

SIAM Activity Group Financial Mathematics and Engineering Charter Renewal Application

This CHARTER RENEWAL applies to the SIAM Activity Group on Financial Mathematics and Engineering. The SIAM Activity Group (or SIAG) to which this renewal applies was originally formed under the aegis of SIAM on March 26, 2003 by the SIAM Council and on December 7, 2002 by the SIAM Board of Trustees with its initial operating period beginning January 1, 2003 and ending December 31, 2005. Its charter has been renewed by the Council and Board six times thereafter.

This SIAG has **630** members, including 386 student members, as of December 31, 2015.

According to its Rules of Procedure, the objective(s) of the SIAG are:

It is the purpose of the SIAM Activity Group on Financial Mathematics and Engineering to foster activity in the area of financial mathematics, financial computation, and financial engineering. Its goals are:

- To foster collaborations among mathematical scientists (including probabilists, statisticians, functional analysts interested in stochastic control and dynamic programming, numerical analysts interested in the numerical solution of parabolic PDEs), computer scientists, computational scientists, data scientists, and researchers and practitioners in finance and economics;
- To foster collaborations in those areas of research related to theory and to the development and use of mathematical and computational tools in quantitative finance in the public and private sector;
- To promote and facilitate the development of financial mathematics and engineering as an academic discipline.

Within the framework of SIAM, the SIAG will conduct activities that implement its purposes.

Its purposed functions were:

The SIAG on Financial Mathematics and Engineering will organize activities in financial mathematics. The SIAG is expected to:

- 1) Organize minisymposia at the SIAM Annual Meeting on years where there is no SIAG conference.
- 2) Organize a track of at least six minisymposia at the SIAM Annual Meeting at least once every five years. The VP for Programs and the VP at Large will coordinate the scheduling with the SIAG chairs.

Other activities can include:

- 3) Broker partnerships between academia, industry, and government. The SIAG will seek to facilitate the establishment of academic programs in FME and to foster its development as an academic and research discipline. The SIAG also will facilitate the placement of undergraduate and graduate students in internships in industry and government.
- 4) Work with other societies (such as the AMS, IMS, and INFORMS) to promote financial mathematics and engineering. The SIAG will work with other professional societies and industry groups to promote FME. For example, SIAM and another society might organize a workshop on a topic of mutual interest. The SIAG also would attempt to increase government support for FME through various outreach activities.
- 5) With the approval of the SIAM Program Committee, the SIAG may organize special sessions at SIAM meetings, and conduct special one- or two-day meetings immediately before or after a regular SIAM meeting. Other SIAG meetings may be organized only with the approval of the SIAM president and vice president for programs.

SIAG meetings, workshops, and conferences may be organized only with the approval of the SIAM president and the SIAM vice president for programs.

To which have been added:

SIAG/FME Early Career Prize:

The SIAM Activity Group on Financial Mathematics and Engineering (SIAG/FME) Early Career (formerly Junior Scientist) Prize, established in 2010, is awarded to an outstanding junior researcher in the field of financial mathematics for distinguished contributions to the field in the three calendar years prior to the year of the award.

SIAG/FME Student Prize:

This prize is awarded by the SIAM Activity Group on Financial Mathematics & Engineering (FME). It aims to recognize outstanding research presented by students and/or postdocs at the biennial SIAM conference on FME. Up to six finalists will be selected to present their work and up to two awards are made at each conference; each award has equal merit and each winner receives a \$200 prize. It was established in 2014.

The SIAG has complemented SIAM's activities and supported its proposed functions. The answers to the questions below indicate how this was accomplished and what the officers propose as the future directions for the SIAG.

