriate hire in the medium term. Since this new emphasis is at the cutting edge of applied academic pursuit, the proposed faculty's current research emphases meet and exceed what will be required to foster an appropriately innovative and intellectual climate in the MFI.
- Since this MFI program is a professional one, students will not typically be engaged in substantial levels of original academic research. The IT and library resources at UofT will far exceed the basic requirements for the program. It should also be noted that some financial assistance will come from the mandatory internships in which the students will engage; this will affect every student in the program. The leaders of the program are also discussing the possibility of setting up a bursary or some other form of fundraising from industrial sources, in order to create a small number of additional scholarships. We believe the faculty already have industrial contacts in Toronto who might have an interest in setting up such a bursary. Even if this starts at a small scale, there are immediate benefits to this type of named scholarship beyond the financial assistance it provides to students.
- The students in the program will all be required to produce a report from their internship activities. This report will be analyzed and graded by the program faculty. A report of high quality will be required for graduation. Reviewing the reports represents some time commitment from the faculty. Currently the plan is to have four professors take on this task every year, in an equitable way, ensuring a good supervisory load distribution.

8 Quality and Other Indicators

- Perhaps one of the most important indicators of the success of a new graduate program is the quality of its faculty. As mentioned above, the faculty already on staff at DSS are academically well qualified to teach the planned courses; one additional hire and eventually a second full time hire will be needed to ensure that the current faculty are not overburdened with teaching exclusively for the MFI. That being said, some of the details of the current faculty's excellence are as follows.
- Of the seven current DSS faculty associated with the proposed program, 4 are full professors, 2 are associate professors, and 1 is an assistant professor. This constitutes a high level of senior expertise.

Two full professors are highly regarded senior specialists in actuarial science, both with Associate of the Society of Actuaries status, with academic credentials to match: Prof. Samuel Broverman is a major contributor to the Actex and SOA study guides and manuals for the North American actuarial exams, which are a critical component of actuarial education; Prof. Sheldon Lin is an internationally recognized scholar in statistics and actuarial science, current Associate Editor of *Insurance: Math and Economics* and a past co-Editor of the *North American Actuarial Journal*, bringing to the program a high level of research expertise in actuarial science and applied statistics.

Full professor Ken Jackson is a highly prolific, well-funded, and well-regarded scholar in numerical methods, including for stochastic differential equations and applications to finance, with extensive experience in the supervision of graduate students; he will have a critical role in teaching the numerics for finance course.

Full professor Keith Knight is an active member of the research community in applied statistics and econometrics, whose role as an instructor of time series analysis will ensure strength in this planned area of the program.

Associate Professor Sebastian Jaimungal is the lead member of the academic team. He is a very highly regarded and prolific mid-career researcher in mathematical finance and empirical quantitative finance, with additional research expertise in insurance mathematics, numerical methods, and applied statistics. His commitment to the profession and well-regarded status therein are evident from his numerous editorial and committee positions, and conference invitations. It goes all to Prof. Jaimungal's credit that DSS and U of T recognize the importance of how quantitative finance can be used as a tool to further develop actuarial mathematics, with professional graduate education as a keystone to this effort.

Associate Professor Badescu is an early mid-career researcher with a strong record in actuarial mathematics. His participation will ensure a high level of instruction in the program's courses on both life-insurance and non-life-insurance mathematics. Assistant Professor Zhou Zhou is an early-career researcher specializing in statistical inference and non-stationary time series, whose participation will enrich the course offerings, particularly in time series analysis.

- The current research interests of the faculty show a good deal of expertise in time series and econometrics, even though this is not a requirement of the program itself.
- There remains some uncertainty in the composition of the faculty because it will be necessary to rely occasionally to some extent on sessional lecturers, and particularly because one or two senior hires will need to occur, at least one of which would preferably be with expertise in the practice of risk management in the insurance business. This would strengthen the component of the program at the intersection of insurance mathematics and quantitative finance, particularly in the course on actuarial risk management. We identified this hiring requirement as a potential challenge, in the sense that one cannot expect to be able to make a strong hire in this area in the first year of the program, or perhaps even in the second year. It is critical for DSS and the MFI team to avoid rushing into the hire of such a person, since bringing in a high-quality faculty will far outweigh a slight delay in making the hire. If and when it can be determined that a second hire in DSS with connection to the MFI program is warranted, we recommend that both hires occur by the 5th-year steady-state mark.

