



Forecasting the German forest products trade: A vector error correction model



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ABSTRACT

In the forest sector often very complex models are used that take into account a variety of factors. In addition to variables that describe the natural production of wood, into these models flow among others also such variables that depict nature conservation legislation, market contexts, etc. The limited availability of large amounts of data and more particularly of precise data to all these subject areas considerably weakens the validity of the models. Our study therefore takes up the challenge to develop a model, as simple as possible, that can help to estimate export and import volumes as well as export and import prices of raw timber in Germany. To this end, we apply the technique of time series analysis and develop a simple model that allows for short-term and medium-term forecasting in the German forest sector. We show that using a vector error correction model (VECM) can succeed in a relatively simple modelling of future quantities and prices of raw timber for Germany.

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Introduction

To exploit economic potentials while successfully balancing social and environmental objectives of the ecosystem forest, a wise management of the natural resource timber is necessary. Especially due to the intensifying and at the same time competing diverging claims on timber utilization in recent years the commercial use of timber has become increasingly important. In this context, knowledge about future developments in the timber market plays a deci-

sive role for forestry and timber industry so that harvesting, storage and production planning can be adjusted to constantly changing market conditions.

Future developments of timber products quantities and prices are crucial for production planning and for keeping the working capital at an optimal level. Short-term and medium-term forecasts can help to adjust commodity stocks, to prevent whip effects and to align sales as profitably as possible, which appears to be essential for decision-makers in timber industry.

Even traditional forest management such as timber production depends on such forecasts. Forecasts allow to optimize control of the supply

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chain and based on this to minimize risks in the supply chain management. Although the natural production in the medium term is little influenced, timber harvesting will certainly adapt to changing market conditions in order to increase yield.

Hänninen (2004) points out the growing interest in short-term forecasts in forest sector markets and prices. Changes in economic growth rates reflect in fluctuations in the demand for forest products. This results in an increasing need for the use of short-term forecasting models in forestry and forest industry. Hetemäki et al. (2004) also emphasize the importance of short-term analysis and forecasting of forest product markets since these react ever more quickly to changes in macroeconomic conditions due to liberalization of capital and currency markets, globalization of the forest industry, and developments in information technology and logistics.

In the forest sector often very complex models are used that take into account a variety of factors. In addition to variables that describe the natural production of wood, into these models flow among others also such variables that depict nature conservation legislation, market contexts, etc. (Buongiorno, 1996).

The high complexity of such models has proven to be disadvantageous because it requires an extensive knowledge of economic data, forest growth data as well as data relevant to environmental protection. The limited availability of large amounts of data and more particularly of precise data to all these subject areas considerably weakens the validity of the models. The data is often collected not in a uniform manner or not time-consistently.

Therefore, our study takes up the challenge to develop a model, as simple as possible, that can help to estimate export and import volumes as well as export and import prices of raw timber in Germany. To this end, we apply the technique of time series analysis, which is based on investigation of the structure and the regularity of a time series as a basis for those subsequent updating in the future (forecast). Economic time series may be of non-stationary nature. The well-known problem of spurious regression, which is a characteristic of such non-stationary time series, is encountered by the test of cointegration and the estimation of an error correction model.

In our investigation we use the property of vector models having to make no distinction between exogenous and endogenous variables. We show that using vector models can succeed in relatively simple modelling of predictions of quantities and prices of timber products for Germany.

We encounter the problem of complex data collection by using already available and easily accessible data, namely Gross Domestic Product (GDP) and exchange rate, two in the research literature often occurring economic indicators, which are often brought in connection with exports, imports and prices. As stated by Toppinen and Kuuluvainen (2010), the use of monthly data can introduce more complexity to the model. We therefore work with quarterly data and look at the period from 1995 to 2012 to estimate our model. The forecast period stretches over fourteen quarters, from Q1:2013 to Q2:2016.

The aim of our work is to find a simple but useful model, with which based on past values it can be examined whether it is possible to make meaningful predictions of export and import volumes and prices of raw timber in Germany. Similar investigations have been conducted for North America and the Scandinavian countries. To our knowledge, such a model of forest sector from a German perspective has not yet been tested. After a brief overview of the existing scientific literature in forest sector modelling, the statistical framework is described in part two and the model as well as the data used in part three. In part four the model calculations are presented. Finally the results are shown and discussed in part five.

Overview of econometric literature in forest sector modelling

Since the late 1980s forecasting models have been developed for all areas of the forest sector. An early summary can be found in the work of Buongiorno (1996). Part of the newer models, the partial equilibrium models, is summarized in the work of Latta et al. (2013). An overview of the models used in Europe can be found in Toppinen and Kuuluvainen (2010).

Common feature of all these models is their complexity since they include parame-

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