FD Group Work Project 1 M5

Group Members

Student Group 7995
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Carefully read and follow the GWP submission instructions below:

Before the submission deadline:

- Read the ***GWP1 Assignment & Grading Rubric***
- Make sure that you are familiar with the ***Group Work Policy***
- Use the ***GWP Report Template*** for your report. Make sure that you have included full names and email addresses of all group members and have indicated whether or not they actively contributed to the work
- While completing the project, designate one group member who will upload and submit the group work project on behalf of your group.
- Don't wait until the last minute to upload your work: Make sure to use Turnitin and check your similarity report to avoid plagiarism.
- Remember, the submitting group member can (re-)upload an updated and improved version of your work up to 5 times prior to the submission deadline.
- Before the submission deadline, use Turnitin to check your similarity report, and then upload an updated version of your submission if necessary

Ready to submit:

- If your submission is composed of multiple files, upload the PDF report separately from the zipped folder that includes all additional files (spreadsheets with data, charts, code).
- Make sure that the submitting group member has uploaded the final version of your project.

- After the deadline, your submission can no longer be changed by any of the group members. Groups who have not made any submission will not be able to upload their work.

Submission Deadline: January 22, 2025 at 5:30 AM GMT+5:30

Group Member Reviews Received

Criterion	Douglas Owiye Atsewa	Deepak Kumar
Contributes to project planning and input was meaningful to advanced project development	-	-
Completes work and provides contributions well in advance of the deadline (not finished last minute)	-	-
Develops quality materials that were used in the project submission (not plagiarized)	-	-
Responds to group member requests for clarifications of contributions and necessary revisions of work	-	-
Total	-	-

MScFE 600 FINANCIAL DATA

Group Work Project # 1

See grading rubric here.

Below you will find four separate scenarios and each one includes a set of questions that you are required to answer in words, using code, or both words and code. The 'Submission requirements and format' section on Page 4 provides a detailed explanation on how to complete and submit the assignment through the online platform.

Groups of 3 members must complete all the Tasks and answer all the questions.

Groups of 2 members or 1 member will skip some of the questions following the requirements on Page 3.

Tasks

1. Data Quality

One of the important components of financial data is ensuring good quality data. However, it is helpful to understand what poor quality data looks like.

a. Provide an example of poor quality structured data
b. How would you recognize this poor quality? Write 3 - 4 sentences that show how the data fails to include properties of good quality data.
c. Provide an example of poor quality unstructured data
d. Unstructured data can be more difficult to assess than structured data. Just as you did in part b, write 3 - 4 sentences that show how this unstructured data fails to check requirements of good quality data.

2. Yield Curve Modeling

a. Pick government securities from a country. The country selected should be one of the countries from your group so that you can fit a Nelson-Siegel model.
b. Be sure to pick maturities ranging from short-term to long-term (e.g. 6 month maturity to 20 or 30 year maturities).
c. Fit a Nelson-Siegel model.

d. Fit a Cubic-Spline model.
e. Compare the models in terms of 1) fit and 2) interpretation.
f. Be sure to specify at the levels of model parameters (ex. Alpha1).
g. In Module 2 Lesson 4 ('Smoothing Data'), we said smoothing data can be unethical. If Nelson-Siegel is smoothing the yield curve, is this considered unethical? Why or why not?

3. Exploiting Correlation

Financial Data is meant not only to process data but to understand how meaningful factors can be used to summarize or represent the data. Let's understand the role that correlation and principal components play.

a. Generate 5 uncorrelated Gaussian random variables that simulate yield changes (they can be positive or negative with a mean close to 0 and a standard deviation that is small).
b. Run a Principal Components using EITHER the correlation OR covariance matrix.
c. Write a paragraph explaining how the variances of each component compare with each other. In this paragraph, you will address the following question: how much variance is explained by Component 1, Component 2, Component 3?
d. Produce a screeplot (see https://en.wikipedia.org/wiki/Scree_plot) of the variance explained for each component.

Now let's work with real data:

e. Collect the daily closing yields for 5 government securities, say over 6 months.
f. Be sure to compute the daily yield changes!
g. Re-run the Principal Components using EITHER the correlation or covariance matrix.
h. How do the variances of each component compare? In other words, how much variance is explained by Component 1, Component 2, Component 3, etc.?
i. Produce a screeplot of the variance explained for each component.
j. How does the screeplot from the uncorrelated data compare with the screeplot from the government data?

4. Empirical Analysis of ETFs

Pick a sector ETF (in the US, for example, XLRE)

a. Find the 30 largest holdings.
b. Get at least 6 months of data (~ 120 data points).
c. Compute the daily returns.
d. Compute the covariance matrix.
e. Compute the PCA.
f. Compute the SVD.

