

Optimal Management of Forest Stands under Wind Risk in Czech Republic

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Abstract : Storms are important damaging agents in European forest ecosystems. In the latest decades, significant economic losses in European forestry occurred due to storms. This study investigates the problem of optimal harvest planning when forest stands risk to be felled by storms. One of the most applicable mathematical methods which are being used to optimize forest management is stochastic dynamic programming (SDP). This method belongs to the adaptive optimization class. Sequential decisions, such as harvest decisions, can be optimized based on sequential information about events that cannot be perfectly predicted, such as the future storms and the future states of wind protection from other forest stands. In this paper, stochastic dynamic programming is used to maximize the expected present value of the profits from an area consisting of several forest stands. The region of analysis is the Czech Republic. The harvest decisions, in a particular time period, should be simultaneously taken in all neighbor stands. The reason is that different stands protect each other from possible winds. The optimal harvest age of a particular stand is a function of wind speed and different wind protection effects. The optimal harvest age often decreases with wind speed, but it cannot be determined for one stand at a time. When we consider a particular stand, this stand also protects other stands. Furthermore, the particular stand is protected by neighbor stands. In some forest stands, it may even be rational to increase the harvest age under the influence of stronger winds, in order to protect more valuable stands in the neighborhood. It is important to integrate wind risk in forestry decision-making.

Keywords : Czech republic, forest stands, stochastic dynamic programming, wind risk

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