Abstract: Stochastic modeling techniques have become increasingly popular during the last decades, particularly in mathematical finance since the groundbreaking work of Bachelier [16], Samuelson [44], and Black and Scholes [3]. Essentially, all models are wrong in the sense that they simplify reality. However, there are numerous models available to model particular phenomena of financial markets and calculated option prices, hedging strategies, portfolio allocations, etc. depend on the chosen model. This gives rise to the question which model to choose from the rich pool of available models and, second, how to determine the correct parameters after having selected some specific model class. Thus, one is exposed to both model and parameter risk (or uncertainty). In this survey, we first provide an inside view into the principles of stochastic modeling, illustrated with examples from mathematical finance. Afterwards, we define model risk and uncertainty according to Knight [9] and present some methods how to deal with model risk and uncertainty.