Minutes of the Kick off Meeting of the Research Project:

"Complexity based Research Initiative for Systemic Instabilities" (CRISIS)

(Grant Agreement 288501)

The Kick off meeting of the Research Project "Complexity based Research Initiative for Systemic Instabilities" (CRISIS) has been held in Catania, at the Hotel Romano Palace, November 11-16, 2011. The following representatives of the partners were present:

- CATHOLIC UNIVERSITY OF MILAN (Milan, Italy): Domenico Delli Gatti, Tiziana Assenza, Mariagrazia Bonanomi, Alessandro Gobbi, Jakob Grazzini
- POTSDAM INSTITUT FUER KLIMAFOLGENFORSCHUNG (Potsdam, Germany): Doyne Farmer, Fabio Caccioli
- UNIVERSITEIT VAN AMSTERDAM (Amsterdam, the Netherlands): Cars Hommes
- Centre de Recerca en Economia Internacional (CREI) at University Pompeu Fabra (Barcelona, Spain): Vasco Carvalho
- MEDIZINISCHE UNIVERSITAET WIEN (Wien, Austria): Stephan Turner, Sebastien Poledna
- THE CITY UNIVERSITY (London, United Kingdom): Giulia Iori
- LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE (London, United Kingdom): Eric Beinhocker (acting as a substitute for Danny Quah, head of the research unit, unable to attend)
- AITIA INTERNATIONAL INFORMATIKAI ZARTKORUEN MUKODO RT (Budapest, Hungary): Laszlo Gulyas, Tamas Mahr
- UNIVERSITA DEGLI STUDI DI PALERMO (Palermo, Italy): Rosario Mantegna, Salvatore Micciché
- COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES (Paris, France): Jean Philippe Bouchaud, Francesco Zamboni
- UNIVERSITA' POLITECNICA DELLE MARCHE (Ancona, Italy): Gabriele Tedeschi (acting as a substitute for Mauro Gallegati, head of the research unit, unable to attend)
- SCUOLA NORMALE SUPERIORE DI PISA (Pisa, Italy): Fabrizio Lillo, Stefano Marmi

After an informal get together on November 11th, the KOM started in full on

November 12

Morning:

- **Doyne Farmer** presented the content and policy implications of the project in the context of the debate on the nature of the Global Financial Crisis, the remedies to the disruption of financial markets and the ensuing recession and the failure of current macroeconomic models to address these issues satisfactorily. Farmer emphasized the need for new computationally intensive agent-based models and for appropriate ICT tools which is at the core of CRISIS.

Farmer's presentation was followed by remarks from the audience emphasizing the challenge implicit in the project and the importance of the results for re-shaping economic policy making.

- **Domenico Delli Gatti** presented and discussed the content of WP 10, devoted to management and organizational issues. He briefly recalled some key data concerning the project, traced the steps followed to assemble the proposal, highlighted the changes in the DoW required by the project officer Aniyan Varghese following the negotiation meeting of May 18 2011 in Brussels, recalled the

changes in the consortium implemented in June and presented the structure of the project in terms of deliverables and milestones.

- **Mariagrazia Bonanomi** illustrated the steps to be taken after signing the Grant agreement and the administrative procedure concerning the distribution and the use of financial resources.

Delli Gatti's and Bonanomi's presentations were followed by clarification questions concerning the timeline of the project and the sequence of deliverables and milestones, the allocation of funds, the relationship between the scientific and the administrative staff.

Afternoon:

- **Domenico Delli Gatti** presented and discussed the content of WP 3 devoted to the development of the Macroeconomic Agent Based Model (MABM). In particular he presented the simplest MABM – the so-called Mark I (MABM_I) – which is the benchmark for the development of the full fledged MABM of the project, the so-called mark III. MABM_I consists of only two real markets (goods, labour) and only one financial market (bank loans). Delli Gatti illustrated the modelling strategy followed to build MABM_I and answered many clarification questions.

Delli Gatti's presentation was followed by a large number of comments, criticisms concerning the working hypotheses and suggestions to overcome the limitations of the analysis. One of the main contentious issue is the reliance in MABM_I on purely adaptive expectations to model expectations of future demand on the part of firms. The discussion then turned to issues pertaining to the progress from Mark I to Mark2, where MABM_II should incorporate features of financial markets (to be developed in WP2) not yet present in MABM_I. In particular Farmer emphasized the importance of the mortgage market, absent from MABM_I. The development of MABM_III (a multi-country MABM) was briefly touched upon.