Now that you have calculated, presented and plotted tasks from c to f, you must explain each transformation thoroughly. Write a paragraph of 500 words at minimum that explains why returns are important, compare and contrast PCA and SVD, explain what the eigenvectors, eigenvalues, singular values etc show us for the specific data, etc,

Groups of 2 members: Complete Task 1, and then choose 2 Tasks among the remaining 2, 3, and 4.

Groups of 1 member: Complete Task 1, and then choose 1 Task among the remaining 2, 3, and 4.

Every Group Work Project Submission is composed by a report in PDF format and coding (see details in the 'Submissions requirements and format' below.

In the report, be sure to include a **list of references** and use them properly. This is mandatory for every GWP assignment you will submit in this Program.

Just compiling a list of references is not enough. **In your paper you also must show where each reference was used specifically (in-text citation)**.

Use the In-Text Citations and References Guide to learn how to add in-text citations and references.

In the Student Resource Center located in the dropdown menu under your name you find several other resources to complete your Group Work Projects properly:

- Academic Writing Guide,
- Anti-Plagiarism Guide,
- How to use LIRN, the online free library

Important note on the use of AI: Carefully read the WQU **Academic Policy on the use of AI** explaining how the use of AI tools is restricted and regulated. Severe penalties apply for excessive and improper use of AI.

Submission requirements and format

One team member submits on behalf of the entire group the following items:

1. **1 PDF document*** with written answers for Tasks 1, 2, 3, and 4.
   a. Use the available Report Template and fill out the required information on group members on the first page
2. A **zipped folder** including:
   a. .ibynb executable Jupyter notebook**
   b. 1 PDF document **with the output** from the Jupyter notebook. To include the output, RUN the code before downloading the PDF.

** **Use Google Docs to collaborate**. Start by uploading the Report Template provided in the Course Overview. Once your report is completed, click File → Download → PDF Document (.pdf) to obtain the copy for your submission.*

*** **Use Google Colab or GitHub to collaborate** in completing the executable Python program.*

*The PDF file with your report must be uploaded **separately** from the zipped folder that includes any other types of files. This allows Turnitin to generate a similarity report.*

Grading Rubric

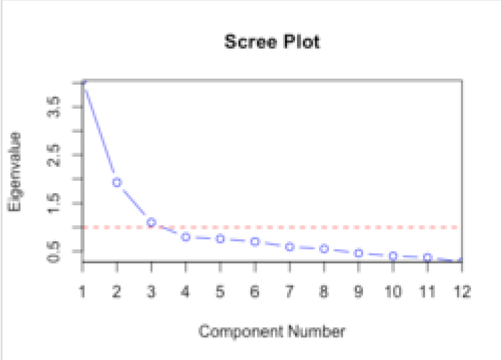
Your instructor will evaluate your group submission for GPW1 using the following rubric:

Quantitative Analysis (open-ended questions) **60 Points**	**Technical and Non-technical Reports** **40 Points**	**Writing and Formatting** **20 Points**
The group is able to apply results, formulas, and their knowledge of theory to real-life finance scenarios by doing the following: ● Providing all the necessary information to support their arguments. ● Presenting arguments that reflect group discussion and research. ● Using authoritative references to support a position and provide updated information ● Concluding with practical takeaways for more insightful financial decision-making	Technical Reports contain 3 parts: 1) summary of key results; 2) interpretation of results; and 3) the recommended course of action that can reasonably follow from those results and interpretations. **Note**: Technical reports will include the technicalities of models, such as names, methods of estimation, parameter values, etc. and exclude generalities about the work done. It should NOT include the names of Python code that was used.	A submission that looks professional should include: ● The axes labels and scales in graphs. ● No significant grammar errors or typos. ● Organized, clear structure, and easy to read document. ● Proper citations and bibliography using MLA format.
	Non-technical Reports contain 3 parts: 1) clear explanation of results; 2) the recommended course of action that follows; and 3) the identification of factors that impact each portfolio. **Note**: AVOID all references to model names, algorithms, unnecessary details, and focus on the investment decision.	

Revised: December 10, 2024

Scree plot

In multivariate statistics, a **scree plot** is a line plot of the eigenvalues of factors or principal components in an analysis.[1] The scree plot is used to determine the number of factors to retain in an exploratory factor analysis (FA) or principal components to keep in a principal component analysis (PCA). The procedure of finding statistically significant factors or components using a scree plot is also known as a **scree test**. Raymond B. Cattell introduced the scree plot in 1966.[2]



A sample scree plot produced in R. The Kaiser criterion is shown in red.

A scree plot always displays the eigenvalues in a downward curve, ordering the eigenvalues from largest to smallest. According to the scree test, the "elbow" of the graph where the eigenvalues seem to level off is found and factors or components to the left of this point should be retained as significant.[3]

Etymology

The scree plot is named after the elbow's resemblance to a scree in nature.

