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Drawdowns, drawups and risk management.

In this work we study drawdowns and drawups of general diffusion processes. The drawdown process is defined as the current drop of the process from its running maximum, while the drawup process is defined as the current increase over its running minimum. The drawdown and the drawup stopping times are the first hitting times of the drawdown and the drawup processes respectively. We derive a closed-form formula for the Laplace transform of the probability density of the drawdown of a units when it precedes the drawup of b units. We then discuss an application of these results in financial risk management. In particular, consider a digital with a unit payoff on the event that a drawdown precedes a drawup. Such an instrument would provide insurance against adverse movements in the market and could thus be of interest to an investor. Using model-free relationships derived in this work, we are able to provide a robust replication of this instrument using One-touch knockouts. Under extra assumptions on the underlying process we show that it is also possible to derive semi-static replication using single-barrier and plain digital options. (Received February 18, 2010)