Chapter 1

Introduction

In this dissertation, capital investment and unemployment are analyzed using modern statistical methods. These two variables are crucial for the analysis of the state of an economy. The three papers of this work take three different points of view: The first paper uses microdata from two business surveys about the investment behavior of firms. Thereby, the response behavior in qualitative and quantitative surveys is compared. The second paper treats capital investment not on the micro level, but as aggregated time series. It is examined which investment theory – the neoclassical or Tobin's q – better explains the investment behavior of Swiss firms. The third paper switches to analyze unemployment and thereby looks at spatial time series. In doing so, the variables that are found to explain unemployment in non spatial models are examined in spatial settings. These different types of data need to be analyzed using different methods, developed in modern statistics.

In the first paper (based on Schenker, 2007[1]), micro data from two different business surveys are compared. The data include metric (quantitative) and categorical (so-called qualitative) information about the investment plans of firms. Due to the lack of data, a comparison of such data on the micro level was not possible until now. When comparing the answers of these two surveys, it is possible to explicitly test the assumptions of the quantification method presented by Carlson and Parkin (1975[2]). By applying traditional

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[1] Schenker, R. Comparing Quantitative and Qualitative Survey Data. *KOF Working Papers 169* (2007).

[2] Carlson, J.-A., and Parkin, J. M. Inflation Expectations. *Economica 42*, 166 (1975), 123–38.

statistical methods, it is possible to estimate response functions (cf. Ronning, 1984[3]). They show the distribution of the quantitative answers for each of the qualitative values. Unfortunately, these methods are not able to evaluate the uncertainty of these response functions which hinders us estimating parametric response functions. When using bootstrapping (originally proposed by Efron, 1979[4]) it is possible to assess the uncertainty at every point of the response functions. Boostrapping generates "new" observations (the so called bootstrap sample) by resampling from the available data and calculates the distributions based on the bootstrap sample. In the last years, bootstrapping has been used in many fields (cf. MacKinnon, 2006[5]). Thanks to the bootstrap, it is possible to estimate parametric response functions and as a result generate a new quantification method for qualitative data.

The second paper uses time series from business surveys to test investment theories and forecast investment in equipment and in constructions. These times series do not provide information about single firms, but about aggregates for different industries. KOF Swiss Economic Institute has been conducting business surveys for many years. Therefore, a lot of time series are available for testing investment theories and for forecasting investment. Traditional estimation methods cannot deal with data sets containing more variables than observations. In the last years, several methods have been proposed to overcome this problem. The second paper uses two of these methods, iterative Bayesian Model Averaging and Adaptive Lasso. Iterative Bayesian Model Averaging is a refinement of Bayesian Model Averaging (cf. Hoeting et al., 1999[6]) and has been developed by Yeung et al. (2005[7]) for

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[3] Ronning, G. Welche Informationen Enthält die Antwortkategorie 'unverändert' in Tendenzbefragungen? *Zeitschrift für Empirische Wirtschaftsforschung (Ifo-Studien) 18* (1984), 261–72.

[4] Efron, B. Bootstrap Methods - Another Look at the Jackknife. *Annals of Statistics 7*, 1 (1979), 1–26.

[5] MacKinnon, J. G. Bootstrap Methods in Econometrics. Working Papers 1028, Queen's University, Department of Economics, Feb. 2006.

[6] Hoeting, J. A., Madigan, D., Raftery, A. E., and Volinsky, C. T. Bayesian Model Averaging - A Tutorial. *Statistical Science 14*, 4 (1999), 382–401.

[7] Yeung, K. Y., Bumgarner, R. E., and Raftery, A. E. Bayesian Model Averaging: Development of an Improved Multi-Class, Gene Selection and Classification Tool for Microarray Data. *Bioinformatics 21*, 10 (2005), 2394–2402.

a genome application. Eicher et al. (2007[8]) have brought it to the economic literature. Adaptive Lasso is a enhancement of Traditional Lasso (proposed by Tibshirani, 1996[9]) and has been developed by Zou (2006[10]). By using these two methods, it is possible to work with a data set with more variables than observations. We can thus test the two investment theories and estimate indicators for investment in equipment and constructions.

The third paper uses a spatial model to analyze Swiss cantonal unemployment rates. Originating from a non-spatial model, it is tested which of the variables explaining unemployment in this "standard" setting are also helpful in spatial modelling. The estimation technique used in this paper is based on an article by Kelejian and Prucha (1998[11]). In contrast to their setting, this article uses a time-series model. Spatial models have rarely been used for explaining unemployment. For Switzerland, there are several studies about regional differences in unemployment, but none of them uses a spatial setting. We use a setting including spatial elements in the level as well as in the shocks. This enables us to identify the variables that retain their explanatory power also in the spatial setting.

The modern statistical methods used in this dissertation help to circumvent old problems in economic models and to gain new insights.

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[8] Eicher, T. S., Papageorgiou, C., and Roehn, O. Unraveling the Fortunes of the Fortunate: An Iterative Bayesian Model Averaging (IBMA) Approach. *CESifo Working Papers 1907* (2007), 30.

[9] Tibshirani, R. Regression Shrinkage and Selection via the Lasso. *Journal of the Royal Statistical Society Series B-Methodological 58*, 1 (1996), 267–288.

[10] Zou, H. The Adaptive Lasso and its Oracle Properties. *Journal of the American Statistical Association 101*, 476 (2006), 1418–1429.

[11] Kelejian, H. H., and Prucha, I. R. Generalized Spatial Two-stage Least Squares Procedure for Estimating a Spatial Autoregressive Model with Autoregressive Disturbances. *Journal of Real Estate Finance and Economics 17*, 1 (1998), 99–121.