UNIVERSITY OF Southampton

SEMESTER 2 2020/21

GROUP COURSEWORK BRIEF:

Module Code:	MANG6482	**Assessment:**	Individual Coursework	**Weighting**:	100
Module Title:	Quantitative Finance				
Module Leader:	Dr Renatas Kizys				
Submission Due Date: @ 16:00	Friday 20th August 2021	**Word Count/Duration:**	3000		

Method of Submission:	Electronic via Blackboard Turnitin **ONLY** **(You are not required to submit a hard copy)** **(Please ensure that your name does not appear on any part of your work)**

Any work submitted after 16:00 on the deadline date will be subject to the standard University late penalties (see below), unless an extension has been granted, in writing by the Senior Tutor, in advance of the deadline.

University Working Days Late:	**Mark:**
1	(final agreed mark) * 0.9
2	(final agreed mark) * 0.8
3	(final agreed mark) * 0.7
4	(final agreed mark) * 0.6
5	(final agreed mark) * 0.5
More than 5	**0**

This assessment relates to the following module learning outcomes:

A. Knowledge and Understanding	A1. Demonstrate understanding of the basic theory of financial econometrics; A2. Demonstrate understanding of some specific applications of such theory; A3. Apply such understanding to a specific empirical project; A4. Demonstrate competence in using an econometrics software package (Stata).
B. Subject Specific Intellectual and Research Skills	B1. Demonstrate quantitative skills in evaluating numerical data.
C. Transferable and Generic Skills	C1. Demonstrate skills in utilizing analysis software.

Coursework Brief

This is an individual coursework. Therefore, collaboration is not allowed. Each student will be emailed an individual dataset, and all datasets are different. The coursework consists of three questions. Answer all questions. The word count should not exceed 3,000 words. The coursework should be written in Word and submitted electronically to the Blackboard/Turnitin submission inbox on or before **4.00 PM on Friday 20h of August 2021**. Submission title: **MANG6482_StudentID**. For instance, if your student ID is 12345678, then the submission file should be named as MANG6482_12345678. The cover page must include: your student ID (but **do not** include your name, surname, or username), the module code (MANG 6482), and a word count. You should concisely explain your methodology and justify your decisions, based on the STATA output. Where relevant, your answers/discussion should be contextualised within financial theory. Please include all outputs from STATA in an appendix. You are encouraged to use external sources of academic literature to support your results. Referencing style (i.e., Harvard or other) must be used consistently throughout. Observe that there are penalties for plagiarism!

Question 1: Application of regression analysis to asset pricing models [50 marks]

You will be provided with an individual dataset, entitled "MANG6482_Question_1_XXXXXX.dta" (where XXXXXX is your university username), which contains data on the time indicator (**date**), returns on an individual asset (**ri**), a risk-free asset (**rf**), the market portfolio (**rm**), as well as the four Fama and French pricing

factors (**smb**, **hml**, **rmw**, and **cmw**). The description of these factors is available in Fama and French (1993) and in Fama and French (2015). Where relevant, use the significance level of 5%. **Required:**

a) Depict the individual asset's risk premium against the market risk premium on a scatter diagram. Comment on the diagram.

b) Estimate the CAPM by means of the Ordinary Least Squares estimation procedure. Discuss the explanatory power and the goodness of fit of the model. Interpret the coefficients.

c) The constant term of the CAPM can be thought of as an estimate of abnormal returns ("ALPHA"). Is ALPHA positive or negative? Perform appropriate tests, which would allow you to conclude that ALPHA is either positive or negative, or insignificant. Carefully outline the null and alternative hypotheses for each test.

d) Is the systematic risk ("BETA") of investment in the individual asset higher or lower than the market systematic risk? Perform appropriate tests, which would allow you to conclude that BETA is either higher or lower (or is not significantly different) than the market systematic risk. Carefully outline the null and alternative hypotheses for each test. Explain how the test statistic is constructed and how it is distributed.

e) Estimate the Fama and French three-factor model. Perform a test, which would allow you to conclude if this model outperforms the CAPM. Discuss the explanatory power and the goodness of fit of the model.

f) In the Fama and French three-factor model, perform appropriate tests, which would allow you to conclude if the model satisfies the CLRM assumptions. Interpret the outcome of those tests.

g) Estimate the Fama and French five-factor model. Perform a test, which would allow you to conclude if this model outperforms the Fama and French three-factor model. Discuss the explanatory power and the goodness of fit of the model.

Question 2: ARMA Model Selection [25 marks]

In the file that will be sent to your individual University of Southampton email account, entitled "MANG6482_Questions_2_and_3_XXXXXX.dta" (where XXXXXX is your university username), you will find a time indicator (**period**) and the financial series (**y**)**.** Where relevant, use the significance level of 5%. **Required:**

a) Illustrate the time variation on the variable **y**. Analyse the time series plot.

b) Proceed to test of there is a unit root in the variable **y**. Carefully outline the test equation, as well as the null and alternative hypotheses for this test.

c) Now estimate the autocorrelation and partial autocorrelation functions for **y**. Discuss the estimation output.

d) Estimate the AR(p) model for p=1,2,3,4; and the ARMA(p,q) model for p,q=1,2. Summarise the results in a table with one column for each model. For each model, provide the Akaike and Schwarz Bayesian Information Criteria, as well as the Ljung-Box test for the first 10 autocorrelations. Comment on the results.

e) Based on the estimation output in d), select the optimal AR(p) / ARMA(p,q) model. Carefully justify your choice.

