

# RESEARCH STATEMENT

November 24, 2015

I am passionate about science; I enjoy all aspects of doing research : reading, studying, solving, exploring, generating new ideas, discussing, writing, presenting, etc. I believe that the fundamental approach to science makes a difference. I want to make an important contribution to society and will work hard for it.

Nowadays even rather specific fields as Econometrics or Macroeconomics became so vast that it is hard to keep track of all the developments. From the beginning of my PhD, I have been working to get to know the field better. The working title of my thesis was "Estimating dynamic econometric models with persistent data". Taking into account all different fields that contribute to this topic nowadays, I decided to take a number of courses: on Macroeconomics, General Equilibrium Theory, Stochastic Limit Theory, Advanced Nonparametric Methods, Bayesian Estimation. Some people say it is better to focus on one topic, but I believe that great researchers see the links between different fields and work on making these links visible to other people. Investments made in getting to know new fields pay off at unexpected times in an unexpected manner.

During the last years of research, I have been working on many topics of modern Econometrics. Last year, I mainly focused on Indirect Inference estimation method while being a postdoctoral researcher in the Department of Finance at VU Amsterdam. My job market paper is entitled "Penalized Indirect Inference" and it is a joint work with Francisco Blasques. This paper presents a simulation based estimator that allows researchers to take pre-sample information into account in a frequentist estimation approach. We establish the asymptotic properties of the estimator for both correctly and incorrectly specified models. A Monte Carlo study reveals the role of the penalty function in shaping the finite sample distribution of the estimator. We estimate a state-of-the-art dynamic stochastic general equilibrium model and highlight advantages of using this estimator.

Another project – joint work with Francisco Blasques and Andre Lucas – is dedicated to Indirect Inference estimation of a stochastic volatility model using generalized autoregressive score(GAS) models as an auxiliary model. These models were developed at VU Amsterdam and partly at Cambridge University; they provide a general

framework for modeling time variation in parametric models. They have been applied successfully in areas such as default and credit risk modeling, stock volatility and correlation modeling, modeling time varying dependence structures, credit default swap spread modeling and questions relating to financial stability and systemic risk, modeling high frequency data. In this project, we investigate relative performance of generalized autoregressive conditional heteroskedasticity(GARCH) and GAS as a possible auxiliary model in Indirect Inference. We estimate a stochastic volatility model with fat tails. GAS delivers better approximation of the data generating process in terms of likelihood, but GARCH seems to deliver estimates with smaller variance due to larger derivative of the auxiliary function with respect to the parameter vector.

Joint project with Alexey Gorn at Bocconi University focuses on estimation of dynamic stochastic equilibrium models with heterogeneous agents. These models have become popular amongst economists and are nowadays used as a workhorse of macroeconomic research, they allow for individuals to have different starting endowments (wealth) as well as different income (not everyone needs to be employed). Models with a representative agent are well studied and (relatively) easy to estimate. The challenge with applying similar methods to heterogeneous agents models lies in the larger scale of such models and the fact that many of them can only be solved by simulations. We apply the Indirect Inference estimator. Possible weak identification is handled using the theory developed in Penalized Indirect Inference paper. We summarize wealth distribution of agents to median and 25 % quantile statistics to reduce the dimension of the system. As for the choice of auxiliary statistics, we use estimated VAR coefficients and autocovariances.

Two of the papers from my PhD thesis focus on hypothesis testing. The first paper "Is regularization necessary? A Wald-type Test under Nonregular Conditions" provides a solution to handle a possible singularity in the covariance matrix of a Wald test. Singular matrices appear in hypothesis testing in various applications in economics and finance, for example in causality testing. They also appear in other tests and hence the problem is not specific to the Wald test. I propose to substitute the possibly non-invertible covariance matrix by the identity matrix of conformable size. The resulting test statistic is not pivotal, but its distribution can be calculated numerically or using Monte Carlo or bootstrap methods. I show the asymptotic validity of these approximations. The test has power uniformly for all the alternatives and provides a good addition to existing methods, in particular it does not depend on so-called tuning parameters.

In the second paper "Multivariate Testing for Common Trend Slopes, with an Application to US and European Macroeconomic Data"— joint work with Franz Palm and Jean-Pierre Urbain – we study a multivariate deterministic trend model and propose a test of a general linear hypothesis regarding the trend slope parameters. The

testing procedure is derived for a setting when the deterministic trend is linear, and robust to different specification of the stochastic part of the data. It could be  $I(1)$  or  $I(0)$ , cointegrated or not cointegrated. The results of this paper, suggest that several macroeconomic variables grow with the same growth rate.

This portfolio of research papers has shown my abilities and competence in various parts of econometric research. I have derived asymptotic distributions for all proposed estimators in my research work. I have experience working and showing validity of simulation based estimators, bootstrap methods and classical estimation. I have been improving existing methods and proposing alternative solutions to existing problems. I have much experience with the empirical modeling of both macroeconomic and financial time series data. As a consequence, my practical knowledge of programming and computing has reached high levels.

I think good research is not restricted to solving important up-to-date problems, but it is also about getting your results across to your audience. I presented my papers at various international conferences. I enjoy presenting and writing papers and learning how to do these better, so I participated in several courses to on presentation skills, academic writing and writing grant proposals.

I prefer working on econometric theory, but I am convinced that I will be able to also work on different topics in the field of econometrics. I am confident about my technical skills, but I am also a very motivated and curious person. This makes me interested in research of my colleagues and engage them in my research interests. I try to facilitate exchange of ideas at the Department of Econometrics at VU Amsterdam: I am an organizer of the Brown Bag seminar and a promoter of weekly meetings to discuss research within the Department. I enjoy working in a group, but also like tackling problems on my own: I cooperated with my supervisors and colleagues in Maastricht, I have a paper on my own and I teamed-up with my new colleagues at VU Amsterdam and a colleague at Bocconi for several successful projects.

I am young and have the best years ahead of me. I want to make an important contribution and willing to work hard for it. I believe that life is simple in many ways: if you want to make a contribution, you concentrate your time and energy on your goal, work really hard and make it happen.