- 1) List all current officers of the activity group (including advisory board, if relevant).
 - Chair: Michael Ludkovski
 - Vice Chair: Sebastian Jaimungal
 - Program Director: Tim Leung
 - Secretary: Alex Schied

- 2) *How is the field covered by the activity group doing? Is it growing, is the focus shifting? What have been the significant advances over the last two years?*

The FME field has been undergoing a transition beyond its traditional focus on derivatives pricing and hedging, with multiple emergent research directions. Novel interfaces between mathematical modeling in finance have developed with statistics (machine learning in finance, analysis of algorithmic and high frequency trading), economics and game theory (mean field games, principal-agent problems, systemic risk), probability (quasi-sure analysis, optimal transport), and computer science (stochastic networks, data mining). This shift of focus to large-scale models and large and complex data shares commonalities with broader trends in applied mathematics and presents new computational and analytical challenges. The evolution is also reflective of the changing structure of modern financial markets, which are now largely electronic, globalized across geography and asset classes, and involve strengthened risk-management regulation.

Significant advances have been made in the above topics, which were little explored previously by mathematicians and create new links with cognate fields. Subjects such as mean-field games, martingale transport, and algorithmic trading were virtually non-existent a decade ago, but now are strongly represented at recent SIAM FME conferences and among publications in the SIAM Journal on Financial Mathematics. At the same time, more researchers in other fields, such as statistics and computer science, are working on the theories and applications related to Financial Mathematics.

The FME field also continues to be vibrant in the education arena, with new FME Masters programs cropping up, ever-growing numbers of PhDs, culminating with strong demand for tenure-track and postdoctoral researchers.

- 3) *How is the activity group doing? Is it remaining vibrant? Is the size of the SIAG stable or increasing? How is the SIAG keeping up with the changes in the field? How are the broader interests of SIAM reflected in the activities of the SIAG?*

SIAG FME has become SIAM's outlet to the very active field of quantitative modeling in finance and succeeded in attracting a broader audience to SIAM's membership and SIAM events. The activity group is as vibrant as before with a large number of members, including a high percentage of students. Membership includes a substantial fraction of European members (the field is well represented in Europe) and practitioners from the financial services sector (banks, insurance, asset management, regulatory bodies) which creates a good mix at SIAG events, well attended by all categories.

The flagship journal associated with the SIAG FME (SIAM Journal on Financial Mathematics) has established itself as a high quality mainstream journal at the interface of applied mathematics and finance. The journal receives over 160 submissions per year. In 2015, SIFIN appointed a new Editor-in-Chief J.-P Fouque, first such transition (that went very smoothly) since the journal was started in 2009.

SIAG FME has responded to the changes described above by targeted minisymposia and tutorial sessions at SIAM FME conferences and ICIAM. The SIAG FME Conference has established a reputation as one of the best conferences in the field and perhaps the only conference where a broad range of mathematical topics are represented alongside many talks of practical interest for industry professionals. The SIAG members have been proactive in submitting cutting-edge

contributions on the emerging topics of the field. For example, at SIAM FM'16 there will be multiple minisymposia on applications of machine learning to financial modeling, and on systemic risk in stochastic network models, two highly topical new subjects. The SIAG conference is increasingly a "must" event for PhD students on the job market, and the premier North American meeting in financial mathematics in terms of attendance and breadth of topics. Overall attendance and number of presentations have been increasing at each subsequent meeting.

The size of the SIAG membership remains healthy, although there has been a drop in the number of student members, and some fluctuation among even and odd membership years.

- 4) *Please list conferences/workshops the activity group has sponsored or co-sponsored over the past three years, and give a brief (one sentence or phrase) indication of the success or problems with each.*

The SIAG FME organizes the biennial conference on Financial Mathematics and Engineering. This list of conferences may be found at: <http://www.siam.org/meeting/archive.php#fm>. The SIAM Conference on FME in 2014, which took place in Chicago, had 244 paid attendees.

The next SIAG FME conference will take place November 17-19, 2016 in Austin, TX. There is once more a very strong interest in the event, with over 40 minisymposia proposals and over 80 contributed talk submissions. This continues the upward trajectory of record attendance/number of presentations at each FME Conference.

During the 8th International Congress on Industrial and Applied Mathematics (ICIAM 2015) SIAG FME organized a track of 11 thematic minisymposia, with all sessions very well attended, a testament to the continued global growth of the Activity Group.

