

Black Swans and VaR

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Abstract

Modern financial theory has advanced our understanding of financial markets immensely; albeit, some of modern financial theory's foundational assumptions do not appear to be borne out by market realities. Assumptions of normal distributions of stock returns are the bedrock of finance models, including modern portfolio theory (mean-variance criterion), the capital asset pricing, Value-at-Risk (VaR), and the Black-Scholes models. VaR models, for example, attempt to quantify how much loss a portfolio may suffer with a given probability. While there are various forms of VaR models, the basic version relies on standard deviation as a measure of risk. Given a normal distribution, it is relatively straightforward to measure standard deviation, and hence risk. However, if price changes are not normally distributed, standard deviation can be a very misleading proxy for risk. The purpose of this study is to illustrate the existence of such risk and its historical frequency, paying particular attention to the time period 1980-2008.