

Report of Short Term Scientific Mission (STSM) in Mathematics for Industry

COST Action TD 1409, MI-NET - Rita Duarte Pimentel

As a PhD student I am very thankful for the opportunity to have a STSM at the Norwegian University of Science and Technology (NTNU). Along with my supervisor, Dr. Cláudia Nunes, I have been collaborating with Dr. Verena Hagspiel, Associate Professor at NTNU. As my supervisor was also granted by a STSM, she was able to join us in NTNU. Moreover, Dr. Kuno Huisman and Prof. Peter Kort joined us as well for a week. All together we have been working in several projects, and we expected to have two papers ready for submission soon.

In fact, we have been working for some time now. We apply the real options theory to decide when and how much a company should invest. We have been exploring the technology adoption problem, where a firm can adopt a new technology at any time, paying some irreversible cost. The later the firm adopts a new technology, the higher quality the product has, so the higher the demand for this product will be. Once consumers are willing to buy the newest generation of technological products, we assume the product is durable, but after adoption demand decreases over time. This is the usual behavior with gadgets, in particular, mobile phones.

Last time we met to work together, we extended Huisman (2001), by considering that the technology evolves over time according to a Poisson process and that at the time the firm adopts the new technology, the state of the technology is the starting point to a diffusion process. Only the comparative statics (meaning the changes in the value function with the model's parameters) was missing. It was exactly from this point that we re-started our work in Trondheim. Then we included also in the model capacity optimization after the investment. With this inclusion, the comparative statics turned out to be much more challenging. Before the end of the second week of my stay, we had finished the main calculations.

Finally, we also decided to approach another interesting problem: a firm already operating in a declining market, with the possibility of adoption of innovation in future profits, including time-dependence and competition. We have already derived some nice and important results during our stay in NTNU, but further work needs to be done. We believe that this is a new topic for our future research agenda.

This stay in NTNU really boosted our research, and the fact that we were able to working as a team of five, it was possible to achieve our goals faster than if each one of us was working alone in their home institutions. I am very glad that I had this opportunity, only possible because of the STSM.