Appendix

FOR THE RECORD:

- The Department staff seemed to be operating very effectively and had a very positive outlook with regards to our visit and the new program proposal. As mentioned above, there will be a need to recruit an additional Finance and Insurance expert to help the current Faculty deliver the new program without affecting its current BSc, and PhD offerings in the area of Actuarial Science. We have no recommendations with regards to the possible need for additional staff; surely the Department and the Faculty can reassess their needs once the new MFI program approaches a steady state. However, if such a need should arise, making it by the 5th year steady-state mark is desirable.
- The library support and facilities should be sufficient. Though we did not visit them, we heard no concerns about library facilities and were impressed with the information we received in our interviews with graduate students and researchers about the rest of the facilities.
- The current graduate students were extremely positive about the Department and their educational experience; this includes their appreciation of the quality of the space and the computing facilities.
- Leadership in the Department is deep and very strong. Several senior members, in Statistics, in Actuarial Science and in Mathematical Finance, have played outstanding leadership roles in establishing the Department and in seeking out external opportunities for development. Several of the younger members of the Department also have great potential in this respect. The University and the Faculty have been willing to invest in backing these leaders and this has and will continue to pay great dividends. The MFI inscribes itself in this Faculty investment as a good and timely idea.



1 April 2015

Professor Sioban Nelson
Vice-Provost Academic Programs
University of Toronto

RE: Review of the Masters of Financial Insurance new graduate program proposal

Dear Sioban,

Along with the faculty, staff and students of the Department of Statistical Sciences, I am very pleased with the external reviewers' positive evaluation of the Masters of Financial Insurance (MFI) program proposal. The report speaks to the fundamental rationale for this program. I would like to take this opportunity to extend my gratitude to Professors Jose Garrido and Frederic Viens, for the commitment of their time to this process, as well as their careful review of the proposed MFI program. The Faculty of Arts and Science places a great deal of importance on these reviews and the care with which the appraisal report was prepared is deeply appreciated. The reviewers identify several key issues which we would like to address in the following response.

Start Date of Program

The reviewers note that the September 2015 start date is no longer realistic.

The start of the date of the program has been revised to September 2016, pending final approval of the program.

Curriculum and Delivery

The reviewers refer to the curriculum for the program as "ambitious given its one year duration" and advise that a competitive admissions process be ensured, allowing for the consideration of remedial action for any successful applicant that requires it.

We are in agreement with the reviewers that the highest standards at admissions will be critical to the success of the program in almost every way, including both student performance and placement within the program during the internship as well as afterwards in terms of future employment. The current industrial demand and the Department's own past experience with the admission process will help towards ensuring that those admitted are well prepared to complete the program. The reviewers themselves state in the report that the one-year format for Master programs is now the standard in Ontario and the structure of the program over a three-semester period will allow students to meet the program requirements while completing the program in a reasonable time. Once the first cohort of students applies to the program the Department will be in the position to assess whether remedial assistance, in the form of short preparatory courses prior to commencement of studies, is needed. If it is, the Department will develop these courses for applicants. As the program enrolment grows, the Department will continue to assess whether additional preparatory work is necessary for incoming students.

.../2

The reviewers describe five of the new courses being developed for this program as mostly “based on material covered in undergraduate courses already, extended to include graduate level material”.

We respectfully assert that this is not the case and there may be some misunderstanding on this issue. Although the new courses give an in-depth treatment of some material raised within the Department’s undergraduate curriculum, as all graduate courses do, these new courses are being developed specifically for the MFI, as the reviewers note themselves. These courses are in fact very distinct from anything the Department offers in their undergraduate courses. It is often the case with Masters programs in Actuarial Science that a review of undergraduate material is provided with the aim at training students to write the first four Society of Actuarial (SOA) professional examinations. The Department has carefully designed the MFI program to be much more than this, and one of its unique features is that it breaks this traditional model. Instead, all of the new courses are at the graduate level, and require students to demonstrate graduate level knowledge in depth and breadth, theory and application. The reviewers have been careful to stress the uniqueness of this program throughout their report, which we appreciate.

