

PART A: CONTRACT DETAILS AND OBJECTIVES

1: Full Title: Computational Optimization Methods in Statistics, Econometrics, and Finance

Short Title (i.e. Project Acronym): COMISEF

2: Proposal Number: 0342702-2 (COMISEF)

Contract Number: 2006-0342702-2

3: Duration of the project: 48 Months

4: Contractors and Place(s) of Implementing the Project

The Co-ordinator and other Contractors listed below shall be collectively responsible for execution of the work defined in this Annex:

The Co-ordinator

- | | | | |
|----|---------------------------|--------------------|------------------------|
| 1. | Justus-Liebig-Universität | (Univ. of Giessen) | established in Germany |
|----|---------------------------|--------------------|------------------------|

Other Contractors

- | | | | |
|-----|--|-------------------------|--------------------------------------|
| 2. | Imperial College Of Science,
Technology & Medicine,
London | (Imperial) | established in the United
Kingdom |
| 3. | Università degli Studi
di Roma “La Sapienza” | (La Sapienza) | established in Italy |
| 4. | Birkbeck College,
University of London | (Birkbeck) | established in the United
Kingdom |
| 5. | University of Zurich | (UZH) | established in Switzerland |
| 6. | Université de Genève | (UNIGE) | established in Switzerland |
| 7. | Deutsche Bank AG | (Deutsche Bank) | established in Germany |
| 8. | University of Copenhagen | (UKBH) | established in Denmark |
| 9. | University of Cyprus | (Univ. of Cyprus) | established in Cyprus |
| 10. | University of Essex | (Univ. of Essex) | established in the United
Kingdom |
| 11. | Klagenfurt University | (Klagenfurt University) | established in Austria |
| 12. | University of Lodz | (Univ. of Lodz) | established in Poland |

5: Project Overview

The scope of quantitative research in economics and finance broadens due to the increasing availability of data sets. In order to extract relevant information from these data new statistical procedures are developed often resulting in highly complex optimization problems. Novel optimization procedures are required to tackle these problems without imposing unrealistic assumptions. COMISEF will contribute to the development of these methods, their statistical analysis and their application to problems in statistics, econometrics and finance by concentrating on heuristic optimization methods.

In this context, COMISEF will conduct individual and joint research and training activities exploiting the specific expertise of all partners.

5.1 Overall Objectives

The key objective for the network research activities is to establish heuristic optimization as an additional research paradigm in quantitative research in the fields covered by the network including economics, statistics and finance. To this end, a clear formal analytical framework of performance and convergence of optimization heuristics will be developed. New applications in economics and finance will demonstrate the versatility and power of the proposed paradigm.

The second key objective for the network is to train a cohort of early stage researchers with specific knowledge in this promising field of research activities. Experienced researchers will be equipped with complementary skills required for a successful career in this interdisciplinary research program. The network will also support activities in research, training and transfer of knowledge proposed and contributed by the research fellows.

Third, COMISEF will contribute to disseminate the new research paradigm in academia and industry by organizing several tutorials, workshops and conferences and by contributing to relevant international conference series. The network will also use high-ranked scientific publications, its web platform and industry collaboration to disseminate the knowledge generated from its activities.

5.2 Overall Approach and Methodology

In order to establish optimization heuristics and their applications as a new research paradigm, the network must meet certain research output, training and transfer of knowledge goals. COMISEF aims to meet these goals by exploiting synergies between network partners. To this end, it has defined specific subtasks. Each project partner has defined a specific project within a subtask to be approached by the early stage researchers as part of their training through research, i.e. under guidance from, and supported by, team members at the partner institution and in close contact with all other early stage researchers in the network. Furthermore, these research activities are supported by a regular exchange and discussion of results at the workshops and conferences organized by the network. Finally, the experienced researchers recruited by the network will contribute to and coordinate research activities together with all network partners.

The research goals include in particular the development and implementation of new (heuristic) optimization tools, the assessment of their (relative) performance, the establishment of standards for their evaluation and the analysis of potential high performance implementations. A second important contribution to more widespread use of these methods is a more detailed statistical analysis of the convergence properties of optimization heuristics, including the analysis of simultaneous convergence of optimization tools and estimators and the impact of such tools in other modelling applications, e.g. model selection on (nonlinear) time series models. The set of applications covered in the research and training activities comprises statistical and econometric modelling problems, econometric estimation and testing problems, financial engineering and pricing of financial instruments. Specific attention is given to applications in the context of agent-based models, e.g. modelling of learning and indirect estimation of agent-based models. By providing further convincing applications combined with a solid statistical theory and the establishment of an evaluation standard, COMISEF will contribute to a broader use of the promising set of optimization tools in the fields covered by the network.

