The main goal of the project is to analyze wholesale electricity markets with multivariate time series models. The research contributes to the theory of econometrics by proposing a new type heteroscedastic SVAR (Structural Vector Autoregressive) model. On the other hand, it also has a practical value and may provide interesting arguments in the ongoing discussion on the results of the rising share of Renewable Energy Sources (RES) on electricity prices. The project covers two areas:

- evaluation of the influence of RES on the level and the variability of electricity prices.
- Development of a new type of SVAR model with conditional heteroscedasticity. The model, which will be called in this project CH-SVAR, has not been so far discussed in the literature. It can be viewed as an interesting alternative for more complicated GARCH-SVAR models.

In the last decades, one could observe dynamic changes of the electricity market. Monopolistic or highly centralized market structures have been deregulated and replaced by more competitive market forms. In most of the developed countries (EU, U.S., Canada, Australia) electricity is now traded via exchanges, where producers and wholesale byers trade short term (0.5-1 hour) contracts. This liberalization of electricity market introduced a new type of risk, associated with fluctuation of electricity prices (see Harris C (2006), Weron (2006)). The market price is now an outcome of a complex game. On one hand, the electricity demand depends strongly on the weather conditions, the business cycle and is price inelastic. On the other hand, system stability requires a constant balance between production and consumption. As the result, electricity prices are very volatile and difficult to forecast (see Weron (2014) for a comprehensive review).

In the same time, new regulation induced by the Climate Policy 3×20, have led to a change of the generation structure. The climate policy obligated the EU member countries to reduce the CO2 emission by 20% and increase the share of EU energy consumption produced from renewable resources to 20% by the year 2020. These goals result in a rapid growth of amount of electricity generated with wind or solar energy. According to REN21 (2014) report:

- In the European Union, over the years 2007-2013, renewables represented the majority (72%) of new electric generating capacity. A decade earlier, the conventional fossil generation accounted for 80% of new capacity in the EU-27 plus Norway and Switzerland.
- RES achieved high levels of penetration in several countries. For example, in 2013, wind power met 33.2% of electricity demand in Denmark and 20.9% in Spain; in Italy, solar PV met 7.8% of total annual electricity demand.

It should be emphasized that electricity is a basic good and therefore the main concern of the market planers is to ensure safety of the electricity system (understood as an equilibrium between the supply and the demand). The continuous balancing encompassed with limited storage possibilities and liberalized markets results in highly variable prices, which depend strongly on both the consumption level and the generation mix. The econometric analysis will help to verify the following hypothesis:

- Rise of the renewables share leads to a significant fall of the wholesale electricity prices due to the merit order effect,
- RES generation influences the variability of the wholesale electricity prices. The effect can be positive (a reduction of the variance) or negative (an increase of the variance) conditional on the level of demand and the level of RES.

The literature indicates that electricity prices are characterized by strong seasonality and time-varying variances. Therefore, conditional heteroscedasticity will be included in the model, which leads to CH-SVAR models. In this type of models, it is assumed that variances of structural shocks depend on a set of exogenous variables. In the context of electricity markets, the set could contain: seasonal deterministic components, forecasted demand or forecasted generation mix. Recent works on SVAR models have shown that the heteroscedasticity assumption can be successfully used for identification of model parameters. The early work of Lanne, Lütkepohl (2008) demonstrated that a shift of relative variances of structural shocks is a sufficient condition for identification and estimation a SVAR model. The literature indicats that a simmilar effect could be obtain by assuming a regime switching data generating process. Different types of regime transition mechanisms have been considered: Lanne et al (2010) assumed that the process is governed by a Markow chain (MS-SVAR), whereas Lütkepohl, Netsunajev (2014) described it with a Smooth Transition function (STR-SVAR). Recently, ARCH-SVAR models have been investigated by Milunovich, Yang (2013) and Lütkepohl, Milunovich (2015). In the same time, there are no publications, which will examine the CH-SVAR models. Due to a simple structure, this type of models could be considered as an interesting alternative for an GARCH-SVAR type of models.