Other Risk Measures

There are other ways to measure risk besides standard deviation. Two other cc
are semi-deviation and Value-at-Risk (written as VaR).

Semi-Deviation

If you were given two stocks, one that continued to increase by 10% every day,
by 10% every day, would you intuitively think that one stock was more risky tha
deviation measures of risk would give these two stocks the same level of risk, b
investors are more worried about down-side risk (when stocks decline), rather
motivation for semi-deviation measure of risk is to measure downside risk spec
kind of volatility.

Semi-deviation is calculated in a similar way as standard deviation, except it on
that are less than the mean.

$SemiDeviation = \sum_{t=1}^{n} (\mu - r_i)^2 \times I_{r_i<\mu}$
where $I_{r_i<\mu}$ equals 1 when $r_i < \mu$, and 0 otherwise.

Value-at-Risk (VaR)

VaR, or value-at-risk is a portfolio risk measure. Risk managers at investment fi
banks calculate VaR to estimate how much money a portfolio manager's fund n
a certain time period. Corporations also estimate their own VaR to decide how
hold to avoid bankruptcy during a worst case scenario.

VaR is defined as the maximum dollar amount expected to be lost over a given
predefined confidence level. For example, if the 95% one month VaR is $1 millic
confidence that the portfolio will not lose more than $1 million next month. An
the VaR is that there is a 5% chance of losing $1 million or more next month. Th
calculating VaR are beyond the scope of this lesson, but if you ever become a ri
work with a risk manager, you'll probably see Value-at-Risk quite a bit.

For a visual representation of VaR, we can look at a data distribution that repre
of a stock. If we color in the area in the left tail that represents 5% of the distrib
represented by that point on the horizontal axis is the rate of return that may c
case scenario. To convert that to a VaR, we multiply that rate of return by the a
exposed to risk. For a portfolio, it would be the amount of dollars invested in th

As an example, let's say we invested $10 million in a stock. We estimate the me
deviation of the stock's returns and model it with a distribution function (it mig
distribution, but there are other models). Then we find the rate of return that d
distribution to its left, in the left tail. Let's say that rate of return is -20%. We mu
by the amount that we're exposed to, which is $-0.20 \times \$10million = -\$2m$
any given day is $2 million. In other words, we may plan some hedging strategi
to help us handle the possibility of losing $2 million on stock A on any given da
an image of the distribution, check out Wikipedia's page on Value-at-Risk