

The **Vienna Graduate School on Computational Optimization (VGSCO)** is a joint research and training program of the **University of Vienna, TU Wien, IST Austria** and **Vienna University of Economics and Business** funded by the **Austrian Science Funds (FWF)**. Its main goal is to give PhD candidates a comprehensive training in different areas of optimization with special emphasis on algorithmic and numerical aspects. It fosters scientific collaboration between the PhD students and their advisors representing a broad spectrum of topics and areas in the field of optimization.

The VGSCO currently announces a PhD position in the area of

Multivariate Dynamic Programming and Mathematical Finance (Vienna University of Economics and Business, Supervisor: Birgit Rudloff)

Richard Bellman introduced dynamic programming in 1954 in his seminal work. Until today, it is an essential tool that is widely used in many areas of engineering, applied mathematics, economics, finance and natural sciences. It allows to break complicated multi-period (scalar) optimization problems into a sequence of smaller and easier sub-problems that can be solved in a recursive manner. Recently, this principle was extended to some problems, where the objective function is not scalar, but vector- or even set-valued.

This multivariate dynamic programming principle allows also to treat some problems that were thought to be time inconsistent, but as they inherent a multivariate nature (e.g. because the problem is a scalarization of a vector optimization problem or, since there is not a single solution, but a set of Nash equilibria for dynamic Nash games) they satisfy in fact the multivariate dynamic programming principle.

The topic of this PhD project may include further extensions of his recently developed multivariate dynamic programming principle (in discrete or continuous time), the development of algorithms to solve such problems numerically, and an application to some problems in Mathematical Finance. A topic of interest is for example dynamic Nash games, where the set of Nash equilibria can be calculated recursively backwards in time.

The candidates are expected to have a solid theoretical background in optimization theory, as well as strong computer skills. A background or interest in Mathematical Finance is an advantage.

The advertised position is associated with the PhD Label Mathematics in Economics and Business at the Institute for Statistics and Mathematics at **Vienna University of Economics and Business**, in the Research Group of **Prof. Dr. Birgit Rudloff**. The successful candidate will become a member of the **Vienna Graduate School on Computational Optimization**. The duration of the employment is of 3 years with possibility of extension. The extent of employment is 30 hours per week. The annual gross salary is approximately 31,000 €. The planned start of the position is autumn 2020.

Application Requirements and Procedure

The candidates must have a master degree (or equivalent) in *Mathematics, Operations Research* or *Statistics* (or comparable fields) at the moment the PhD position starts. The application documents should contain a letter of motivation; the scientific CV with publication list, if available; higher education certificates/diplomas; the diploma/master thesis and letter(s) of recommendation. Applications have to be submitted at: vgsco.univie.ac.at/positions/application. The deadline for applications is **June 15, 2020**.