In this article, an extensive portfolio optimization case study is conducted. For this, a Markov-Switching model is estimated to time series of three global stock indices. The estimation includes a new methodology for the search for realistic initial values and a large number of covariates that were tested for their ability to explain transition probabilities. In a second step, the model is used in an industry-standard portfolio optimization environment and compared under realistic assumptions to a Black-Scholes model. Our results indicate that risk measures are significantly reduced and performance measures improved when a Markov-Switching model is used. These improvements are especially due to the faster reallocations in turbulent market phases like the burst of the dot-com bubble or the current financial crises.