The specific research activities require different research methods. Nevertheless, some approaches will be used by several projects. Part of the role of the senior scientists and experienced researchers in the network will be to guarantee an exchange of best research practice between individual researchers, especially the early stage researchers appointed to the network. In particular, the following methods will be used: screening of existing methods and their implementations, identification of (unrealistic) constraints imposed, generalization of existing modelling approaches, Monte Carlo Simulations, statistical analysis of optimization results (extreme value theory, response surface analysis), calibration of parameters of optimization heuristics, empirical assessment of results (ex post forecasts).

To support the transfer of knowledge, COMISEF will collaborate not only with its external advisory board and the industry partner within the network, but will also use existing and new links to industry and academia through its activities in research, training and transfer of knowledge.

PART B: IMPLEMENTATION

1. Description of the joint Research/Training Project

- **Research**

The overall research objectives are organized within four work packages with specified tasks assigned to one or several network partners based on their specific expertise and contributions. A summary of these activities is provided in Table 1.

Table 1: Project Objectives and Contributing Partners

Work Package	WP Co-ordinator	Tasks	Partners
WP1: Optimization and numerical methods	UNIGE	1. Development of new (heuristic) optimization tools 2. Assessment of the (relative) performance Establishing evaluation standards 3. High performance implementations	3,10,11,12 3,6 1,6,10 6,9,10
WP 2: Statistical analysis of stochastic optimization tools	Univ. of Giessen	1. Statistical analysis of the convergence properties of optimization heuristics 2. Analysis of simultaneous convergence of optimization tools and estimators 3. Analysis of the impact of optimized model selection on (nonlinear) time series models	1,6,10 1,8,10 1,3,9,12
WP 3: Identification of promising fields of applications, implementation and evaluation of new optimization tools	Univ. of Lodz	1. Statistical and econometric modelling problems 2. Econometric estimation and testing problems 3. Financial engineering 4. Pricing of financial instruments	1,8,9,12 3,8,11,12 7,8,10,12 2,4,5,7
WP 4: Modelling of artificial markets	Univ. of Essex	1. Modelling of learning (reinforcement learning and/or genetic algorithms) 2. Indirect estimation of agent-based models 3. Establishment of an evaluation standard for agent-based models	7,8,10,11 1,6,10 10,11
1 Univ. of Giessen, 2 Imperial, 3 La Sapienza, 4 Birkbeck, 5 UZH, 6 UNIGE, 7 Deutsche Bank, 8 UKBH, 9 Univ. of Cyprus, 10 Univ. of Essex, 11 Klagenfurt University, 12 Univ. of Lodz,			

For each work package, one partner coordinates the research and training activities with regard to the expected research outcomes (see column “WP Co-ordinator” in Table 1). Decision making on research activities follows a bottom up approach, i.e. typically, among partners contributing to a specific WP, co-ordinated by the WP Co-ordinator. Issues of general interest for the network will be discussed and co-ordinated by the steering committee, which consists of the scientist in charge of each network partner and two “speakers” nominated by the network fellows.

The two experienced researchers hired by the network will be located at the Univ. of Giessen and at the Univ. of Essex. The experienced researcher located at the Univ. of Giessen will contribute and support research activities in WP 1 and 2, and to applications with econometric content in WP3. The second experienced researcher will provide research input and support to WP1 and 4, and to applications related to financial market data in WP3. In order to disseminate knowledge and best practice in research methodology, these experienced researchers will visit other partners involved in the specified work packages. The experienced researchers will not only support training through research, but will also contribute to emerging synergies that address the research objectives. Thus, the experienced researchers represent an important link between network partners on the one hand and training and research activities on the other.

Within the work packages, the following specific subtasks will be considered (the numbers in parentheses indicate partners involved):

WP 1: Optimization and numerical methods

- Development and evaluation of a general data driven optimization heuristic (1,6)
- Development and evaluation of hybrid heuristics for estimation of parameters of (nonlinear) time series models (3,12)
- Development and analysis of optimization heuristics for optimal control and dynamic game solutions in stochastic models (6,11)
- Heuristic optimization algorithms for high-breakdown point regression estimates (6)
- Defining standards for the presentation of results of (stochastic) optimization algorithms; analysis of required information (1,6,10)
- High performance implementations (parallel, distributed and/or grid computing), e.g., for indirect estimation of model parameters and general simulation (6,9,10)

WP 2: Statistical analysis of stochastic optimization tools

- Statistical analysis of the convergence of optimization heuristics for uniform design problems: theoretical description and empirical findings (1,10)
- Evaluation of optimization heuristics by means of extreme value theory (1,6)
- Analysis of joint convergence of heuristics and econometric estimates (1,8,10)
- Statistical inference in evolutionary forecasting methods (3)
- Impact of automatic model selection tools on the statistical analysis of time series models, e.g., vector error correction models and non-linear time series models (1,9,12)

