MSc in Banking and Finance.
Quantitative Methods in Finance
Please answer all questions. Time 2 Hours

Table 1 represents the results of a regression of the excess returns of a portfolio (EXR1) on a constant, a January Dummy JANDUM, the excess returns of an Index (RMRF), 2 factors HML and SMB , RMJAN=RMRF*JANDUM and HMJAN=HML*JANDUM.

Table 1 (Regression Results)

Dependent Variable: EXR1
Method: Least Squares
Sample: 1960M01 2003M12
Included observations: 528

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.195860	0.075063	-2.609278	0.0093
JANDUM	3.125605	0.309967	10.08366	0.0000
RMRF	0.891656	0.019155	46.55023	0.0000
RMJAN	-0.069405	0.051735	-1.341531	0.1803
HML	0.244881	0.030713	7.973313	0.0000
HMJAN	-0.259879	0.082013	-3.168764	0.0016
SMB	1.212854	0.024675	49.15281	0.0000

R-squared	0.936031	Mean dependent var	0.791042
Adjusted R-squared	0.935294	S.D. dependent var	6.384388
S.E. of regression	1.624015	Akaike info criterion	3.820849
Sum squared resid	1374.098	Schwarz criterion	3.877447
Log likelihood	-1001.704	Hannan-Quinn criter.	3.843006
F-statistic	1270.598	Durbin-Watson stat	1.918973
Prob(F-statistic)	0.000000		

1 **Are the coefficients significant at 5%? Taking into account the significance of the coefficients, what is the estimated excess return of EXR1 if the excess return of the Index is 10%, the 2 factors are 5% and the month is January?**

2 **Test, at 5% level, the hypothesis that the coefficient of the Index stock is 1 versus less than 1. What is the F-statistic testing?**

Table 2 (Regression Residuals- Correlogram)

Sample: 1960M01 2003M12
Included observations: 528

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|. |	.|. |	1	0.040	0.040	0.8311	0.362
.|. |	.|. |	2	0.055	0.054	2.4596	0.292
.|. |	.|. |	3	-0.032	-0.036	2.9906	0.393
.|* |	.|* |	4	0.074	0.074	5.9047	0.206
*|. |	*|. |	5	-0.070	-0.073	8.5567	0.128
.|. |	.|. |	6	0.072	0.070	11.318	0.079
.|. |	.|. |	7	-0.003	0.003	11.323	0.125
.|* |	.|* |	8	0.117	0.102	18.729	0.016
*|. |	*|. |	9	-0.087	-0.086	22.830	0.007
.|. |	.|. |	10	0.071	0.058	25.565	0.004

3 According to the results presented above, are the residuals autocorrelated of order 1 at 5% level? According to the results presented above (from the whole Table) are the residuals autocorrelated?

Table 3 (Squared Residuals- Correlogram)

Sample: 1960M01 2003M12
Included observations: 528

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|* |	.|* |	1	0.160	0.160	13.608	0.000
.|** |	.|** |	2	0.250	0.231	46.969	0.000
.|* |	.|* |	3	0.187	0.129	65.518	0.000
.|* |	.|. |	4	0.140	0.053	75.928	0.000
.|* |	.|. |	5	0.102	0.013	81.449	0.000
.|* |	.|. |	6	0.077	0.003	84.616	0.000
.|* |	.|* |	7	0.166	0.120	99.427	0.000
.|* |	.|* |	8	0.191	0.145	119.09	0.000
.|* |	.|. |	9	0.143	0.051	130.10	0.000
.|* |	.|* |	10	0.195	0.085	150.62	0.000

4 According to the results presented above, are the squared residuals autocorrelated of order 1 at 5% level? What is the Q statistic testing?

5 What is the value of the statistic for testing the autocorrelation of the squared residuals of <u>up to (including the)</u> 6th order? What is the value of the statistic for testing the autocorrelation of the squared residuals of <u>the</u> 6th order?

Table 4 (AR(1)-GARCH (1,1) Estimation)

Dependent Variable: EXR1
Method: ML - ARCH
Sample: 1960M01 2003M12
Included observations: 528
Convergence achieved after 27 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.215375	0.065730	-3.276666	0.0011
JANDUM	2.754053	0.289026	9.528735	0.0000
RMRF	0.886684	0.015190	58.37222	0.0000
HML	0.230113	0.025710	8.950268	0.0000
HMJAN	-0.224371	0.072333	-3.101931	0.0019
SMB	1.210181	0.019789	61.15546	0.0000
Variance Equation				
C	0.059279	0.029110	2.036364	0.0417
RESID(-1)^2	0.093629	0.024686	3.792828	0.0001
GARCH(-1)	0.884937	0.027799	31.83333	0.0000

R-squared	0.935627	Mean dependent var	0.791042
Adjusted R-squared	0.935010	S.D. dependent var	6.384388
S.E. of regression	1.627581	Akaike info criterion	3.667354
Sum squared resid	1382.788	Schwarz criterion	3.740123
Log likelihood	-959.1815	Hannan-Quinn criter.	3.695842
Durbin-Watson stat	1.933592		

6 Are the coefficients significant (at 5%)? What is meant by "positivity restrictions"? Do the estimated coefficients (Table 4) comply with these restrictions?

Table 5 (AR(1)-EGARCH (1,1)-symmetric Estimation)

Dependent Variable: EXR1
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Sample: 1960M01 2003M12
Included observations: 528
Convergence achieved after 60 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
LOG(GARCH) = C(8) + C(9)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(10)
*LOG(GARCH(-1))

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.227359	0.071749	-3.168832	0.0015
JANDUM	2.797658	0.275024	10.17242	0.0000
RMRF	0.883466	0.014739	59.93962	0.0000
HML	0.227558	0.025096	9.067327	0.0000
HMJAN	-0.218976	0.067183	-3.259392	0.0011
SMB	1.190848	0.019506	61.05021	0.0000
AR(1)	0.154748	0.044944	3.443145	0.0006
Variance Equation				
C(8)	-0.128325	0.031606	-4.060184	0.0000
C(9)	0.189902	0.043551	4.360467	0.0000
C(10)	0.975554	0.010612	91.93324	0.0000

R-squared	0.934970	Mean dependent var	0.791042
Adjusted R-squared	0.934221	S.D. dependent var	6.384388
S.E. of regression	1.637428	Akaike info criterion	3.654327
Sum squared resid	1396.890	Schwarz criterion	3.735181
Log likelihood	-954.7422	Hannan-Quinn criter.	3.685979
Durbin-Watson stat	2.222093		

7 Is the above model stationary?

8 Which of the two models, presented is Table 4 and Table 5, fit the data best?

Critical Value of the Standard Normal leaving 10% at the right tail is 1.285, leaving 5% is 1.645, and 2.5% is 1.960.
Critical Values leaving 5% at the right tail of χ_1^2 is 3.84.

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