Criticism

This test is sometimes criticized for its subjectivity. Scree plots can have multiple "elbows" that make it difficult to know the correct number of factors or components to retain, making the test unreliable. There is also no standard for the scaling of the x and y axes, which means that different statistical programs can produce different plots from the same data.[4]

The test has also been criticized for producing too few factors or components for factor retention.[1]

As the "elbow" point has been defined as point of maximum curvature, as maximum curvature captures the leveling off effect operators use to identify knees, this has led to the creation of a Kneedle algorithm.[5]

See also

- Biplot
- Parallel analysis
- Elbow method

- Determining the number of clusters in a data set

References

1. George Thomas Lewith; Wayne B. Jonas; Harald Walach (23 November 2010). *Clinical Research in Complementary Therapies: Principles, Problems and Solutions* (https://books.google.com/books?id=CSNw-spnFdkC&pg=PA354). Elsevier Health Sciences. p. 354. ISBN 978-0-7020-4916-3.
2. Cattell, Raymond B. (1966). "The Scree Test For The Number Of Factors". *Multivariate Behavioral Research*. **1** (2): 245–276. doi:10.1207/s15327906mbr0102_10 (https://doi.org/10.1207%2Fs15327906mbr0102_10). PMID 26828106 (https://pubmed.ncbi.nlm.nih.gov/26828106).
3. Alex Dmitrienko; Christy Chuang-Stein; Ralph B. D'Agostino (2007). *Pharmaceutical Statistics Using SAS: A Practical Guide* (https://books.google.com/books?id=FlXwIvSHND8C&pg=PA380). SAS Institute. p. 380. ISBN 978-1-59994-357-2.
4. Norman, Geoffrey R.; Streiner, David L. (15 September 2007). *Biostatistics: The bare essentials* (https://books.google.com/books?id=8rkqWafdpuoC&pg=PA201). PMPH-USA. p. 201. ISBN 978-1-55009-400-8 – via Google Books.
5. Satopaa, Ville; Albrecht, Jeannie; Irwin, David; Raghavan, Barath (2011-06-20). *Finding a "kneedle" in a haystack: Detecting knee points in system behavior* (https://ieeexplore.ieee.org/document/5961514). 2011 / 31st International Conference on Distributed Computing Systems. IEEE Workshops. Institute of Electrical and Electronics Engineers. pp. 166–171. doi:10.1109/ICDCSW.2011.20 (https://doi.org/10.1109%2FICDCSW.2011.20) – via IEEE Explore.

In-Text Citations and References

This document is an excerpt from the Anti-Plagiarism guide and is focused on how to create in-text citations and references and why they must both be used in your assignments.

What is Citation and Why is it Important?

In academic writing, especially at the graduate level, citation is a standard practice that shows what you have read and how it informs your own research. Whenever you cite a source, it shows that you have conducted research on a topic and that you have considered a variety of relevant ideas and viewpoints in your discipline. In-text citations and references help your reader understand who and what you've read and what sort of larger discussions and debates you considered as you developed your own ideas and arguments. Citation also helps your reader (and the grader) differentiate between your ideas and the ideas of the researchers you've read and incorporated into your arguments. When you cite the authors you've read and used in your work, you're also giving them credit for their research, which is how you avoid plagiarism.

Note that **you must cite every source you include in your paper**—even if it's from a blog post or any other site on the internet. This includes free, open-access materials and even content in the public domain.

In order to appropriately give an author credit for their work, there are two key components to citation: in-text citations, which you use in the body of your essay, and a references or works cited page, which is a list of references to all the sources you cited in your essay. Whenever you use the ideas or research from an outside source, **you must include both an in-text citation and a reference for that source in order to avoid plagiarism**. In-text citations are required whether you quote the source directly or paraphrase the source material.

To create citations and references, you need to pick one citation style and be consistent. Citation styles are systems for writing and citing that are designed to be specific to certain disciplines and fields of study. At WQU, our lesson notes and course materials follow the Modern Language Association's (MLA) style guidelines, so we'll provide examples and guidelines for how to create in-text citations and references in MLA style. But please note that you can use any citation style you'd like. Other common citation styles, for example, include the American Psychological Association (APA) and Chicago style.

How to Create an In-Text Citation:

To create an in-text citation in MLA style, you need two pieces of information: 1.) the author's last name(s) (or the name of the organization), and 2.) the page number where the cited material can be located within the source. If your source doesn't have page numbers, then you can just omit that information from the citation. Put a space between the author and the page number, but do not include any punctuation between them.

Here are a few examples of how to create in-text citations for your sources:

One Author: (Hughes 50)
Two Authors: (Hughes and Throughton 102)
Three or More Authors*: (Hughes et al. 234)
Organization as Author: (U.S. Department of Labor 109)
No Page Number: (U.S. Department of Labor)
***Note:** For sources with three or more authors, you only need to list the first author's last name followed by the phrase "et al." Fun fact: Et al. means "and others" in Latin.

How to Create a Reference:

To create a reference in MLA style, you'll need a lot more information about your source. The reference provides all the information your reader will need about the source in case they'd like to locate and read the source on their own. As such, references typically include much more information than in-text citations do.

