In this contribution, a bi-objective robust optimization of cutting parameters, with the taking into account uncertainties inherent in the tool wear and the tool deflection for a turning operation is presented. In a first step, we proceed to the construction of substitution models that connect the cutting parameters to the variables of interest based on design of experiments. Our two objectives are the best machined surface quality and the maximum productivity under consideration of limitations related to the vibrations and the range of the three cutting parameters. Then, using the developed genetic algorithm that based on a robust evaluation mechanism of chromosomes by Monte-Carlo simulations, the influence and interest of the uncertainties integration in the machining optimization is demonstrated. After comparing the classical and robust Pareto fronts, A surface quality less efficient but robust can be obtained with the consideration of uncontrollable factors or uncertainties unlike that provides the deterministic and classical optimization for the same values of productivity