epitome
global services

CASE STUDY ON RISK ANALYTICS

Scope of work

Hedge Funds require comprehensive risk measurement tools to sustain their risk management framework. For the current project assigned to us by one of our clients, who is a US-based hedge fund, our risk analytics team has employed an array of risk-measurement tools to suit the specific needs of the client.

Our client requires risk measures of its portfolios that consist of equities. The specific requirement is to predict on a daily basis the maximum loss he can incur the next day based on his current position in the portfolios. Additionally, we report to the client, a comparative analysis of the performance and volatility of its fund vis-à-vis its peers and benchmarks, on a weekly basis.

Project details & methodology

The first requirement of predicting the maximum loss the client can face, the next day, was tackled by using the statistical technique of Value-at-Risk (VaR). We provided the client with VaR measures by Monte Carlo simulation approach.

Based on the data we received from the client we used our in-house model to calculate the 1-day VaR at 99% confidence level using Monte Carlo simulation. The output data is tabulated in a format specified by the client and sent.

The advantage of using our in-house Excel based model became apparent as it was easily customized to cater to the client's type and dimension of input and output data.

Our client also needed weekly reporting of a comparative analysis of the volatility of returns and the performance of his fund as compared to his peers and a benchmark.

We calculated the Sharpe Ratio, Sortino ratio for the fund and its peers from the data provided to us to give a comparison of performance of the funds.

As for volatility measure, the standard deviation of the returns were calculated from the last prices provided and then the co-efficient of variation was calculated as the data sets of the different entities had significantly different means. The coefficients of variation expressed as percentage were tabulated for the comparison of volatilities.

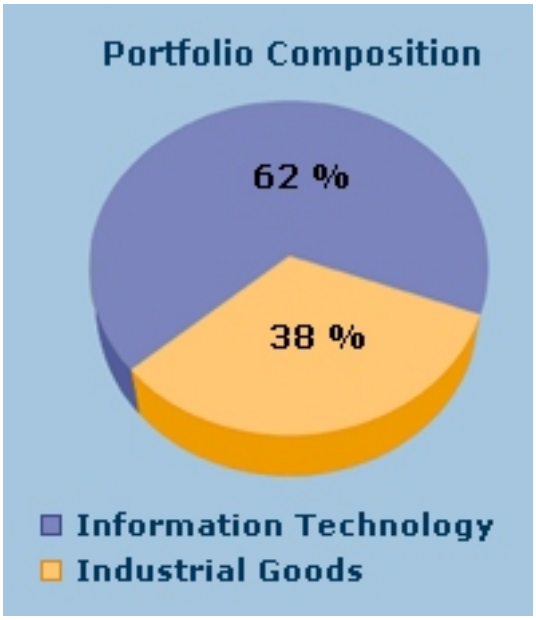
Illustrating with a toy portfolio

We have considered a portfolio consisting of stocks only with the following parameters:

Stock	Qty	Price ($)	Mcap ($)
MSFT	3,000.00	30.56	91680.00
CAT	4,500.00	73.10	328950.00
NVDA	4,000.00	33.71	134840.00
SNDK	3,500.00	44.15	154525.00
LMT	3,000.00	96.64	289920.00
Portfolio			**999915.00**

The price data in the adjacent table describing the toy portfolio corresponds to the valuation date of 04-May-07.

The objective is to calculate, for this portfolio, the risk measures and the comparative statistics, as described in the previous section.



Sector-wise, Industrial goods and Information Technology are the only two components. While, Caterpillar Inc. (CAT) and Lockheed Martin Corporation (LMT) belong to Industrial goods sector, Microsoft Corp. (MSFT), NVIDIA Corporation (NVDA) & SanDisk Corp. (SNDK) represent the IT sector.

For the purpose of calculation, daily closing prices of all the constituent stocks dating back to a year from the valuation date were collected from Bloomberg and fed in the VaR calculator. The outputs generated are given in the next page:

Value-at-Risk (VaR) Report

Methodology Monte Carlo
Conmfidence Level 95.00%
Time Horizon 1 day

Security Sector/Portfolio	Mkt Value $	VaR $	VaR %
CAT	328,950.00	9045.10	2.75
LMT	289,920.00	4884.78	1.68
Industrial	618,870.00	10,499.14	1.70
MSFT	91,680.00	1,634.45	1.78
NVDA	134,840.00	6,527.46	4.84
SNDK	154,525.00	7334.20	4.75
Information Technology	381,045.00	9,930.84	2.61
Portfolio	**999,915.00**	**14,065.61**	**1.41**

The above tabulation shows the VaR at security, sector and portfolio levels at 95% confidence level.