The SIAG has also initiated international collaborations with overseas applied mathematics societies. In June 2014, the SIAG jointly with SMAI sponsored an event in Paris, France. The 4-day conference featured over 35 invited speakers and over 100 registrants. The SIAG very recently agreed to organize another similar event in September 2017 in London, UK, to be jointly sponsored by SIAG FME and IMA and/or LMS (we are presently discussing the precise arrangements). We are pleased to be part of such joint ventures which also strengthen our international membership.

- 5) *Please indicate the number of minisymposia directly organized by the activity group at the last two SIAM annual meetings. When did the SIAG last organize a track at an annual meeting or meet jointly with the SIAM Annual Meeting?*

* Because of the number of Activity Groups, the current guidelines are that an Activity Group should organize a track about every seven (7) Annual Meetings or meet jointly with the Annual Meeting within a seven (7) meeting period.*

The last time the Activity Group met jointly with the Annual Meeting was FM'12 in Minneapolis. This meeting included 30 invited Minisymposia, as well as 13 Contributed Sessions. Our next opportunity for a joint meeting/track would be either in 2018 or 2020 (since there is likely no SIAM AN in 2019).

- *Please indicate other activities sponsored by the activity group, to include newsletters, prizes and web sites. Have each of these been active and successful?*

Since 2013 the SIAG has initiated a Newsletter which is sent out electronically to the SIAG mailing list and published online on the SIAG wiki. The latest edition was published in Spring 2016. The Newsletter have received very positive feedback from members and raised the SIAG's visibility in the field.

In 2014, the SIAG established a new Conference Paper Prize awarded to the best graduate student/postdoc presenter at the FME Conference. The inaugural prize was contested at FM'14 during a special prize session and the two co-winners selected and announced at the conclusion of the conference. The next prize will be awarded at FM'16 later this year. Based on member feedback, the prize is likely one cause of the uptick in junior presenter submissions.

The SIAM book series on Financial Mathematics was launched in 2013 and is now fully up and running. The first volume in the series was published in Feb 2016 and is entitled *Lectures on BSDES, Stochastic Control, and Stochastic Differential Games with Financial Applications* by René Carmona. Several further volumes are in preparation. Last year, the book series acquired a new Editor-in-Chief in Thaleia Zariphopoulou.

- *What activities are planned and proposed for the next period of the charter? Please describe scheduled and suggested future activities in detail.*
 - Organization of FM'16 and FM'18 Conferences. The preparations for the next SIAG Conference in Fall 2016 are in full swing. The Conference will feature 8 plenary speakers, as well as two semi-plenary mini-tutorials, and will take place over 3 full days.
 - Organization of a joint meeting in London, UK in September 2017. The event is tentatively scheduled to be hosted by Imperial College and will be in a Workshop format with about 80 participants.
 - Bid to organize the Gene Golub SIAM Summer School in either 2018 or 2019. The SIAG never organized G2S3 so far, but several of our members and officers have extensive experience with summer schools (e.g. hosted by Fields, PIMS, European research agencies, etc). Summer schools on FME topics take place regularly in Europe and in Canada. In 2015, there was a successful FME workshop as part of the Mathematics Research Communities sponsored by AMS.
 - Regular contribution of articles (twice a year) to the new SIAM News Online in addition to continuing the SIAG Newsletter initiative.
- *How can SIAM help the activity group achieve its goals?*
 - Renewal of the SIAG charter.
 - Development of corporate relations for sponsorship of FM'16 and future meetings.
 - Help with marketing the Activity Group to students, to establish a more stable student membership.
- *How can the activity group help SIAM in its general role of promoting financial mathematics and engineering?*

The SIAG FME has contributed to SIAM's general goals by

- promoting SIAM membership and SIAM meetings to a broader audience including researchers and students involved in mathematical modeling in finance, as well as industry professionals and finance academics
- promoting the use of mathematical models and methods in finance and enhancing the visibility of research done by SIAM members to this wide audience
- establishing the importance of SIAM as a serious player and partner for dialogue with industry and government in issues related to the use of mathematical models in risk management and finance.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a 2 year operating period beginning January 1, 2017.



Mike Ludkovski

Chair, SIAG Financial Mathematics and Engineering
May 20, 2016