WP 3: Identification of promising fields of applications, implementation and evaluation of new (heuristic) optimization tools

- Genetic algorithms and other heuristic methods for non-linear model building in time series analysis, e.g., regime switching and conditional heteroskedastic models (3,12)
- Using optimization heuristics to derive joint bootstrap intervals for impulse response analysis of vector error correction models (1,12)
- Optimal model selection in linear and nonlinear time series models (8,9,10)
- Heuristic algorithms for dynamic optimization and their application to macroeconomic models (11,12)
- Optimization based decision support system for macroeconomic policy analysis (11,12)
- Risk management and dynamic trading strategies, financial engineering and hedging strategies, applications in insurance and reinsurance (7,10)
- Estimation of latent factor models for high-frequency data (7,8)

- Calibration methodologies for derivative pricing models: Stochastic and local volatility models (with jumps); pricing measure; hybrid derivatives (2,4,7)
- Minimization of explicit time dependence in option pricing models (2,4,5)

WP 4: Modelling of artificial markets

- Analysis of reinforcement learning and genetic algorithms for applications of agent-based models of market design and for the analysis of general economic modelling (10,11)
- Implementation and application of a standard method for the evaluation of agent-based models based on an indirect estimation approach (1,6,10)
- Improving the modelling of auction and market design in agent-based models based on evaluation results (7,8,10)
- Establishing an evaluation standard for agent-based models (1,10,11)

The fellows appointed by the network will contribute to these subtasks. In particular, each early stage researcher will work on a specific research project providing major input to one of the subtasks. The scientists in charge will define these projects in discussion with the steering committee and each will be based on the project descriptions in the proposal. The network will closely monitor the progress of the research activities. To this end, a set of milestones has been identified for the four work packages (Table 2); the numbers in parentheses indicate the partners responsible for specific milestones.

Table 2: Milestones

Month	Work Package 1	Work Package 2	Work Package 3	Work Package 4
12	Implementation of existing methods; first new methods (3,6,10)	Empirical assessment of optimization heuristic performance (1,6,10)	Identification of new potential applications (2,3,4,5,7,8,11,12)	Identification of the potential for optimization heuristics in agent-based modelling (7,10,11)
24	New methods implemented and tested (hybrids, data driven specifications) (3,6,9,10,12)	Standardized empirical performance analysis; theoretical results on convergence (1,6,10)	First results for new applications in statistics, econometrics and finance (2,3,4,5,7,8,11,12)	First results for implementations for learning; indirect estimation of agent-based models (1,6,10,11)
36	Standards for presentation of results; specific implementations (1,6,9,10)	Extreme value analysis of performance; allocation of computational resources (1,6,10,12)	Performance assessment for new applications; further development (1,2,3,4,5,7,8,11,12)	Comparison of different agent-based models/learning mechanisms (1,6,10,11)
48	Ready to use algorithms (tested, optimized data)	Modelling of simultaneous convergence of	Ready to use applications; documentation of	Standardized indirect estimation and evaluation

	driven parameters) documentation (6,9,10)	optimization tools; implications for applications (1,3,8,10,12)	results (2,3,4,5,7,8,11,12)	approach (1,6,10,11)
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After the first year, a number of (heuristic) optimization and numerical methods will have been developed and proposed for specific applications. Furthermore, a standardized approach for the statistical evaluation of these methods will be provided. The scope for new applications in statistics, econometrics, finance and agent-based modelling will be identified in parallel and the most promising cases will be selected for further analysis. During the second year, a set of implemented methods will become available, including new hybrid methods and data driven methods with automatic parameter selection. Statistical procedures for performance analysis will be refined and this will be complemented by approaches for theoretical convergence analyses. The third year marks the peak of expected research output. The new methods will have been established and standards for the presentation of results provided. Extreme value theory will be used to describe the empirical performance and to draw conclusions for the optimum allocation of computational resources. The method for indirect inference will be used to compare and improve agent-based models. The final year will consolidate the results, providing ready-to-use implementations, documentation of methods and results, and a framework for the simultaneous analysis of stochastic effects in estimation and modelling problems and heuristic optimization algorithms. Thus, the research phase will end with an important sample of new methods and results combined with a proper statistical framework for their assessment. This outcome will be a driving factor for distributing the new research paradigm in the European Research Area.

