HANKEN Svenska handelshögskolan
Institutionen för finansiell ekonomi
och ekonomisk statistik

INTRODUCTORY EXAM

13.9.2013

Tools allowed: Basic calculator

Time: 1h 45min.

Jan Antell

EMPIRICAL METHODS IN FINANCE (1725)

Advertisement

There will be three sessions on retrieving data from databases. The administration is handled by Hanken's library (Staffan Dellringer), and the instructors are representatives for each data vendors. The following sessions have been scheduled:

1. ThomsonONE.com, Tuesday 17 September at 1:00 pm., room 409, (Joel Furze, English)
2. Orbis, Wednesday 25 September at 11:45 am., room 407, (Johan Knopf, Eng/Swe)
3. Datastream, Thursday 26 September at 2:00 pm., room 407, (Albertha Clink, English)

For the term paper in this course as well as for the bachelor's and master's thesis seminars you need to be able to collect data.

We strongly recommend you to participate in these lectures.

All answers must be justified and motivated and **all calculations must be shown in detail**. If you fail on this, you will get no points for the question. A simple *Yes* or *No* is never an answer. A clear, readable writing style is warranted. Highlight the most important parts of your answer.

1. (1.5 points.) Shortly answer the following questions.
   a) What is meant by a symmetric matrix? Give an example of a symmetric matrix used in finance applications.
   b) What is the difference between statistical significance and practical significance, for example in a regression model?
   c) A term paper is to be produced in the fantastic course *Empirical Methods in Finance* at Hanken. The same topic is used by two or three groups, each consisting of two students. Collaboration between the groups is strictly prohibited. Nevertheless, Mr Ditta and Mrs Datta collaborate with Mr Snopf and Mrs Snipf. Based on Hanken's *Action plan against Academic Dishonesty*, what are the repercussions for the students?

2. (4 points.) All calculations must make use of matrix algebra. The following return data for three securities over a time span of six years are available.

Time	Return 1	Return 2	Return 3
1	6.00	7.00	50.00
2	2.00	0.00	81.00
3	7.00	7.00	-68.00
4	5.00	6.00	-36.00
5	6.00	13.00	27.00
6	4.00	3.00	-21.00

Turn the page.

a) Set up the data in a matrix. Give the matrix a name.

b) Use the matrix you defined in the previous part to calculate the vector of mean returns, ...

c) ... continue by calculating the variance-covariance matrix, and ...

d) ... finally use the following formula to calculate the correlation matrix:

$$\mathbf{Corr} = \begin{bmatrix} \frac{1}{s_1} & 0 & 0 \\ 0 & \frac{1}{s_2} & 0 \\ 0 & 0 & \frac{1}{s_3} \end{bmatrix} \begin{bmatrix} s_1^2 & s_{12} & s_{13} \\ s_{21} & s_2^2 & s_{23} \\ s_{31} & s_{32} & s_3^2 \end{bmatrix} \begin{bmatrix} \frac{1}{s_1} & 0 & 0 \\ 0 & \frac{1}{s_2} & 0 \\ 0 & 0 & \frac{1}{s_3} \end{bmatrix} = \begin{bmatrix} 1 & r_{12} & r_{13} \\ r_{21} & 1 & r_{23} \\ r_{31} & r_{32} & 1 \end{bmatrix} = \mathbf{D}_V^{-1/2}\mathbf{V}\mathbf{D}_V^{-1/2}$$

e) Shortly comment on your results, both with respect to matrix algebra and finance theory.

3. (4.5 p.) The CAPM states a linear relationship between return and risk. The beta is often estimated by regressing a linear regression model of the form $R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$, where R_{it} is the return on stock i at time t, and R_{mt} is a proxy for the market return. In the computer output below the questions, NokiaRetLM indicates that the company being evaluated is Nokia, and that we are looking at $T = 60$ continuously compounded (L) monthly (M) returns. OMXHGenRetLM is the monthly cont. compounded return on the OMXH general index.

a) What is meant by stating that R_{mt} is a *proxy* for the market return?

