Additional Slides

Question 1.

The nominal monthly rate for a loan is quoted at 5%.

- What is the equivalent annual rate?
- Semiannual rate?
- Continuous rate?

- *Hint: use*

$$R_{\text{Annual}} = \left(1 + \frac{R_{\text{Nominal}}}{n}\right)^{n} - 1$$

Nominal vs Annual (EAR)

$$1 + R_{ANNUAL} = \left(1 + \frac{R_{NOMINAL}}{n}\right)^{n}$$

$$R_{ANNUAL} = \left(1 + \frac{R_{NOMINAL}}{n}\right)^{n} \text{-1}$$

Formula sheet $EAR = \left(1 + \frac{R}{F}\right)^{F} - 1$

Question 1.

The nominal monthly rate for a loan is quoted at 5%.

- What is the equivalent annual rate?
- Semiannual rate?
- Continuously compounded rate?

Annual Rate: $R_{ANNUAL} = \left(1 + \frac{R_{NOMINAL}}{n}\right)^{n}$ -1

$$R_{ANNUAL} = \left(1 + \frac{0.05}{12}\right)^{12} - 1 = 1.05116 - 1 = 0.05116 \text{ or } 5.12\% \text{ p.a}$$

Annual rate = 5.12%; semiannual rate = 5.05%; continuous rate = 4.99%.

Question 1.

The nominal monthly rate for a loan is quoted at 5%.

- Semiannual rate?

$$Semi - Ann \qquad \left(1 + \frac{R_{SA}}{2}\right)^2 = \left(1 + \frac{R_{NOMINAL}}{n}\right)^n$$

$$Let\ A = \left(1 + \frac{R_{NOMINAL}}{n}\right)^n = \left(1 + \frac{0.05}{12}\right)^{12} = 1.05116$$

$$Semi - Ann \qquad R_{SA} = \left(\left(A^{\frac{1}{2}}\right) - 1\right) * 2 = 5.05\%\ \text{p.a}$$

Question 1.

The nominal monthly rate for a loan is quoted at 5%.

- Continuously compounded rate?

$$Cts\ Compounded \qquad e^{R_{CC}} = \left(1 + \frac{R_{NOMINAL}}{n}\right)^{n}$$

$$Let\ A = \left(1 + \frac{R_{NOMINAL}}{n}\right)^{n} = 1.05116$$

$$R_{CC} = \ln(A)$$

$$R_{CC} = \ln(1.05116) = 0.04989 \text{ or } 4.99\% \text{ p.a}$$

Statistical Calculations

Exercise 1.

Time Period	Stock Y (%)	Market (M) (%)	$\left(R_t^Y - \bar{R}^Y\right)$	$\left(R_t^M - \bar{R}^M\right)$	$\left(R_t^Y - \bar{R}^Y\right)^2$	$\left(R_t^M - \bar{R}^M\right)^2$	$\left(R_t^Y - \bar{R}^Y\right) \times \left(R_t^M - \bar{R}^M\right)$
1	10	10					
2	14	-2					
3	12	8					
4	8	10					

a. Compute the average return of Y and M.
b. Compute the sample standard deviation of returns for Y and M.
c. Compute the covariance between returns for Y and M.
d. Compute the correlation between the returns of Y and M.

Statistical Calculations

SOLUTION

Time Period	Stock Y	Market (M)	$\left(R_t^Y - \bar{R}^Y\right)$	$\left(R_t^M - \bar{R}^M\right)$	$\left(R_t^Y - \bar{R}^Y\right)^2$	$\left(R_t^M - \bar{R}^M\right)^2$	$\left(R_t^Y - \bar{R}^Y\right) \times \left(R_t^M - \bar{R}^M\right)$
1	10	10	-1	3.5	1	12.25	-3.5
2	14	-2	3	-8.5	9	72.25	-25.5
3	12	8	1	1.5	1	2.25	1.5
4	8	10	-3	3.5	9	12.25	-10.5

Statistical Calculations

Solution

Time Period	Stock Y	Market (M)
Average	11%	6.5%
Variance	0.067	0.33
Standard Deviation	2.582%	5.745%
Covariance	-9.5	
Correlation	-0.8540	

Statistical Calculations

Exercise 2.

Consider the annual returns on two assets:

Year	Stock	Bond
2011	0.0403	0.1837
2012	0.1432	0.1101
2013	0.1898	0.1726
2014	-0.1467	0.0114
2015	-0.2646	-0.0306
2016	0.3721	0.1464

a. Calculate the average returns of the two assets.

b. Compute their sample variances and standard deviations.

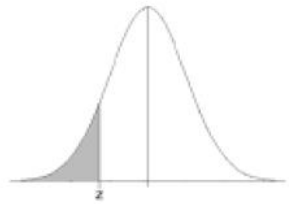
c. Compute the covariance between the returns on the two assets.

d. What is the correlation coefficient between the two series of returns.

Solution

Time Period	Stock	Bond
Average	0.0557	0.0989
Variance	0.0539	0.0079
Standard Deviation	0.2322	0.0888
Covariance	0.0140	
Correlation	0.8126	

Standard Normal Cumulative Probability Table



Cumulative probabilities for NEGATIVE z-values are shown in the following table:

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

$P(Z < -0.333)$ → -0.3 / 0.02