As a consequence, European competitiveness will be affected positively not only in academic research, where computationally intensive methods are expected to become a new leading research paradigm, but also in applied research, e.g. in risk management or macroeconomic forecasting. Improved tools for the measurement and management of risk are not only of interest to the financial industry, but also for institutions supervising the stability of the financial sector. Therefore, the research results may eventually contribute to reducing risk in the financial sector which is a definite advantage for the European Union. A similar argument applies with regard to improved methods for macroeconomic forecasting. Their implementation will help to reduce forecast errors and thereby improve the choice and timing of economic policy instruments at both national and European levels.

- **Training and Transfer of Knowledge (ToK)**

The network as a whole undertakes to provide a minimum of 432 person-months of Early Stage and 48 person-months of Experienced Researchers whose appointment will be financed by the contract. Quantitative progress on this, with reference to the table contained in Part C and in conformance with relevant contractual provisions, will be regularly monitored at the consortium level. It is envisaged that all ESRs will be appointed during the recruitment phase at the beginning of the network activities, and they will therefore benefit from all training activities offered by the network. Furthermore, a simultaneous start of the research activities taken over by the ESRs corresponds well to the overall research objectives described above.

The joint training activities consist of two core components: training through research and participation in tutorials offered by the network.

- Training through research will be supervised by senior scientists at each partner institution. ESRs obtain further assistance with their research activities from the ER hired by the network and benefit from the possibility of visiting other teams. They receive feedback on their research outcomes through participation in the workshops and conferences organized by COMISEF, in particular the special sessions organized at the Macromodels' conference series. Furthermore, ESRs are encouraged to participate in international workshops and conferences and to initiate their own activities, e.g. mini workshops, online tutorials for specific methods used etc.
- The network provides technical tutorials (T1 – T6) for all ESRs and ERs appointed by the network, other team members from network partners and to participants outside the network. These tutorials cover all major aspects relevant to the network research activities. In particular, the ESRs and ERs will acquire new, and complement existing, knowledge thereby profiting from the interdisciplinarity of the network. The tutorials cover the following topics: T1: Tutorial on Heuristic Optimization; T2: Tutorial on Model Selection; T3: Tutorial on Convergence analysis; T4: Tutorial on Advanced Econometrics; T5-I and T5-II: Tutorials on Applied Finance I and II; T6: Tutorial on Heuristic Optimization in Agent-based Models. The tutorials T1 – T6 comprise two days of lectures and hands-on training. For the network fellows, a third day will be reserved for networking and own training activities.
- The network also offers two tutorials providing complementary skills (TC-I, TC-II) (scientific writing, presenting, programming, project management, project funding, etc.). The tutorials TC-I and TC-II are planned for one or two days depending on specific needs identified by discussion with network fellows and feedback from the training manager. These tutorials will also provide time for active contributions by ESRs.
- The ESRs and ERs as well as other team members have the opportunity to participate in two workshops aiming at a closer interaction between academia and industry (HPC, PW). The workshop on high performance computation (HPC) will be offered in close cooperation with, and supported by, NEC Ltd. The workshop on stochastic optimisation techniques in portfolio management (PW) will be organized by the industry partner Deutsche Bank. These workshops will also contribute to strengthening existing and establishing new links between network fellows and industry.
- ESRs are invited to participate once in one of the two summer schools (SS1 and SS2) offered every year respectively by the partners Imperial and UKBH. These highly rated summer schools provide Ph.D. level training in fields relevant to the research projects.
- The yearly meeting at the MACROMODELS' (MM) conference series in Poland organized by the Univ. of Lodz is the central platform of the network. In special COMISEF workshops, team members and research fellows will present and discuss research results. The steering committee will convene for a management meeting. The network fellows will be encouraged to hold their own network meetings. Using the well-established platform of the MACROMODELS' conference series will increase the visibility of COMISEF's activities.

Finally, COMISEF invites the Commission representatives to these meetings for discussion of the project's progress.

- The network will ensure all partners produce and implement Career Development Plans for the fellows based on a proposal from the Co-ordinator. These plans should define clear objectives and should be based on an agreed time schedule. They should be reviewed regularly at least once a year.
- The network fellows are invited to suggest and organize additional training activities in consultation with the training manager (see below) and supported by COMISEF.

All tutorials, workshops and conference sessions are open to participants from outside the network, in particular from industry in order to build and strengthen links between network fellows and industry.

Table 3 shows the training and ToK events schedule in accordance with the overall research and training goals. It also indicates the partner responsible for the organization and financial management of the event (organizer) and partners contributing specific content (contributors).