Faculty

The reviewers speak to the need for two new faculty hires to support the program in the medium term. They take care that additional faculty are needed to support the entire actuarial science / mathematical finance enterprise within the Department of Statistical Sciences [DoSS], but are not required to launch the program given sufficient expertise currently existing in the Department.

There is agreement that additional faculty is necessary as the program grows and the Department has made this a priority. The reviewers note that the two additional faculty positions are needed in the mid-term. Because this first position provides needed teaching capacity to Actuarial Science programs as well as the MFI program, the Department is requesting the first position prior to the start of the MFI program. As per our Faculty’s normal process, a request from the Department has been made to the A&S Faculty Appointment Committee for a tenure-stream position in Financial Insurance. This committee, chaired by and advisory to me, meets annually to review requests for faculty positions from Arts & Science units. Requests are normally reviewed on the basis of criteria that are announced in advance through an annual memorandum to unit heads, including: the unit’s Academic Plan and the Faculty’s response; any subsequent external review reports; any subsequent discussion and developments that have led to changes in direction; new information and changes to circumstances facing the unit, as well as new academic priorities, challenges, and/or opportunities that have arisen; enrolment pressures at the undergraduate and graduate levels; and the integrity of the unit’s programs of teaching and research, given the projected impact of any retirements or resignations. The Faculty Appointments Committee meets on April 14, 2015; I will update you as to the approval of this position following the outcome of that meeting

In terms of the second position, we expect the Department to bring forward the request for the position as enrolment in the program grows. We will work with the Department to ensure the appropriate timing of this.

The reviewers cite the use of sessional lecturers within the MFI program as a potential cause for concern and evidence that further positions will be needed once the program is fully subscribed with 30 students.

While we agreed with the reviewers that an increase in faculty complement as mentioned above is required, we do not share the same view concerning the involvement of sessional lecturers. A strength of the MFI program is the engagement of industrial professionals in classroom instruction. Their involvement will greatly enhance the experiential, educational and professional components of the program. These are the types of individuals the Department plans to hire for this program. The Department has past experience in identifying, and hiring, such individuals and this is largely done through industrial contacts at both the level of individual faculty and at the level of a program or the Department itself. When industrial professionals are hired to teach a course, they are hired as “sessional instructors” as per our collective agreement with CUPE, like all other non-tenure/teaching-stream faculty. The Department also plans to appoint these same industrial professionals as Adjunct Professors through the Faculty of Arts & Science as is befitting the nature of their appointment.

Space

The reviewers commented that space provision in terms of a state of the art classroom would be addressed by ensuring the creation of such a classroom by the time the program is at full enrolment.

As the reviewers noted, they visited temporary classrooms that the MFI program will use in the initial years. The reviewers were impressed with these temporary classrooms and were also satisfied that the Faculty was capable of renovating and providing high-quality permanent space in the long-term. As noted in the program proposal, when the program reaches its steady-state (5 years out), it will require a dedicated thirty seat classroom with “horseshoe” seating and audio visual equipment including video conferencing. At that time, the program will also require two breakout rooms with modular tables and seating for small group project-based work. The exact location of this dedicated space is still being determined within the overall medium to long-term Faculty of Arts & Science Sector Master Plan. Several options will be made available as current projects underway within other academic units provide additional space that can be allocated to the MFI program. We will continue to work closely with the Department to monitor the enrolment growth and to ensure the space available for the program meets its needs.

Resources and Planning

The reviewers recommended that the creation of an advisory board for this program be considered and indicated that such a board would be a challenge for the Department and the Program.