- **Doyne Farmer** presented and discussed the Agent Based Model of the US Housing Market which a group of American researchers (D. Farmer, P. Howitt, J. Geneakoplos, R. Axtell) is currently building under the umbrella of the Institute for New Economic Thinking (INET). The experience they developed may be useful in the implementation of CRISIS, even if the scale of the effort is not comparable (the INET model is a model of only one market, the market for housing and the associated mortgage market).

Farmer's presentation was followed by a large number of questions concerning the results of the INET model and suggestions to exploit the INET model's experience to avoid mistakes in Agent based model building for CRISIS.

After the presentations and the plenary discussion, participants took part in breakout sessions, which were meant to allow each team to meet together, discuss what they are doing and refine plans. In particular there were two breakout sessions, one organized by Carvalho and Delli Gatti on WP3 (more specifically on steps to refine and extend MABM_I in order to make it adequate for the development of MABM_II) and one organized by Farmer, Beinhocker, Bouchaud, Iori, Lillo, Mantegna, Thurner on WP2 (more specifically on the features of the Financial Agent Based Model).

November 13

Morning:

- **Giulia Iori** presented and discussed the content of WP 2 devoted to the development of the Financial Agent Based Model (FABM). In particular she emphasized the need for enlarging and enriching the set of agents and markets considered in AB models. As far as agents are concerned she emphasized the role (for instance in the origin and development of the Global Financial Crisis) not only of households, firms and banks – as in MABM_I – but also of hedge funds and other institutional or professional investors. As to financial markets, she encouraged to take into account not only the

market for bank loans, but also of the mortgage market, the Stock market, the market for corporate bonds and the interbank market. Moreover Iori emphasized the role of the network structure of financial markets (especially the interbank market) in amplifying or mitigating shocks.

Iori's presentation triggered a wealth of comments and remarks from the audience suggesting ways of (i) building a coherent and economically meaningful FABM and (ii) merging the FABM and the MABM. Delli Gatti proposed to take into account the role of investment banks (and more generally of the shadow banking system) – along commercial banks – in financial markets. Farmer and Beinhocker advocated a strategy (analogous to the one adopted in the INET housing market model) based on "clamping" the model by taking development on the Stock market as exogenous.

- **Vasco Carvalho** commented on the need for (and prospective importance of) Agent based models as against standard New Keynesian DSGE. The latter have clearly shown their limitations in the wake of the Global Financial Crisis, but they are still the workhorse of modern macroeconomics and are largely used for forecasting purposes. Agent based models such as the one which will be developed by the CRISIS team must be brought to the data (validation) in such a way as to be useful for forecasting purposes.

An interesting methodological discussion followed Carvalho's comments. Participants compared and contrasted advantages and disadvantages of agent based vs DSGE macroeconomic models as forecasting tools.

After this, **Doyne Farmer** proposed to discuss an urgent organizational issue concerning the first technical review (to be held after six months from the beginning of the project, i.e. from November 1st 2011). He suggested to reach consensus within the consortium on a time window to propose to the project officer Aniyan Varghese. The time window the participants agreed upon was May 14-20 2012.
Moreover participants agree to meet in subgroups in the months leading to the technical review to take stock of the work carried out by the partners.
Finally the partners agree to hold frequent (biweekly) conference calls.

Afternoon:

- **Tamas Mahr** presented and discussed the content of WP5 on the online game and of WP6 on the agent base simulator. In particular he dealt with the issues pertaining to (i) the production and implementation of the software to be used in the computer implementation of the Agent based models; (ii) the potential features of the online game; (iii) the website. **Laszlo Gulyas** contributed to the presentation with many clarifying remarks.

The presentation by Mahr and Gulyas was followed by a large number of comments, questions and suggestions. The participants agreed on basing the story line of the online game on MABM_II. The website was registered as www.crisis-economics.eu The discussion on the delicate issue of the computing language for encoding the Agent based models was postponed to the following day.