Table 3: Recruitment and Training Activities

Month	Activity	Organizer	Contributors
1 – 5	Recruitment of ESR and one ER	All partners	
3	Kick-off meeting during Fourth International Conference on Computational Management Science 2007 (Geneva)	UNIGE	Univ. of Giessen
6	Tutorial T1: Heuristic Optimization	UNIGE	Univ. of Giessen, Univ. of Essex
8	Summer School 1 (Financial Markets)	Imperial	
9	Summer School 2 (Advanced Econometrics)	UKBH	
9	Tutorial T2: Model Selection	Univ. of Cyprus	La Sapienza, Klagenfurt University
10	Tutorial Complementary Skills TC-I	Univ. of Giessen	Univ. of Essex
11	Tutorial T5-I: Applied Finance I	Birkbeck	Univ. of Giessen, Imperial, UZH, Deutsche Bank
12	Annual Meeting and COMISEF Workshops at MACROMODELS' 2007	Univ. of Lodz	
14	Tutorial T3: Convergence Analysis	Univ. of Giessen	Imperial, UNIGE
16	Tutorial T4: Advanced Econometrics	La Sapienza	UKBH, Klagenfurt University, Univ. of Lodz
15– 18	Recruitment of the second ER	Univ. of Essex	
20	Summer School 1 (Financial Markets)	Imperial	

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21	Summer School 2 (Advanced Econometrics)	UKBH	
23	Tutorial Complementary Skills TC-II	UZH	UNIGE
24	Annual Meeting and COMISEF Workshops at MACROMODELS' 2008	Univ. of Lodz	
24	Mid Term Review	Univ. of Giessen	
27	Tutorial T6: Agent-based Models	Univ. of Essex	Univ. of Giessen, Klagenfurt University
31	Tutorial T5-II: Applied Finance	UKBH	UZH, UNIGE, Deutsche Bank
32	Summer School 1 (Financial Markets)	Imperial	
33	Summer School 2 (Advanced Econometrics)	UKBH	
33	Workshop High Performance Computing	Klagenfurt University	Univ. of Cyprus
36	Annual Meeting and COMISEF Workshops at MACROMODELS' 2009	Univ. of Lodz	
40	Workshop Stochastic Optimization in Portfolio Management	Deutsche Bank	
44	Summer School 1 (Financial Markets)	Imperial	
45	Summer School 2 (Advanced Econometrics)	UKBH	
48	Annual Meeting and COMISEF Workshops at MACROMODELS' 2010	Univ. of Lodz	

The two experienced researchers appointed by the network play a crucial role in disseminating new knowledge and best practice among network participants. They provide additional advice to the ESRs including visits to several project partners as a means for transfer of knowledge. They will also conduct their own research on specific subtasks within the research agenda. Thereby, they will gain a unique interdisciplinary expertise and international exposure. The network will contribute to further training and career development of these researchers. They will benefit from all training activities mentioned above which should complement their expertise in new areas, thereby strengthening their interdisciplinary competence. The training manager will assist them in developing an individualized training programme. In addition, the network partners will provide specific advice and practice with regard to project funding and teaching. The ERs will also be encouraged to contribute own activities to the network.

