Portfolio Risk

http://spreadsheetml.com/finance/modernportfoliorisk.shtml

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ConnectCode's Financial Modeling Templates

Have you thought about how many times you use or reuse your financial models? Everyday, day after day, model after model and project after project. We definitely have. That is why we build all our financial templates to be reusable, customizable and easy to understand. We also test our templates with different scenarios vigorously, so that you know you can be assured of their accuracy and quality and that you can save significant amount of time by reusing them. We have also provided comprehensive documentation on the templates so that you do not need to guess or figure out how we implemented the models.

All our template models are only in black and white color. We believe this is how a professional financial template should look like and also that this is the easiest way for you to understand and use the templates. All the input fields are marked with the '*' symbol for you to identify them easily.

Whether you are a financial analyst, investment banker or accounting personnel. Or whether you are a student aspiring to join the finance world or an entrepreneur needing to understand finance, we hope that you will find this package useful as we have spent our best effort and a lot of time in developing them.

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1.   Portfolio Risk

1.1   Background

In 1952, Harry Markowitz wrote a paper call "Portfolio Selection" which was published by the Journal of Finance. In this paper, he described how investors can maximize their expected returns while minimizing risks. Together with William Sharpe who formalized the concept of Capital Asset Pricing Model (CAPM) they brought about what was known as the Modern Portfolio Theory.

The main rationale behind the theory is if investors were given a choice of investing in two different assets which provides the same returns but have different risks, the investors would likely choose the asset with a lesser risk.

1.2   Portfolio Risk

In finance, risk is defined as the uncertainty that an investor has to face. For a security like a stock it is measured as the volatility of the returns of the stock over a period of time. Similarly, for a portfolio, it is the volatility of the returns of the portfolio over a period of time.

The Standard Deviation is one way for tracking this volatility of the returns. Another way is through the Beta of the Stock or the Portfolio. Beta is a relative measure that measures the volatility of the stock or portfolio with respect to that of the market.

A portfolio is simply a combination of assets or securities. The Modern Portfolio Theory describes how investors can combine different assets to create a portfolio that reduces risk but not the expected returns. This is considered the main aim of holding a portfolio over holding specific asset. The combination of different assets, especially uncorrelated assets, is known commonly as diversification. This is where you frequently hear people talk about how diversification reduces risks.

2.   Portfolio Risk Calculator Spreadsheet

This spreadsheet starts by calculating the Returns of the individual stocks, the Returns of the Portfolio and the Returns of the Market based on historical prices. The Returns are then used in the calculation of the Mean, Variance and the Standard Deviation. The Portfolio Mean, Variance and Standard Deviation are also calculated to allow you to see the effects of diversification. The spreadsheet also calculates the Beta of the Portfolio which is another measure of risk and the Correlation of the Portfolio with the Market.

	A	B	C	D	E	F	G	H	I
1	Portfolio Risk (Mean, Variance and Std Deviation)								
2									
3						Copyright© 2009, ConnectCode. All rights reserved.			
4	Proportion								
5	Total	Stock 1*	Stock 2*	Stock 3*	Stock 4*	Stock 5*	Stock 6*		
6	100.00%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%		
7	Price								
8	Date*	Stock 1*	Stock 2*	Stock 3*	Stock 4*	Stock 5*	Stock 6*		Market*
9	1/1/2001	$25.00	$25.00	$25.00	$25.00	$25.00	$25.00		$25.00
10	2/1/2001	$25.50	$25.50	$25.50	$25.50	$25.50	$25.50		$25.50
11	3/1/2001	$23.81	$23.81	$23.81	$23.81	$23.81	$23.81		$23.81
12	4/1/2001	$15.75	$15.75	$15.75	$15.75	$15.75	$15.75		$15.75
13	5/1/2001	$20.18	$20.18	$20.18	$20.18	$20.18	$20.18		$20.18
14	6/1/2001	$19.00	$19.00	$19.00	$19.00	$19.00	$19.00		$19.00
15	7/1/2001	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00		$20.00
16	8/1/2001	$19.50	$19.50	$19.50	$19.50	$19.50	$19.50		$19.50
17	9/1/2001	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00		$21.00
18	10/1/2001	$22.00	$22.00	$22.00	$22.00	$22.00	$22.00		$22.00
19	11/1/2001	$25.00	$25.00	$25.00	$25.00	$25.00	$25.00		$25.00
20	12/1/2001	$23.00	$23.00	$23.00	$23.00	$23.00	$23.00		$23.00
21	1/1/2002	$22.00	$22.00	$22.00	$22.00	$22.00	$22.00		$22.00

2.1   Inputs

2.1.1   Proportion

The Portfolio Risk spreadsheet allows diversification of up to 6 different stocks by default. The first part of the spreadsheet allows you to key in the proportion of each stock in the portfolio. You can use the Total field in the spreadsheet as a guide to ensure that the total proportion sums up to 100%.

