



**tGov Workshop on Running FP7 Projects**  
**Brunel University**  
**9 May, 2012**

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eGovPoliNet  
The Policy Community



School of Social Sciences  
CITY UNIVERSITY LONDON



Start/End date	01/11/2011 – 31/10/2014 (36 months)
Type of project	Collaborative Project – STREP
Funding source	FP7-ICT-2011-7-5.6
Total Budget/ EC contribution	4,368,689/3,316,000
12 Partners	UCSC, PIK, UvA, CREI, MUW, CITY, LSE, AITIA, UNIPA, CEA, UPM, SNS



## Participating Institutions

Acronym	Name
UCSC	Universita Cattolica del Sacro Cuore, Italy
PIK	Potsdam Institute for Climate Impact Research, Germany
UvA	Universiteit van Amsterdam, the Netherlands
CREI	Centre de Recerca en Economia Internacional, Spain
MUV	Medical University of Vienna, Austria
CITY	City University London, UK
LSE	London School of Economics and Political Science, UK
AITIA	International Informatikai Zrt, Hungary
UNIPA	Universita degli Studi di Palermo, Italy
CEA	Commissariat a l'Energie Atomique et aux Energies Alternatives, France
UPM	Universita Politecnica delle Marche, Italy
SNS	Scuola Normale Superiore di Pisa, Italy



**Jean-Claude Trichet (former President, ECB), November 2010:**

- *“The key lesson I would draw from our experience is the danger of relying on a*
- *single tool, methodology or paradigm. Policy-makers need to have input from*
- *various theoretical perspectives and from a range of empirical approaches ....*
  
- *... We do not need to throw out our DSGE and asset-pricing models: rather we*
- *need to develop complementary tools to improve the robustness of our overall*
- *framework. .... In this context, I would very much welcome inspiration from*
- *other disciplines: physics, engineering, psychology, biology. Bringing experts*
- *from these fields together with economists and central bankers is potentially*
- *very creative and valuable.”*



## Goals

- The core element consists of a *coupled* pair of agent-based models of the European economy, one for the financial system and one for the macro-economy.
- These models will be calibrated using a comprehensive data set.
- The decision making components of the model will also be calibrated using laboratory experiments with human subjects.
- The final result will include a graphical user interface with open-source software.
- The output of the research will be used to provide new insights for policy makers and evaluate quantitatively policy measures at the European level

# CRISIS

Complexity Research Initiative for Systemic Instabilities

## WT1 List of work packages

Project Number <sup>1</sup>	288501	Project Acronym <sup>2</sup>	CRISIS
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### LIST OF WORK PACKAGES (WP)

WP Number <sup>63</sup>	WP Title	Type of activity <sup>64</sup>	Lead beneficiary number <sup>65</sup>	Person-months <sup>66</sup>	Start month <sup>67</sup>	End month <sup>68</sup>
WP 1	Database Construction	RTD	7	64.70	1	36
WP 2	Agent based network model of the financial system	RTD	6	122.00	1	36
WP 3	Agent based model of the macro economy	RTD	1	120.00	1	36
WP 4	Laboratory Experiments with Human Subjects	RTD	3	50.50	1	36
WP 5	On-line economic game	RTD	8	67.00	1	36
WP 6	Agent-based economic simulator	RTD	8	68.00	1	36
WP 7	Stylized statistical physics models of interacting agents	RTD	10	50.50	1	36
WP 8	Integration and synthesis of Financial Market and macro ABM	RTD	2	78.00	1	36
WP 9	Dissemination	MGT	7	4.00	1	36
WP 10	Management	MGT	1	8.00	1	36
				Total	632.70	



## **WP1: Database Construction**

- O1.1 To parameterize key relationships in constructing the agent-based models developed in WP2 and WP3 and for the general ABM to be built in WP8.
- O1.2 To initialise the models in a state approximating the current state of the EU economy, or in historical state (e.g. 2006 just before the crisis).
- O1.3. To test the performance of the models versus historical data.
- O1.4 To enable the models to respond realistically when played in game-mode.



## **WP2: Financial Agent-Based Model (FABM)**

- O2.1 Extension and harmonization of available ABMs of financial markets.
- O2.2 Understanding systemic risk, originating from inter-bank credit relations, and in particular the relation between contagion, network topology and leverage.
- O2.3 Unification of various approaches (programming platforms, data structures, use of variables).
- O2.4 Analysis of empirical data on actual European inter-bank network topologies, bank-firm relations, and data of the real economy (in collaboration with WP1 and WP3) in order to calibrate the model with parameters obtained from real economic data.
- O2.5 Linking the financial model to the macro model in collaboration with WP3, WP6 and WP8.
- O2.6 Policy Implementation using simulation platform developed in WP8.