b) Compute the return for Nokia predicted by the model, given that the market return is 5%

c) Mr Ilop claims that Nokia's share follows the market, i.e., that its beta is equal to one.

   i. State the statistical null and alternative hypothesis implied by the claim.

   ii. *Compute* the relevant test statistic.

   iii. Test the hypothesis.

   iv. What is your conclusion, i.e., does Nokia's share follow the market or not?

d) Consider one additional econometric issue shown in the table and comment on it.

gretl: model 4

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Model 4: OLS, using observations 2007:07-2012:06 (T = 60)
Dependent variable: NokiaRetLM

                  coefficient   std. error   t-ratio    p-value
  ---------------------------------------------------------------
  const            -2.64512      1.19518     -2.213     0.0308     **
  OMXHGenRetLM      1.23360      0.166825     7.395     6.37e-010 ***

Mean dependent var   -3.825278   S.D. dependent var   12.67939
Sum squared resid     4882.380   S.E. of regression   9.174909
R-squared             0.485266   Adjusted R-squared   0.476392
F(1, 58)              54.67961   P-value(F)           6.37e-10
Log-likelihood       -217.1076   Akaike criterion     438.2152
Schwarz criterion     442.4039   Hannan-Quinn         439.8537
rho                  -0.026982   Durbin-Watson        1.896126
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Critical values of the *t*-distribution

Made by Jan Antell

Note Probability refers to the tail probability.
The values are created in Excel by the function TINV(probability;degrees_freedom).
p-values are obtained by the function TDIST(x;degrees_freedom;tails)

	Probability level in the one-sided/two-sided test								
One-sided	20.00%	10.00%	7.50%	5.00%	3.75%	2.50%	1.00%	0.50%	0.05%
Two-sided	40.00%	20.00%	15.00%	10.00%	7.50%	5.00%	2.00%	1.00%	0.10%
df									
1	1.376	3.078	4.165	6.314	8.449	12.706	31.821	63.657	636.619
2	1.061	1.886	2.282	2.920	3.443	4.303	6.965	9.925	31.599
3	0.978	1.638	1.924	2.353	2.681	3.182	4.541	5.841	12.924
4	0.941	1.533	1.778	2.132	2.392	2.776	3.747	4.604	8.610
5	0.920	1.476	1.699	2.015	2.242	2.571	3.365	4.032	6.869
6	0.906	1.440	1.650	1.943	2.151	2.447	3.143	3.707	5.959
7	0.896	1.415	1.617	1.895	2.090	2.365	2.998	3.499	5.408
8	0.889	1.397	1.592	1.860	2.046	2.306	2.896	3.355	5.041
9	0.883	1.383	1.574	1.833	2.013	2.262	2.821	3.250	4.781
10	0.879	1.372	1.559	1.812	1.987	2.228	2.764	3.169	4.587
11	0.876	1.363	1.548	1.796	1.966	2.201	2.718	3.106	4.437
12	0.873	1.356	1.538	1.782	1.949	2.179	2.681	3.055	4.318
13	0.870	1.350	1.530	1.771	1.935	2.160	2.650	3.012	4.221
14	0.868	1.345	1.523	1.761	1.923	2.145	2.624	2.977	4.140
15	0.866	1.341	1.517	1.753	1.913	2.131	2.602	2.947	4.073
16	0.865	1.337	1.512	1.746	1.904	2.120	2.583	2.921	4.015
17	0.863	1.333	1.508	1.740	1.897	2.110	2.567	2.898	3.965
18	0.862	1.330	1.504	1.734	1.890	2.101	2.552	2.878	3.922
19	0.861	1.328	1.500	1.729	1.884	2.093	2.539	2.861	3.883
20	0.860	1.325	1.497	1.725	1.878	2.086	2.528	2.845	3.850
21	0.859	1.323	1.494	1.721	1.873	2.080	2.518	2.831	3.819
22	0.858	1.321	1.492	1.717	1.869	2.074	2.508	2.819	3.792
23	0.858	1.319	1.489	1.714	1.865	2.069	2.500	2.807	3.768
24	0.857	1.318	1.487	1.711	1.861	2.064	2.492	2.797	3.745
25	0.856	1.316	1.485	1.708	1.858	2.060	2.485	2.787	3.725
26	0.856	1.315	1.483	1.706	1.855	2.056	2.479	2.779	3.707
27	0.855	1.314	1.482	1.703	1.852	2.052	2.473	2.771	3.690
28	0.855	1.313	1.480	1.701	1.849	2.048	2.467	2.763	3.674
29	0.854	1.311	1.479	1.699	1.847	2.045	2.462	2.756	3.659
30	0.854	1.310	1.477	1.697	1.845	2.042	2.457	2.750	3.646