Value-at-Risk (VaR) Report

Methodology Monte Carlo
Conmfidence Level 99.00%
Time Horizon 1 day

Security Sector/Portfolio	Mkt Value $	VaR $	VaR %
CAT	328,950.00	12295.43	3.74
LMT	289,920.00	7033.42	2.43
Industrial	618,870.00	14,712.54	2.38
MSFT	91,680.00	2,330.49	2.54
NVDA	134,840.00	9,277.52	6.88
SNDK	154,525.00	9,935.66	6.43
Information Technology	381,045.00	14,148.00	3.71
Portfolio	**999,915.00**	**19,893.88**	**1.99**

The above tabulation shows the VaR at security, sector and portfolio levels at 99% confidence level.

As a part of comparative statistics, measures of Sharpe ratio, Sortino ratio and Maximum drawdown are calculated from the same data set of 1 year daily returns of the constituent stocks of the portfolio. The results are tabulated in the next page:

Sharpe Ratio

Risk-free rate pa 5.00%

Security	Return pa %	Std dev pa %	Sharpe ratio
CAT	-0.49	17.08	-0.32
LMT	30.80	11.93	2.16
MSFT	30.44	15.79	1.61
NVDA	39.11	43.86	0.78
SNDK	-28.21	41.26	-0.80
Portfolio	**10.02**	**10.02**	**0.49**

The Sharpe ratio has been calculated at both the security and portfolio levels.

Sortino Ratio

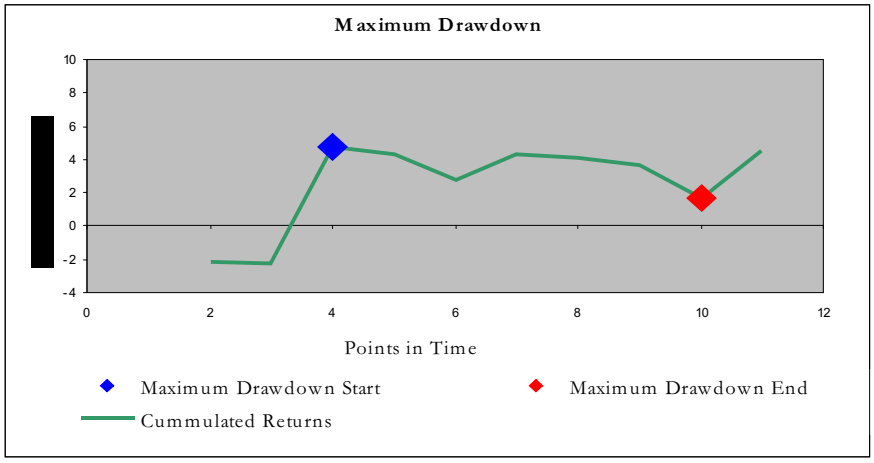
Risk-free rate pa 5.00%
MAR 5.00%

Security	Return pa %	Download dev pa %	Sortino ratio (monthly)	Sortino ratio (annualized)
CAT	-0.49	19.21	-0.08	-0.29
LMT	30.80	3.65	2.04	7.07
MSFT	30.44	23.64	0.31	1.08
NVDA	39.11	38.65	0.25	0.88
SNDK	-28.21	29.59	-0.32	-1.12
Portfolio	**9.94**	**5.53**	**0.26**	**0.89**

The Sortino ratio, too, has been calculated at both the security and portfolio levels.

Finally, the Maximum Draw downs for the constituent securities and the portfolio is calculated. The results are summarized in the following:

Security	Max Draw down %
CAT	-20.44
LMT	-1.16
MSFT	-10.19
NVDA	-25.15
SNDK	-48.02
Portfolio	**-3.03**



A comprehensive picture of the portfolio performance, vis-à-vis the risk, is obtained from all these