We agree with the reviewers that an advisory board will be a key element of the success of the program. The Department does not see the creation of an advisory board as a challenge. The faculty have strong ties to the local finance and insurance industries, which gives them access to

a variety of important individuals. The Department currently has an Actuarial Science Industrial Advisory Board with a robust membership. They have the experience in creating and managing an active and engaged board and this provides them the confidence to replicate this effort in creating an advisory board for the MFI program.

The reviewers identify MITACS funds as potential resources in recruiting industrial partners while providing “subsidies for top-performing students”.

We appreciate the reviewers’ recommendation and agree that the MITACS Accelerate program can be beneficial in recruiting industry partners and will consider these as needed. Currently several members of the Department’s Actuarial Industry Advisory Board have shown interest in hiring interns without the need of matching funds. As well, the experience of the MMF program’s internship placement has shown that many industry partners are willing to take on interns without MITACS funds, although they can be helpful.

The reviewers recommended the possible need to hire additional administrative staff to help the current faculty “deliver the new program without affecting its current BSc and PhD offerings in the Actuarial Science”.

The staff within the Department of Statistical Sciences is supportive of exciting new initiatives, such as the new MFI program, and have been very effective in their roles when dealing with both undergraduate and graduate programs and research endeavours. The Department is aware that there may be a need for an additional administrative staff member as an industrial liaison assistant who will work closely with the MMF assistant to coordinate internships. This additional resource has been built into the proposed program budget.

To conclude, the appraisal report has provided a thoughtful analysis of the new Masters of Financial Insurance program and we appreciate that the reviewers identified both the strengths and areas of development of the proposal.

Sincerely,



David Cameron
Dean and Professor of Political Science

Cc: Jamie Stafford, Chair and Graduate Chair, Department of Statistical Sciences



APPENDIX H: Dean's Response to the External Appraiser Report

April 15, 2015

Professor David Cameron
Dean
Faculty of Arts and Science
University of Toronto

Re: Appraisal Report, Proposed new Master of Financial Insurance

Dear David,

I am very pleased to receive the appraisal of the proposed Master of Financial Insurance. Your administrative response to the appraisal nicely summarizes the report and highlights the specific suggestions made by the reviewers for consideration. I note that you agree with the appraisers that high admission standards will be critical to student success in the one-year program. I am delighted that, in response to suggestions made by the reviewers, you indicate that the Department is committed to continuously assessing the need for preparatory courses prior to starting the program, and providing them as required. You have responded to and clarified a number of resource issues including the use of sessional instructors. You do not view sessional instructors as problematic since, in this case, these instructors will be industry professionals who will provide experiential expertise in the field, as is common in professional master's programs. The appraisers suggested the hiring of two tenure-track faculty members before the five-year mark, and I note that one hire has already been requested of your Faculty. You have also clarified that course material developed for the program will be distinctive from existing undergraduate material and that the program start date has been revised to September 2016 from September 2015.

The reviewers noted that this program's distinctive combination of quantitative finance and insurance mathematics make it unique in North America and also very well-placed within the context of the University's existing financial offerings. I will be very pleased to recommend this new professional master's program to governance for approval, following approval at the Divisional level.

Sincerely,

Sioban Nelson
Vice-Provost, Academic Programs

cc.

Terri Cook, Executive Assistant to the Dean, Faculty of Arts and Science

Simcoe Hall, 27 King's College Circle, Room 225, Toronto, ON M5S 1A1 Canada

Tel: +1 416-978-2122 • Fax: +1 416-978-3939 • provost@utoronto.ca • www.provost.utoronto.ca

Professor Sandy Welsh, Vice-Dean, Graduate Education and Program Reviews
Faculty of Arts & Science

Teresa Nicoletti, Administrative Coordinator, Office of the Dean, Faculty of Arts and Science
Daniella Mallinick, Acting Director, Academic Programs, Planning and Quality Assurance, Office
of the Vice-Provost, Academic Programs

Jennifer Francisco, Coordinator, Academic Change, Office of the Vice-Provost, Academic
Programs

Locke Rowe, Dean, Graduate Studies and Vice-Provost, Graduate Research and Education, SGS
Elizabeth Smyth, Decanal Advisor on Graduate Policies, SGS