Here, we include examples of how to create references for a few common source types: books, journal articles, and YouTube videos. Please note that your reference might vary depending on how many authors you have, whether you're citing a chapter in an edited book, whether you're citing a specific edition of a book, and other factors. In order to create an accurate reference for your source, it's important that you first identify what kind of source you're using. Then, find an example citation to use as a model for your own source information.

Book:

Format:

Last Name, First Name. *Book Title*. Publisher, Year.

Examples:

Sorkin, Andrew Ross. *Too Big to Fail: The Inside Story of How Wall Street and Washington Fought to Save the Financial System–and Themselves*. Penguin Books, 2010.

For ebooks, simply add the URL after the period that follows the year:

Sutton, Richard S., and Andrew G. Barto. *Reinforcement Learning: An Introduction*. MIT Press, 2018. http://incompleteideas.net/sutton/book/the-book.html.

Journal Article:

Format:

Last name, First name. “Article Title.” *Journal Title*, volume number, issue number, year, page range, URL.

Examples:

Akansu, Ali. "The Flash Crash: A Review." *Journal of Capital Market Studies*, vol. 1, no. 1, 2017, pp. 89–100, https://www.emerald.com/insight/content/doi/10.1108/JCMS-10-2017-001/full/html.

Sanger, William, and Thierry Warin. "High Frequency and Unstructured Data in Finance: An Exploratory Study of Twitter.” *Journal of Global Research in Computer Science*, vol. 7, no. 4, 2016, pp. 6–16, https://www.rroij.com/open-access/high-frequency-and-unstructured-data-in-finance-an-exploratory-study-oftwitter-.php?aid=70514.

Booth, Anthony, and Boudewijn de Bruin. "Stakes Sensitivity and Credit Rating: A New Challenge for Regulators." *Journal of Business Ethics*, vol. 169, 2021, pp. 169–179, https://link.springer.com/article/10.1007.

Hattingh, Marié, et al. "The Use of Critical Thinking to Identify Fake News: A Systematic Literature Review." *Responsible Design, Implementation and Use of Information and Communication Technology*, 2020, pp. 235–246, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7134234/.

***Note:** For open-access journals, oftentimes, there may be no volume number, issue number, or page numbers. In this case, simply omit this info from your reference.

YouTube Video:

Format:

Username. “Video Title.” *YouTube*, Upload date, URL.

Examples:

Ben Lambert. "Characteristic Functions Introduction." *YouTube,* 18 June 2013, https://www.youtube.com/watch?v=mYhca1p26n4.

Harvard University. “Lecture 31: Markov Chains | Statistics 110.” *YouTube*, 29 April 2013, https://www.youtube.com/watch?v=8AJPs3gvNlY.

How to Cite Source Code in MLA:

https://style.mla.org/citing-source-code/

Revised January 2023

Guide to Academic Writing at WQU

This guide is intended to provide a supplemental resource for students on how to write effectively during their studies at WorldQuant University. This document is not meant to be all-inclusive, but does address common topics that will help students improve and develop as writers at the graduate level. Please note that your instructors may have individual preferences, so they may request you do things differently in your writing. This guide is meant to be a starting point for learning the basics of academic writing at the graduate level.

For topics not covered here, refer to the Modern Language Association (MLA) Handbook (9th edition), as it is the basis for these style guidelines.

Table of Contents

Introductions and Conclusions

Introductions and conclusions are particularly useful for the reader because they help the reader situate new material within the context of what they already know.

Introductions:

Introductions should do 3 things:

1. Contextualize the material within the larger goal or purpose of your assignment and within the field or subject at large. What background knowledge is necessary for the reader to understand the topic at hand? What needs to be explained or introduced about the topic?
2. Summarize the information that will be presented and the order in which it will be covered. This will help guide the reader through your assignment and prepare them for what is to come.
3. Explain the significance and importance of the material overall. Why is this topic important within the field, and what are its implications? In other words, why should the reader care about the information that is about to be presented?

Sample Introduction:

Mortgage-backed securities, specifically the securitization of sub-prime mortgage debt, played an integral role in the Global Financial Crisis. First, I will explain what a mortgage-backed security is and how it works. Then, I will examine the role of mortgage-backed securities in the destabilization of the financial system during the Global Financial Crisis. This research can help to better illuminate how regulations may or may not help to avoid future financial crises and demonstrate other actions that can be taken to stabilize the financial system, especially as it pertains to mortgage-backed securities, during times of economic turbulence.

In yellow, there is a brief summary of the assignment's content. In blue, there is a clear outline of what to expect from the assignment and the order in which information will be presented. In purple, there is a clear explanation of the takeaway for this assignment: for the learner to understand the workflow of a finance project and to learn what excites them about the process.

Conclusions:

Conclusions should mirror introductions. They should summarize the content that was presented, reinforce the significance or key takeaways of that material, and contextualize the material that was just presented by explaining its larger implications and significance. Remember that by this point, the reader has already read the materials, so instead of talking about the material vaguely, you can add a bit more detail and elaboration into your conclusion because the reader will understand what you are referring to.