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31	0.853	1.309	1.476	1.696	1.842	2.040	2.453	2.744	3.633
32	0.853	1.309	1.475	1.694	1.840	2.037	2.449	2.738	3.622
33	0.853	1.308	1.474	1.692	1.839	2.035	2.445	2.733	3.611
34	0.852	1.307	1.473	1.691	1.837	2.032	2.441	2.728	3.601
35	0.852	1.306	1.472	1.690	1.835	2.030	2.438	2.724	3.591
36	0.852	1.306	1.471	1.688	1.834	2.028	2.434	2.719	3.582
37	0.851	1.305	1.470	1.687	1.832	2.026	2.431	2.715	3.574
38	0.851	1.304	1.469	1.686	1.831	2.024	2.429	2.712	3.566
39	0.851	1.304	1.468	1.685	1.829	2.023	2.426	2.708	3.558
40	0.851	1.303	1.468	1.684	1.828	2.021	2.423	2.704	3.551
41	0.850	1.303	1.467	1.683	1.827	2.020	2.421	2.701	3.544
42	0.850	1.302	1.466	1.682	1.826	2.018	2.418	2.698	3.538
43	0.850	1.302	1.466	1.681	1.825	2.017	2.416	2.695	3.532
44	0.850	1.301	1.465	1.680	1.824	2.015	2.414	2.692	3.526
45	0.850	1.301	1.465	1.679	1.823	2.014	2.412	2.690	3.520
46	0.850	1.300	1.464	1.679	1.822	2.013	2.410	2.687	3.515
47	0.849	1.300	1.463	1.678	1.821	2.012	2.408	2.685	3.510
48	0.849	1.299	1.463	1.677	1.820	2.011	2.407	2.682	3.505
49	0.849	1.299	1.462	1.677	1.819	2.010	2.405	2.680	3.500
50	0.849	1.299	1.462	1.676	1.818	2.009	2.403	2.678	3.496
55	0.848	1.297	1.460	1.673	1.815	2.004	2.396	2.668	3.476
60	0.848	1.296	1.458	1.671	1.812	2.000	2.390	2.660	3.460
65	0.847	1.295	1.457	1.669	1.809	1.997	2.385	2.654	3.447
70	0.847	1.294	1.456	1.667	1.807	1.994	2.381	2.648	3.435
75	0.846	1.293	1.454	1.665	1.806	1.992	2.377	2.643	3.425
80	0.846	1.292	1.453	1.664	1.804	1.990	2.374	2.639	3.416
85	0.846	1.292	1.453	1.663	1.803	1.988	2.371	2.635	3.409
90	0.846	1.291	1.452	1.662	1.801	1.987	2.368	2.632	3.402
95	0.845	1.291	1.451	1.661	1.800	1.985	2.366	2.629	3.396
100	0.845	1.290	1.451	1.660	1.799	1.984	2.364	2.626	3.390
110	0.845	1.289	1.450	1.659	1.797	1.982	2.361	2.621	3.381
120	0.845	1.289	1.449	1.658	1.796	1.980	2.358	2.617	3.373
130	0.844	1.288	1.448	1.657	1.795	1.978	2.355	2.614	3.367
140	0.844	1.288	1.447	1.656	1.794	1.977	2.353	2.611	3.361
150	0.844	1.287	1.447	1.655	1.793	1.976	2.351	2.609	3.357
200	0.843	1.286	1.445	1.653	1.790	1.972	2.345	2.601	3.340
Infinity	0.842	1.282	1.440	1.645	1.780	1.960	2.326	2.576	3.291

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