2.1.2   Price

The second part allows you to key in the prices of the stock and the market in the past 1 year. It is possible to download prices from websites like http://finance.yahoo.com. You can also refer to our spreadsheet on automatic downloading of stock data. The prices will be used for the calculation of returns and other results in the Outputs section.

2.2   Outputs

The outputs of the spreadsheet are listed below.

	Date	Stock 1	Stock 2	Stock 3	Stock 4	Stock 5	Stock 6	Portfolio	Market
22	Returns								
23	Date	Stock 1	Stock 2	Stock 3	Stock 4	Stock 5	Stock 6	Portfolio	Market
24	1/1/2001								
25	2/1/2001	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
26	3/1/2001	-6.63%	-6.63%	-6.63%	-6.63%	-6.63%	-6.63%	-6.63%	-6.63%
27	4/1/2001	-33.85%	-33.85%	-33.85%	-33.85%	-33.85%	-33.85%	-33.85%	-33.85%
28	5/1/2001	28.13%	28.13%	28.13%	28.13%	28.13%	28.13%	28.13%	28.13%
29	6/1/2001	-5.85%	-5.85%	-5.85%	-5.85%	-5.85%	-5.85%	-5.85%	-5.85%
30	7/1/2001	5.26%	5.26%	5.26%	5.26%	5.26%	5.26%	5.26%	5.26%
31	8/1/2001	-2.50%	-2.50%	-2.50%	-2.50%	-2.50%	-2.50%	-2.50%	-2.50%
32	9/1/2001	7.69%	7.69%	7.69%	7.69%	7.69%	7.69%	7.69%	7.69%
33	10/1/2001	4.76%	4.76%	4.76%	4.76%	4.76%	4.76%	4.76%	4.76%
34	11/1/2001	13.64%	13.64%	13.64%	13.64%	13.64%	13.64%	13.64%	13.64%
35	12/1/2001	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
36	1/1/2002	-4.35%	-4.35%	-4.35%	-4.35%	-4.35%	-4.35%	-4.35%	-4.35%
37	Mean	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%
38	Variance	0.0200317	0.0200317	0.020032	0.0200317	0.0200317	0.0200317	0.020032	0.020032
39	Std Dev	0.1415332	0.1415332	0.141533	0.1415332	0.1415332	0.1415332	0.141533	0.141533
40	Covariance(Portfolio,Market)								0.020032
41	Beta of Portfolio								1
42	Correlation of Portfolio with Market								1

2.2.1   Returns

The stock Returns is calculated as follows:

Returns = (Price in this period - Price in previous period) / Price in previous period

The market returns is calculated in a similar manner.

The portfolio Returns is calculated as follows:

Portfolio Returns = (Proportion of Stock 1 * Returns of Stock 1) +
(Proportion of Stock 2 * Returns of Stock 2) +
(Proportion of Stock 3 * Returns of Stock 3) +
(Proportion of Stock 4 * Returns of Stock 4) +
(Proportion of Stock 5 * Returns of Stock 5) +
(Proportion of Stock 6 * Returns of Stock 6)

- Mean is calculated using Microsoft Excel AVERAGE function on the returns.
- Variance is calculated using Microsoft Excel VARP function on the returns.
- Std Dev (Standard Deviation) is calculated using Microsoft Excel STDEVP function on the returns.
- Covariance(Portfolio,Market) is calculated using Microsoft Excel COVAR function on the returns of the Portfolio and the returns of the Market.
- Beta of Portfolio is calculated as the Covariance(Portfolio,Market) divided by the Variance of the Market.
- Correlation of Portfolio with Market is calculated using Microsoft Excel CORREL function on the returns of the Portfolio and the returns of the Market.