Organization

This section covers the use of headings, topic sentences, and transitions, which all help to improve the organization, structure, and flow of content.

Using Headings:

To aid in organization, you can use headings and subheadings to organize your assignments. This can help your reader navigate your assignment more effectively, enabling them to skim the structure of the material upfront and to easily locate material for further review when needed.

When using headings, be mindful of sections or paragraphs that are long or short compared to other sections or paragraphs. No heading is necessary for the introduction, but do use a heading for the conclusion. If using a level of heading, there should always be at least 2 instances of that heading. For example:

- Credit Risk
  - Capacity
  - Capital
  - Character
  - Collateral
  - Conditions
- Mortgage-Backed Securities
- Conclusion

Using Metadiscourse:

In graduate-level writing, it is common to use metadiscourse, also known as signposting, in your essays and assignments. Metadiscourse refers to words and phrases that you can use to guide the reader through your text. Think of these phrases as signs that help guide someone along the journey of reading your paper. When using metadiscourse, you can signal not only the direction but also the purpose of the material to your reader.

When used purposefully, metadiscourse can be an invaluable tool to help your reader understand the structure and progression of your ideas. However, if you use metadiscourse too often, it will lose its value and will not be as useful or helpful to the reader. Metadiscourse is most useful at the beginning and ends of major sections or ideas and at key points of transition within your assignment. Below are examples of different kind of metadiscourse that can be helpful to incorporate into your materials:

Forecasting:

Forecasting language allows you to outline upcoming material for the reader. This is especially helpful at the beginning of your assignment but can also be useful at the start of a major section within your assignment. Depending on whether it's your individual assignment or a group assignment, using either "I" or "we" might be appropriate. This type of forecasting statement at the beginning of your paper will help your reader know what to expect as they read:

> First, we will explain the Spearman correlation. Then, we will compare the Spearman correlation to Kendall's tau. Finally, we will discuss situations where using the Spearman correlation is more effective than using Kendall's tau.

Notice how the sentences above set up a clear outline for the content of an assignment. The reader knows exactly what to expect. You could also incorporate headings for each of these sections that will match up with the organization presented here to reinforce the structure of the material. At the end of your assignment, you can summarize what you've written by using similar language but in the past tense, along with any additional details or context you want to incorporate.

> In this assignment, we first provided an overview of the Spearman correlation and compared it to Kendall's tau. Afterwards, we discussed specific contexts in which it would make the most sense to use the Spearman correlation rather than Kendall's tau. Using the Spearman correlation makes the most sense when…

Transitions:

Transitional phrases can be helpful for alerting the reader to important changes in thought or topic in your assignment. Perhaps you are giving an important list of characteristics or applying a concept to a real-world context. Words like “nevertheless,” “now,” “therefore,” “however,” “first,” and “in conclusion” tell your reader what is happening in your assignment by establishing relationships between what you’ve already discussed and what you’re about to discuss. For instance, the example below might help to transition from one paragraph about skewness in statistical analysis to the next paragraph about kurtosis.

> While skewness is important for evaluating a dataset, it’s important to consider kurtosis as well to determine the influence of outliers.

Voice and Tone

In your writing, your tone should be academic in nature. This means that you should come across as professional and objective as you write. Avoid using informal language, and look to sample textbooks, journal articles, and other research in your field as an example of how your writing should sound.

As part of academic tone, it is important to be straightforward and concise. As such, it’s best to use the active voice. While the passive voice can be helpful, active voice is generally preferred in academic writing. First, we’ll explain what passive voice is, and then we’ll compare and contrast the two to show why active voice is generally more effective.

Passive voice means that the subject is obscured; it is unclear who or what is performing the action. For example: “The price of goods has been drastically impacted.” By what or whom? This sentence construction obscures the subject, the person or thing impacting the price of goods. Even if we attribute the cause at the end of the sentence as such, “The price of goods has been drastically impacted by inflation,” the sentence is less direct than it could or should be. “Inflation” is the real subject of the sentence here--it is what’s causing the drastic change to the price of goods. However, passive voice positions that subject at the end of the sentence, making the relationship more indirect and placing more emphasis on the object receiving the action--”the price of goods.” Passive voice is often used as a way to deflect blame or avoid responsibility, so it is best to write in active voice whenever possible. However, in situations where the object receiving the action is more important than the subject, passive voice is permissible.

Active voice means the subject (the who or what of the sentence) is performing the action of the sentence. For example, let's take the sentence we used in the paragraph above and put it into the active voice: Inflation can drastically impact the price of goods. In this sentence, the subject is "inflation" and "can impact" is the action. We've restructured the sentence to place the subject, the one performing the action, at the beginning of the sentence. This allows the reader to more clearly see that it is inflation that is the subject of the sentence and that inflation can impact (action) the price of goods (the object, what is being affected by the subject). It is easier to understand this type of construction because information is presented in the order you would expect: the subject, the action, and the recipient of the action.

