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In this paper, we derive a general stochastic maximum principle for a risk-sensitive type optimal control problem of Markov regime-switching jump-diffusion processes. The results are obtained via a logarithmic transformation and the relationship between adjoint variables and the value function. We apply the results to study both a linear-quadratic optimal control problem and a risk-sensitive benchmarked asset management problem for Markov regime-switching models. (Received September 20, 2016)