## **WP3: Macro Agent-Based Model (MABM)**

- O3.1 To build a baseline AB model, MABM mark I (MABM-1), capable of capturing the essential features of the macro-economy. This model will combine a housing market with pre-existing macro models of the UCSC and UPM groups.
- O3.2 To extend the baseline model to MABM mark II (MABM-2), characterized by a richer and more realistic architecture of the corporate sector and of the financial side of the economy (collaboration with WP2).
- O3.3 to devise a multi-country architecture of MABM, i.e. MABM mark III (MABM-3), which is the most appropriate to explore the European economy.



## **WP4: Laboratory Experiments**

- O4.1 To study, by means of laboratory and large scale internet experiments with paid human subjects, behavioural decision rules (e.g. individual expectations) and aggregate behaviour in complex financial and macro-economic nonlinear feedback environments. Coordination with WP5.
- O4.2 To develop a behavioural model of expectation formation and bounded rationality consistent with the experimental data, that can be used as a building block in large-scale agent based models of financial and macro-economic crises in other WPs.



## WP5: Online Game

- O5.1 Create and run an on-line economic game in which players at different geographic locations can do role playing and observe the collective outcome of their actions through the internet.
- O5.2 Create a version of the same game, in which players are in the same location, to be used by policy makers.
- O5.3 Use the data collected from this game to better understand economic decision making.
- O5.4 Increase public awareness of nonlinear feedback effects in economics.



## **WP6: Agent-based economic simulator**

- O6.1 Create a simulation based decision-support tool in collaboration with WP2, WP3, WP4, WP5 and WP8.
- O6.2 Increase public awareness of non-linear feedback effects in economics



## **WP7: Statistical Physics Models of Interacting Agents**

- O7.1 To study, using analytical methods from statistical mechanics and numerical simulations, stylized agent based models of the macro-economy.
- O7.2 To devise and investigate mathematical models for expectation and decision that take into account limited processing resources, uncertainty, learning & heuristics, framing, habits, etc.



## **WP8: Integration and Synthesis**

- O8.1. Produce a properly calibrated and validated General Agent-Based model, which integrates the FABM and MABM, in collaboration with WP2 and WP3.
- O8.2. Produce an economic simulator which can be used by policy makers, in collaboration with WP6.
- O8.3. Create an on-line game with a user community, and show how it can be used for calibration of an agent-based model, in collaboration with WP5.



## Progress

**WP1:** The first deliverable has been produced (DB1.1 Data Needs Assessment and Inventory Report). Compiles detailed data needs from each WP; catalogues available data sources and acquisition plans.

**WP2:** Preliminary work on developing ABMs of (i) bank balance sheet management, (ii) balance sheet contagion through exposure to common assets, (iii) bank-bank relationships in the interbank market, (iv) bank-firm lending and (v) bank-central bank-firm interaction in credit markets.

Next step is to integrate/extend above models.



## Progress

**WP3:** The model of Delli Gatti et al (2011), which forms the core of MABM-1, has been re-coded in Java (the common programming platform for all CRISIS WPs).

Next step is to relax some of the simplifying assumptions of Delli Gatti et al (2011) on price/quantity decisions, durability of goods, and network topologies.

**WP4:** Analysis of data from learning-to-forecast experiments conducted by UvA has been conducted.

Next step is to develop an experimental platform that takes as input the ABMs developed by WP2 and WP3.



## Progress

- WP5:** The first deliverable (D5.1 Game Architecture: Online Multiplayer Economic Game) has been published. This outlines the proposed architecture for the CRISIS game on the basis of the underlying ABMs as well as the programming issues related to game design.
- WP6:** Consultations across WPs have led to development of a unified strategy involving JAVA as the common programming language and MASON as the agent-based simulation platform.
- WP7:** Two parallel lines (i) using MABM-1 as a platform for generating unexpected behaviour such as crashes; (ii) using a “toy” model based on classical lines and converting this into an ABM to study potential for crashes.



## Conclusions

- CRISIS aims to develop an integrated macro-financial model based on ABM, test it against both real-world and experimental data and use it for policy simulations via a user-friendly interface.
- The work of CRISIS builds upon existing work by its partners in the areas of macro-modelling, financial modelling, interbank markets, experimental validation of ABMs and the use of statistical physics methods in studying economic complexity.
- The two core WPs (2 and 3) are making steady progress on modelling the financial and macro sides of the economy.