Microsoft Word has a passive voice checker that can be useful for detecting instances of passive voice, especially in situations where the actor is completely unknown, which usually means there's no "by" phrase at the end of the sentence to indicate who or what is performing the action. Try to revise instances of passive voice with an unknown actor, and use active voice whenever possible in place of other instances of passive voice.

Grammar and Mechanics

This section outlines preferences and rules related to grammar, mechanics, and style. It is not a comprehensive overview of English grammar but is intended to provide some tips and tricks as you write at the graduate-level. **If you are ever unsure of a grammatical rule, look it up and try to practice it in your writing.**

Punctuation:

- Use a serial comma before "and" in lists of more than two items:

  economics, finance, and mathematics

- Use commas after introductory information, including conjunctive adverbs, dependent clauses, prepositional phrases, and transitional phrases:

  Then, this section will cover…

  Therefore, the importance of this theory…

  In this assignment, you will…

- When using a colon to introduce information or elaborate upon an idea, the colon must be preceded by an independent clause:

  This forum post covers two important concepts: securitization and collateralization.

  NOT This forum post covers: securitization and collateralization.

- Only use a semicolon to separate two independent clauses or to separate bulky or wordy items in a list:

  Without data, there is no project; it is as simple as that.

  Some examples of the statistical techniques used to build these models include linear regression; random forests; gradient boosting; support vector machines; neural networks; clustering; self-organizing maps; and many more.

- Periods and commas always go inside quotation marks. Question marks and semicolons can be placed outside under certain circumstances (semicolons generally are). Look up usage for specific punctuation if unsure.
  - The exception to this rule is with in-text citations. If your sentence ends with an in-text citation, it should be formatted as follows, with the end quotation mark, followed by the parenthetical, and then the period: …" (Hughes 54).

- Limit use of quotation marks to direct quotations. Avoid using them to emphasize words or phrases.

- Do not use exclamation points or ellipses—these are generally not needed in academic writing.

Capitalization:

- Follow standard rules for capitalization:
  - Capitalize the first word of a sentence:

    This module will cover…

  - Capitalize names and proper nouns, meaning the specific name for a particular thing, like a brand name, company, etc.

    New York Stock Exchange

    Euclidean distance

    CryptoKitty genome mapping

- When referencing specific works or sources in text, use title case, meaning capitalize the first word, all principal words, and the last word.

  Practical Methods of Financial Engineering and Risk Management

  An Introduction to Quantitative Finance

- Utilize content-specific capitalization as provided in standard and credible industry-specific websites or publications.
- Use title case, not sentence case, for headings: “The Securitization Transformation” not “The securitization transformation”

Spelling:

- Use the American spelling of words:

  “labor” instead of “labour”

  “summarize” instead of “summarise”

- Add unrecognized words to your dictionary in Microsoft Word or Google Docs to avoid typos.

Other Rules:

- Terms to be abbreviated or referred to with acronyms should be written out the first time they are used, followed by the abbreviation or acronym in parentheses—e.g., mortgage-backed securities (MBS).
- Use **one space, not two spaces**, at the end of a sentence before the next sentence:

  In this paper, I discuss credit risk and how to analyze it conceptually. I will also discuss some of the other risks inherent to a mortgage.

Writing Resources

Below, we’ve gathered some helpful writing resources. Be sure to check out the anti-plagiarism guide as well for information on how to avoid plagiarism through proper citation and attribution.

WQU's Anti-Plagiarism Guide:
https://docs.google.com/document/d/1s954jXLg4I7Nc2EQyXkMmlgg1cfxO2_5w5W_o9eU1qs/edit?usp=sharing

How to Cite Source Code in MLA: https://style.mla.org/citing-source-code/

Merriam-Webster: http://www.merriam-webster.com/ – for reference on spellings

Merriam-Webster's Learner's Dictionary:
https://americanenglish.state.gov/resources/merriam-webster-learners-dictionary – if English isn't your first language and you want to learn some new vocabulary, look up any unfamiliar words you encounter during your coursework here. This dictionary provides learners of English with a more accessible and easy-to-understand definition of words, along with examples of how to use them in a sentence and how not to use them.

MLA Handbook, 9th edition (the MLA style guide) – for citation and style questions

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Anti-Plagiarism Guide

What is Plagiarism?

Plagiarism is the act of presenting another person's ideas, research, or writing as your own. Sometimes, plagiarism can be avoided by simply giving yourself enough time to do your own assignments, being honest, and submitting your own work. Other times, plagiarism can be unintentional, and in these situations, it's important to learn effective writing strategies in order to avoid accidentally plagiarizing another person's work. Here, we'll focus on how you can improve your writing so that you can properly cite and reference your sources to make sure you don't unintentionally plagiarize in any of your coursework. Please note that even if you unintentionally plagiarize, you will face penalties for plagiarism. See the WQU Academic Integrity Policy in the University Catalog for more information.