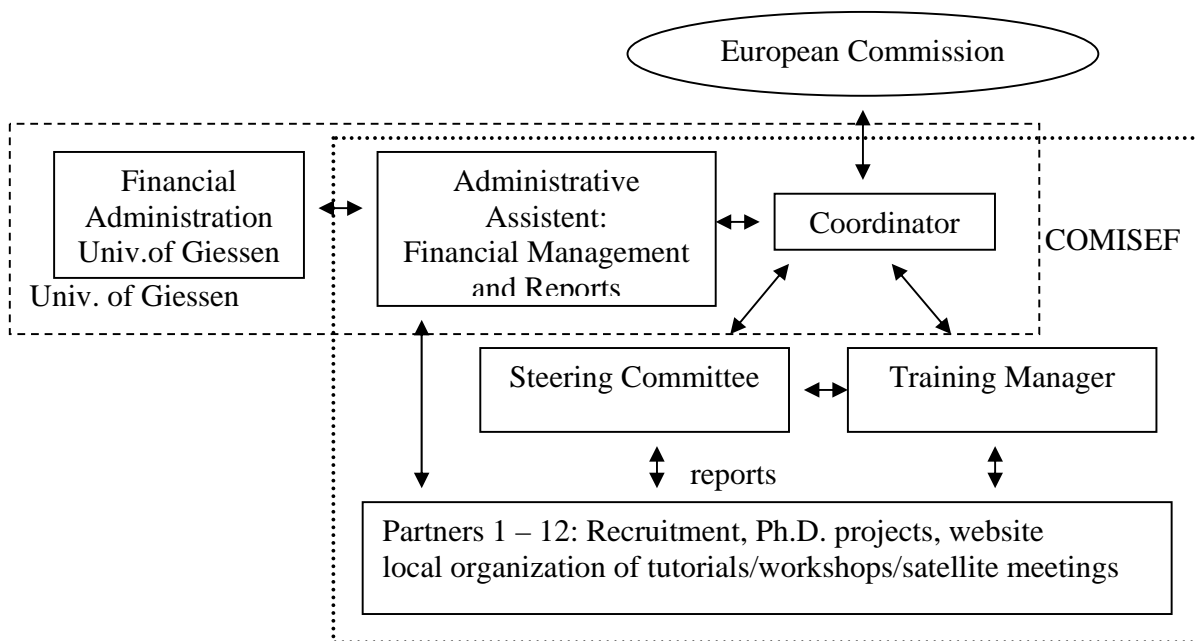
2. Management

The research network will be co-ordinated by Prof. Peter Winker, Univ. of Giessen. The Co-ordinator will be supported by a part-time assistant employed by COMISEF for the duration of the project. The assistant will contribute to the co-ordination of activities, financial management and control as well as reporting.

All research and training activities are co-ordinated by the steering committee consisting of the scientists in charge of all network partners and two "speakers" nominated by the research fellows.

The steering committee will co-ordinate and approve all recruitment decisions and the topics of the research projects conducted by the ESRs. It will take into account issues such as gender and regional balance and balanced coverage of the research fields covered by COMISEF. Furthermore, the steering committee will share overall responsibility for the financial management and control of the network. Responsibility for most training and transfer of knowledge activities is delegated to one or several partners (see Table 3 above). The Univ. of Essex will provide a training manager, who will guide the ESR and ER through the training activities offered by the network, identify additional training needs and support the network fellows in organizing their own training activities. The role of the steering committee in these activities consists mainly in collecting reports, supporting the local organizers and communicating with the European Commission through the network co-ordinator. For the first three years of the project duration, one partner is designated (Imperial, Univ. of Essex, Klagenfurt University) to assist the network co-ordinator in gathering and summarizing input required for the reports to be delivered to the Commission by the co-ordinator. Figure 1 exhibits the management structure of COMISEF.

Figure1: Management Structure



The steering committee will be supported by the external advisory board. The board members are: Prof. Hans M. Amman (Editor-in-chief of Computational Economics, Technical University Eindhoven, NL), Prof. David A. Belsley (Co-Editor of Computational Economics, Boston College, USA), Prof. Dr. Gunter Dueck (IBM Global Services, DE), Prof. Jenny Li (Penn State University, USA, and Yunnan University, China), Prof. Anna Nagurney (Isenberg School of Management, USA), Prof. Panos Pardalos (Editor-in-chief of Global Optimization, University of Florida, USA), and Dr. Stavros Siokos (Citigroup Global Markets, UK). In particular, the advisory board will contribute support for recruitment activities, the evaluation of project outcomes, career development for ESRs and ERs, and the dissemination of results.

Apart from regular meetings between all network partners and young researcher meetings during the satellite meetings in Poland, meetings related to training activities and bilateral visits and exchanges, the communication between co-ordinator, steering committee, advisory board and network participants will rely mainly on the internet, in particular using the website of COMISEF: www.comisef.eu. All information relating to the network will be published on this website, which will be partly accessible only to the network participants (intranet). The latter part will also be used for preparing reports and, if applicable, for providing online tutorials including materials provided by the ESRs and ERs. An e-newsletter with contributions from all contractors will be distributed to all network members. The public part of the website will contribute to the dissemination of information about network activities and results to the general public.

The recruitment of early-stage and experienced researchers will be managed locally by the partner institutions. However, all recruitment decisions will be taken in co-ordination with the steering committee. In particular, this co-ordination will guarantee the fit of the team of early-stage and experienced researchers to the overall goals of the network. Furthermore, this will ensure that all disciplines relevant for the network activities are properly covered. COMISEF will pay special attention to attracting young researchers with families by providing an adapted working environment. Particular care will be paid to ensure that all candidates obtain equal opportunities independent of country of origin, gender etc. Given the high share of women among leading scientists and further team members of COMISEF, the partners are confident that the network will be able to attract highly-qualified early-stage and experienced female researchers. The steering committee will carefully monitor the gender balance of researchers appointed by the network.

Recruitment will use several channels for advertising the positions, in particular letters to heads of economics and finance departments of universities in Europe and the USA, notices in newsletters and on the websites of newsgroups in finance and econometrics (e.g., INOMICS, MathFinance, etc.), of all network partners, and the CORDIS website. It is expected that the large network of researchers contributing to COMISEF and the advisory board will help to attract highly-qualified researchers to apply for jobs. In particular, existing links to New Member States and less favoured regions will be used to communicate job opportunities and to attract qualified candidates from these regions. One experienced researcher and twelve early-stage researchers will be appointed in the recruitment phase, the second experienced researcher in summer 2008. The goal is to fill all early-stage researcher positions by June 2007. If some of the posts cannot be filled with researchers with an adequate background, a second limited recruitment phase will start in summer 2007 to fill the remaining vacancies.