Question 3: GARCH Model Selection [25 marks]

The dataset is the same as in **Question 2**. Where relevant, use the significance level of 5%. Required:

a) In the time series plot, illustrated in **Question 2 a)**, is there evidence of volatility clustering? Why?

b) Perform a test, which would allow you to find out if there is evidence of ARCH/GARCH in the variable **y**. Assume that the mean equation has a constant term only.

c) Now estimate the ARCH(1), GARCH(1,1), EGARCH(1,1), GJR-GARCH(1,1), and GARCH-M(1,1) models. Assume that the mean equation has a constant term only. Summarise the results in a table with one column for each model. For each model, provide the Akaike and Schwarz Bayesian Information Criteria. Comment on the results.

d) Test if the conditional variance is positive-definite in the ARCH(1) or GARCH(1,1) model. Carefully outline the null and alternative hypotheses for this test. Obtain the long-term variance forecast. Illustrate a short-term (one-period ahead) variance forecast.

e) Propose alternative conditional volatility models that might provide a better fit to the data than the models outlined in **Question 3 c)**.

References

a) Eugene F. Fama, Kenneth R. French, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics*, Volume 33, Issue 1, 1993, Pages 3-56, ISSN 0304-405X, https://doi.org/10.1016/0304-405X(93)90023-5.

b) Eugene F. Fama, Kenneth R. French, A five-factor asset pricing model, *Journal of Financial Economics*, Volume 116, Issue 1, 2015, Pages 1-22, ISSN 0304-405X, https://doi.org/10.1016/j.jfineco.2014.10.010.

Nature of Assessment: This is a SUMMATIVE ASSESSMENT. See 'Weighting' section above for the percentage that this assignment counts towards your final module mark.

Word Limit: +10% of the word count is deemed to be acceptable. Any text that exceeds an additional 10% (i.e., 3300 words) will not attract any marks. There is no minimum word count, but students should answer all questions. The relevant word count *includes* items such as cover page, executive summary, title page, table of contents, tables, figures, in-text citations and section headings, if used. The relevant word count *excludes* your list of references and any appendices at the end of your coursework submission.
You should always include the word count (from Microsoft Word, not Turnitin), at the end of your coursework submission, before your list of references.

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Title/Cover Page: You must include a title/ cover page that includes: your Student ID, Module Code, Assignment Title, Word Count. This assignment will be marked anonymously, please ensure that your name does not appear on any part of your assignment.

References: You should use the Harvard style to reference your assignment. The library provide guidance on how to reference in the Harvard style and this is available from: http://library.soton.ac.uk/sash/referencing

Submission Deadline: Please note that the submission deadline for Southampton Business School is **16.00 for ALL assessments.**

Turnitin Submission: The assignment MUST be submitted electronically via Turnitin, which is accessed via the individual module on Blackboard. Further guidance on submitting assignments is available on the Blackboard support pages.

It is important that you allow enough time prior to the submission deadline to ensure your submission is processed on time as **all** late submissions are subject to a late penalty. We would recommend you allow 30 minutes to upload your work and check the submission has been processed and is correct. Please make sure you submit to the correct assignment link.

You will know that your submission has completed successfully when you see a message stating **'Congratulations – your submission is complete…'**. It is vital that you make a note of your **Submission ID (Digital Receipt Number)**. This is a unique receipt number for your submission, and is proof of successful submission. You may be required to provide this number at a later date. We recommend that you take a screenshot of this page, or note the number down on a piece of paper. You should also receive an email receipt containing this number, and the number can be found after submitting by following this guide. This method of checking your submission is particularly useful in the event that you don't receive an email receipt.

You are allowed to test submit your assignment via Turnitin before the due date. You can use Turnitin to check your assignment for plagiarism before you submit your final version. See "Viewing Your Originality Report" for guidance. Please see the Module Leader/lecturer on your module if you would like advice on the Turnitin Originality report.

The last submission prior to the deadline will be treated as the final submission and will be the copy that is assessed by the marker.

It is your responsibility to ensure that the version received by the deadline is the final version, resubmissions after the deadline will not be accepted in any circumstances.

Important: If you have any problems during the submission process you should contact ServiceLine immediately by email at Serviceline@soton.ac.uk or by phone on +44 (0)23 8059 5656.

Late Penalties: Further information on penalties for work submitted after the deadline can be found here.

Special Considerations: If you believe that illness or other circumstances have adversely affected your academic performance, information regarding the regulations governing Special Considerations can be accessed via the Calendar: http://www.calendar.soton.ac.uk/sectionIV/special-considerations.html

Extension Requests: : Extension requests along with supporting evidence should be submitted to the Student Office as soon as possible before the submission date. Information regarding the regulations governing extension requests can be accessed via the Calendar: http://www.calendar.soton.ac.uk/sectionIV/special-considerations.html

Academic Integrity Policy: Please note that you can access Academic Integrity Guidance for Students via the Quality Handbook: http://www.southampton.ac.uk/quality/assessment/academic_integrity.page?. Please note any suspected cases of Academic Integrity will be notified to the Academic Integrity Officer for investigation.

Feedback: Southampton Business School is committed to providing feedback within 4 weeks (University working days). Once the marks are released and you have received your feedback, you can meet with your Module Leader / Module

Lecturer / Personal Academic Tutor to discuss the feedback within 4 weeks from the release of marks date. Any additional arrangements for feedback are listed in the Module Profile. **Student Support**: Study skills and language support for Southampton Business School students is available at: http://www.sbsaob.soton.ac.uk/study-skills-and-language-support/.

External Examiner:	
External Examiner Comments:	
Final Approval by External Examiner Date:	
Module Leader Response to External Examiner: **(Please note these comments are REQUIRED and will be sent to the External Examiner)**	