Plagiarism often stems from the following issues: the ratio of source material to original work, inadequate paraphrase, and missing or incorrect citations. First, we'll talk about when and how you should use outside research in your assignments. Then, we'll look at strategies for how to paraphrase other authors' ideas and arguments. Finally, we'll discuss what citation is and why it's important, particularly at the graduate level.

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Ratio of Source Material to Original Work

If you use too much material from outside sources in your assignment, then it is considered plagiarism–even if you include quotation marks around direct quotations, paraphase adequately, and include all the necessary citations and references. Why? When you are writing an assignment, the expectation is that it is your own original work. If the majority of what you submit is actually from an outside source, then you're misrepresenting your work. This is especially true if you neglect to include the proper citations and quotation marks when needed: if you just copy and paste the words of different authors together without the appropriate quotation marks and citations, it's known as patchwriting, which is a type of plagiarism. As such, it's important that you balance the use of outside source material with your own original thoughts, ideas, and analysis. Otherwise, your assignment isn't a genuine reflection of your understanding of the material.

How to Balance Source Material with Your Own Work:

Whenever you include outside source material in your assignment, there should be a reason for doing so. Typically, you should only use the work of other researchers and scholars to back up and provide support for the claims you are making and to give credibility to your argument. Remember, your paper is meant to be your original contribution or perspective on a given topic or issue. This is your opportunity to think critically and to engage with both the course materials and other outside research. When you let your sources do the talking for you, you're missing out on an opportunity to showcase your own original thoughts and ideas.

When you're writing an assignment, paragraphs typically consist of a topic sentence that makes a claim–in other words, you take a position or a stance on an issue. This claim is then followed by evidence—this is where you should integrate any relevant source material you've found. For instance, if you're making a claim that the COVID-19 lockdowns changed how people spent their disposable income, then you would want to cite some kind of study, article, survey, etc. that shows clear changes in spending patterns compared to before the lockdowns. Then, you should follow up that evidence with analysis, your interpretation of the source material, and how it supports your claim. This ensures that you have a balance of outside source material and original thought. In your analysis, you should explain what the evidence means, how it supports your argument, and why it's significant. Finally, your paragraph should conclude with a transition to the next paragraph.

Paraphrasing

There are two ways to incorporate an author's ideas into your work: you can either quote the material directly or you can paraphrase the material, meaning you put the author's ideas into your own words. If you choose to quote the material directly, you must include quotation marks around the quoted material. This signals to the reader that the words are not yours; consequently, if you forget to include quotation marks, it can be considered plagiarism.

If you choose to paraphrase an author's idea, you'll need to strike a balance between accurately and precisely capturing their intended meaning while using your own words. When paraphrasing, you can't add anything that wasn't originally expressed by the author. But you also have to be careful because if your paraphrase too closely resembles the author's wording, it can be considered plagiarism. Also, remember that even if you are putting another person's idea into your own words, you are still referencing someone else's work, and as such, you need to use an in-text citation. For these reasons, paraphrasing can be a difficult skill to master, but with practice, you can learn to paraphrase like a true scholar.

How to Paraphrase:

Step 1: Choose the part of the text that you want to paraphrase. It's typically easier to paraphrase larger sections of text than a single sentence or even a single paragraph. As you re-read the source you want to paraphrase, think about the following: what are the most important ideas/details/facts I want to include, why do I want to use this in my assignment, and how will this make my argument stronger? If you keep these questions in mind, this will help you prioritize what information to include and how to frame it in a way that is relevant to the focus of your assignment. If it's helpful, you can jot down a list of key ideas from the text that you want to include in your paraphrase.

Step 2: Start writing (and revising) your paraphrase. Put the source away and forget about it for a few minutes. Then, try to rewrite the information from memory. Once you've finished writing, compare what you've written to what the author wrote and revise as needed. Notice key features of the author's writing style so that you can differentiate your writing style from theirs in your paraphrase. For example, if the author tends to include a lot of extra details, examples, or information that is not necessarily relevant to your assignment, you can omit those details from your paraphrase, so long as the overall meaning is still the same. Pay attention to other aspects of their writing style: do they use longer sentences or shorter sentences, active voice or passive voice, first person or third person, etc.? By making different stylistic choices than the writer, you can be confident that you're paraphrasing the source material in your own words.

Step 3: Evaluate your paraphrase for originality. Once you finish paraphrasing the source material, return back to the original source and compare your paraphrase with the author's ideas to make sure that you are true to the author's sentiment without using more than two or three words of their exact language or phrasing. Obviously, the goal isn't to find a synonym for every word in the author's work, and the use of certain important words is unavoidable as you paraphrase their ideas. But generally, aim for using only a string of 2–3 words at most from the author to help distance your paraphrase from their ideas. Then, try performing a Google search of your paraphrase and see if the original source comes up. If the original source comes up near the top of your search results with lots of bolded (similar) words, your paraphrase might be too close to the original material because Google can recognize the similarities in your language. Try revising your paraphrase to distance your language from that of the original author. Then, run the Google search again. If the original source doesn't come up or is far down in the search results, that means your paraphrase is different enough that Google can't recognize the similarities between your paraphrase and the original text.