The responsibility for one of the major training and ToK activities listed in Table 3 above (column Organizer) implies that the partner receives all funding for the respective activity, i.e. costs for organizing the event including accommodation and travelling cost for network members other than fellows have to be financed from the respective partner's budget. Participation costs of fellows have to be covered by their budget allocated for this purpose.

COMISEF will use the following tools to ensure effective and broad dissemination of results:

- (1) COMISEF website www.comisef.eu (already registered for COMISEF)
- (2) Special issues of scientific journals and book series, e.g. Computational Economics, Computational Management Science, Computational Statistics and Data Analysis

(CSDA), the handbook series on “Computing and Statistics with Applications” (Elsevier), and the book series “Advances in Computational Economics” (Springer).

- (3) Organization of workshops for, and with the participation of, practitioners (PW, HPC)
- (4) Presentation of research outcomes by team members at international conferences.
- (5) Contacts with industry partners outside the network

Any new scientific results acquired by the network will be made available through its website, which will provide a platform for the exchange of ideas and results within the RTN, the organization of workshops, tutorials and similar events, but also for providing information to outside researchers.

3. Indicators of Progress and Success

3.1 Quantitative Indicators of progress and success to be used to monitor the project

3.1.1 Research Activities

In reporting on the progress with the implementation of its research plan the network will provide information and data on the following:

- organisation of or participation in and presentations to external specialist workshops and conferences (number; dates, places, title of event)
- specialist exchange among network teams (number, nature, when, where, who)
- individual and joint publications, directly related to the work undertaken within the contract (number, references)
- patents or patent applications directly related to the contract (number, references)
- development of new scientific and/or industrial collaborations (number, references)
- scientific awards and prizes obtained from the work directly related to the contract (number, details)
- interest expressed in the networks’ dedicated Website (number of hits; number of participants to the scientific forum, if any)
- visit of Senior Researchers from inside and/or outside the network (number, name, place and time of visit)
- contacts with relevant users groups whether academic or industrial/commercial (number, name)

3.1.2 Training / Transfer of Knowledge (ToK) Activities

In reporting on the progress with the implementation of its training and ToK plan the network will provide information and data on the following:

- the rate of recruitment of ESR and ER for each participant and for the network as a whole ratio person-months filled/offered)
- the nature and justification for adjustments, if any, to the original overall number of person-months of ESR and ER as well as to the breakdown of this overall number among the participants (see table contained in Part C)

- the time and duration of each individual appointment.
- the number, names and level of involvement of senior researchers directly associated with the tutoring/supervision of the recruited ESR or ER, at each participant
- the number of ESR that are expected to present their PhD thesis and when
- the number and place of the short visits and secondments, placement in company premises undertaken by each individual ESR or ER either with or outside of the network
- number of visits of the ESR and ER to their home scientific community
- attendance at network meetings by the ESR and ER (number, names, place, date)
- participation in and presentations to workshops and conferences by ESR and ER (number, names, place, date)
- organisation of training events (e.g. schools, training workshop/seminar, hands on training session on specialised instrument/techniques) at individual participant sites (number, attendees' names, place, date)
- organisation of network-wide training events (number, attendees' names, place, date)
- participation in training events organised outside the network (number, attendees' names, place, date)
- number of internet tutorial and computer based training courses developed/used
- number, place, purpose of any meeting (e.g. workshop) organised by the ESR or ER themselves
- Participants from industry in the tutorials and conferences of the network (number)

3.2 Qualitative Indicators of progress and success to be used to monitor the project

3.2.1 Research Activities

In reporting on progress with the implementation of its research plan the network will provide information and data on the following:

- general progress with research activities programmed at individual, participant team and network level
- highlights on more particularly innovative developments (novel concepts, approaches, methods and / or products)
- citation index for individual and joint publications directly related to the work undertaken within the contract
- expected scientific / technological breakthroughs
- overall progress and possible problems encountered with individual work packages and/or network-wide research activities
- nature and justification for adjustments, if any, to the original research work plan and/or timetable
- progress on cross interaction among disciplines represented within the network
- progress on cross interaction between academic and industrial partners
- progress regarding interaction with industrial/commercial/economic interests outside the network
- access to / use of state-of-the-art infrastructure and facilities

- highlights on wider societal and/or ethical components of the project, such as public outreach activities
- highlights on the scientific community recognition of the network research contribution (awards, invitation to conferences, ...)