- **Jean Philippe Bouchaud** presented and discussed the content of WP 7 devoted to the development of stylized models whose structure is based upon statistical mechanics. These models play the role of comparative benchmarks for the Agent based models. He presented in detail one of these models.

Bouchaud's presentation was commented upon by the audience. The discussion was centred upon the use of statistical mechanics models to infer results which can also be obtained by agent based models.

After the plenary discussion, participants gathered in small groups for debriefing and breakout sessions.

November 14

Morning:

- **Cars Hommes** presented and discussed the content of WP 4 devoted to economic experiments. This activity aims essentially at obtaining data useful to parameterize in a correct and realistic way the agent based models. He exemplified this procedure describing the experimental evidence on mechanisms of expectations formation gathered in experiments carried out by Hommes and his group in Amsterdam. These experiments reject the assumption according to which only individuals equipped with rational expectations survive. On the contrary, heterogeneity of mechanisms of expectations formation persists in the lab and people switch from one type of expectations to another (for instance from purely adaptive to somehow rational expectations) depending upon a measure of performance (the size of the forecasting error). Hommes emphasized that this evidence can be used to model and parameterize expectations in MABM. MABM_I for instance contemplates only purely adaptive expectations.

Hommes' presentation triggered a wealth of comments and remarks from the audience. Some participants expressed the desire to implement experiments on trust or confidence as a way of capturing phenomena largely present, for instance, in the interbank market. Hommes was open to suggestions but he warned that experiments must be designed in a very rigorous way (a protocol must be followed). Moreover, they are very expensive so that only few experiments can be carried out with the available budget.

- **Eric Beinhocker** presented and discussed the broad outline of the commercialization plan which the project officer has strongly encouraged the CRISIS consortium to devise. Beihnocker has developed a working relationship with a few large consulting and macroeconomic forecasting companies (in particular McKinsey and Oxford Economics) which have expressed their interest in the research output of CRISIS. The terms of an agreement have to be specified. Oxford economics, for instance could provide some of the data that are needed to build data-driven agent based models. In return, they could get access to some of the software or simulation and empirical validation techniques that will be developed by the CRISIS consortium.

The audience approved the line of action proposed by Beinhocker. Participants emphasized that the commercialization plan raises important IPR issues that should be dealt with in due course. They asked Beinhocker to intensify his efforts to complete the commercialization plan, which is one of the earliest deliverable of the project.

Afternoon:

- **Eric Beinhocker** presented and discussed the content of WP 1 devoted to database construction. He encouraged the partners to express their data needs as soon as possible and to collaborate to data collection. Moreover he presented and discussed the content of WP9 on dissemination. He briefed participants on developments concerning the Scientific Advisory Board and the Stakeholders Working Group. The basic criterion is to realize a large and varied membership of the two bodies in order to maximize (i) the feedback on the research work carried out within the consortium and (ii) the amplification of the results in the environments pertaining to the members of the above mentioned bodies.

The audience approved the line of action followed by Beinhocker.

- **Tamas Mahr** and **Laszlo Gulyas** led the discussion on the issue of the software to be used to encode the agent based models. In fact, so far different teams of researchers working in institutions

that are partners of CRISIS use different computing languages (e.g. Matlab, C++) to provide the codes used to run simulations.

After a thoughtful and long discussion participants agreed that an effort should be made to have a unique computing language. Moreover, participants converged on the idea of implementing the codes in Java. The team at AITIA was available to teach Java to the representatives of the partners in charge of developing the codes and to help "translating" the codes available so far in Java.

November 15

Morning:

- **Domenico Delli Gatti** presented some ideas on the way in which the FABM to be developed in WP2 can be merged with the MABM to be developed in WP3. These ideas were commented upon in a lively plenary discussion led by Doyne Farmer which aimed at finding an agreement on the list of agents and markets to be represented in the integrated model. The general principle is that the CRISIS consortium wants to focus on those issues of the real and financial markets which have been most important in the development of the Global Financial Crisis.

Afternoon:

The participants took a half day off.

November 16

Morning:

- **Doyne Farmer** presented a summary and a wrap up of the work carried out during the meeting and led the discussion on the issues remained on the table. Domenico Delli Gatti brought to the fore the issue of the commercialization plan. Moreover some scientific issues concerning the MABM were thoroughly discussed.

End of the meeting