3.2.2 Training / Transfer of Knowledge Activities

In reporting on progress with the implementation of its training plan and ToK the network will provide information and data on the following:

- general progress with training and ToK activities programmed at individual, participant team and network level (type of guidance, supervision, coaching or mentoring in place to support ESR and ER)
- highlights on the development of more particularly innovative approaches to training and ToK (e.g. specific training packages of network-wide relevance)
- highlights on the exploitation of the "complementarities" between network participants with respect to training and ToK
- nature and justification for adjustments, if any, to the original training / ToK plan and/or timetable (e.g. opportunities for new collaborations regarding training activities)
- career development plans as elaborated by the ESR and ER involved in the project
- career development opportunities/prospects for ESR and ER involved in the project
- achievements regarding the acquisition of complementary skills such as communication, language skills, computer skills, project management, ethics, team building, etc.
- achievements regarding the training/ToK on specialised instruments/equipment's
- level of satisfaction of the trainees (e.g. as expressed in response to questionnaires)

3.2.3 Management

In reporting on progress with its management the network will provide information and data on the following:

- effectiveness of the "internal" communication and decision making between the co-ordinator, team leaders, supervisors, down to the ESR and ER, including feedback processes
- effectiveness of the communication between the network and the Commission Services (frequency, efficiency, timely feedback's), particularly regarding the conformance with contractual provisions and the implementation of contingency plans where needed
- effectiveness of network communication with industrial and other stakeholders (anticipation of outcomes and possible end-users interests, contact preparation, follow-up and contractual agreement where appropriate)
- network self-assessment through benchmarking activities (exchange of best practices among participants and/or development of ad hoc performance indicators regarding cost management, staff selection, measurement of research/training/ToK outputs, young researchers' involvement, etc.)
- overall quality and efficiency of the "external" communication strategy of the network (Cordis; personal, team and network web sites updates; newsletters; etc.)

- effectiveness of the recruitment strategy of the network in terms of equal opportunities (including gender balance) and open competition at international level
- development of any specific planning and management tool(s) and databases
- management of intellectual property and commercialisation of network research output

ART C: CONTRACT DELIVERABLES (from A4b of the CPF forms)

Proposal Number ¹	034270-2	Proposal Acronym ²	COMISEF
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Overall Indicative Periodic Project Deliverables by Participant						
Participant No	Early Stage Researchers			Experienced Researchers (4-10 years)		
	Full-time Person Months	Indicative number of researchers	Type B fellowship (%)	Full-time Person Months	Indicative number of researchers	Type B fellowship (%)
1	36	1	0%	24	1	0%
2	36	1	0%	0	0	0%
3	36	1	0%	0	0	0%
4	36	1	0%	0	0	0%
5	36	1	0%	0	0	0%
6	36	1	0%	0	0	0%
7	36	1	100%	0	0	0%
8	36	1	0%	0	0	0%
9	36	1	0%	0	0	0%
10	36	1	0%	24	1	0%
11	36	1	0%	0	0	0%
12	36	1	0%	0	0	0%
Sub-Total	432	12		48	2	

PART D: COMMUNITY CONTRIBUTION (from A5b of the CPF forms)

Proposal Number ¹	034270-2	Proposal Acronym ²	COMISEF
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Overall Maximum Community Contribution										
Year	Eligible expenses for the activities carried out by the researchers					Eligible expenses related to the activities of the host organisations				Maximum EC contribution (in euros)
	A	Transnational Mobility		D	E	F	G	H	I	
	Monthly Living Allowance	B Travel Allowance	C Mobility Allowance	Career Exploratory Allowance	Participation expenses of the eligible researchers	Research/training/transfer of knowledge	Management and Audit Certification	Overheads	Other types of eligible expenses	
	Costs (in euros)	Costs (in euros)	Costs (in euros)	Costs (in euros)	Costs (in euros)	Costs (in euros)	Costs (in euros)	Costs (in euros)	Costs (in euros)	
1	248757,29	13000,00	64628,35	26000,00	36000,00	153390,00	53700,00	54177,52	0,00	649653,16
2	459848,00	14000,00	117615,00	2000,00	64800,00	132890,00	51200,00	79115,26	0,00	921468,26
3	461892,50	14000,00	118032,60	0,00	64800,00	132450,00	51200,00	79117,47	0,00	921492,57
4	186697,71	13000,00	48004,25	0,00	26400,00	114740,00	46200,00	38884,16	0,00	473926,12
5	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
6	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total	1357195,50	54000,00	348280,20	28000,00	192000,00	533470,00	202300,00	251294,41	0,00	2966540,11