Here, we've included an excerpt from a source and a sample paraphrase to show how different a paraphrase should look compared to the original source.

Original Source Material:

"Youth unemployment also has particularly adverse social impacts. Higher unemployment is associated with increases in burglaries, thefts and drug offences. Unemployment is often part of the cycle where involvement in crime reduces subsequent employment prospects and consequently increases the probability of participating in crime. There is new evidence that even young people who choose to go to college or university are hurt if they enter the labour market during a recession. Kahn (2010) has shown that graduating from college during a recession has large, negative and persistent effects on wages. Lifetime earnings are substantially lower than they would have been if the graduate had entered the labour market in good times. Furthermore, cohorts who graduate in worse national economies tend to end up in lower-level occupations. Giuliano and Spilimbergo (2009) suggest that the period of early adulthood (between 18 and 25) seems to be the age range during which people are more sensitive to macroeconomic conditions. They find that being exposed to a recession before age 17 or after age 25 has no impact on beliefs about life chances. However, youngsters growing up during recessions tend to believe that success in life depends more on luck than on effort; they support more government redistribution, but have less confidence in public institutions. Recessions seem to adversely affect youngsters' beliefs.

There is also recent evidence on the consequences of rising unemployment on young people from the UK. The Prince's Trust, which was established by the Prince of Wales, conducted three surveys of young people in 2009 and 2010. In comparison with other young people, the young unemployed were significantly more likely to feel ashamed, rejected, lost, anxious, insecure, down and depressed, isolated and unloved. They were also significantly less happy with their health, friendships and family life than those in work or studying, much less confident of the future and more likely to say that they had turned to drugs, that they had nothing to look forward to and that their life had no direction. Many reported having suicidal thoughts (Blanchflower, 2010).

Further, unemployment while young, especially of long duration, appears to be associated with permanent scars rather than the temporary blemishes that result for older workers (Ellwood, 1984). The majority of older workers get over spells of unemployment reasonably quickly while youngsters do not as they struggle to find a toe-hold in the labour market. The scarring effect of youth unemployment has two components: first, for the young, a spell of unemployment does not end with that spell; it raises the probability of being unemployed in later years. Second early spells of unemployment also carry a wage penalty. These effects are much larger than for older people experiencing unemployment. Mroz and Savage (2006) find that a six month spell of unemployment at age 22 results in an 8 per cent lower wage at 23 and even at ages 30 and 31, wages are 2-3 per cent lower than they otherwise would have been."

– Excerpt from "Young People and the Great Recession" by David N.F. Bell and David G. Blanchflower

Sample Paraphrase:

Bell and Blanchflower detail the consequences of experiencing a recession and being unemployed at a young age. Those who experience a recession between the ages of 18 and 25 are more likely to attribute success to luck rather than effort, according to Giuliano and Spilimbergo as cited by Bell and Blanchflower. As Khan, cited by Bell and Blanchflower, argues, graduating college during a recession can significantly reduce an individual's lifetime earnings. Further, the authors note that unemployment can lead to a variety of negative outcomes among youths. Unemployment at a young age can be particularly scarring: those who are young and unemployed tend to report experiencing feelings of isolation, shame, and depression. They are often set up for repeated bouts of unemployment throughout their careers. Bell and Blanchflower demonstrate that unemployment for youth can have far more significant consequences than unemployment does for older workers.

What is Citation and Why is it Important?

In academic writing, especially at the graduate level, citation is a standard practice that shows what you have read and how it informs your own research. Whenever you cite a source, it shows that you have conducted research on a topic and that you have considered a variety of relevant ideas and viewpoints in your discipline. In-text citations and references help your reader understand who and what you've read and what sort of larger discussions and debates you considered as you developed your own ideas and arguments. Citation also helps your reader differentiate between your ideas and the ideas of the researchers you've read and incorporated into your arguments. When you cite the authors you've read and used in your work, you're also giving them credit for their research, which is how you avoid plagiarism.

Note that you must cite every source you include in your paper—even if it's from a blog post or any other site on the internet. This includes free, open-access materials and even content in the public domain.

In order to appropriately give an author credit for their work, there are two key components to citation: in-text citations, which you use in the body of your essay, and a references or works cited page, which is a list of references to all the sources you cited in your essay. Whenever you use the ideas or research from an outside source, **you must include both an in-text citation and a reference for that source in order to avoid plagiarism**. In-text citations are required whether you quote the source directly or paraphrase the source material.

To create citations and references, you need to pick one citation style and be consistent. Citation styles are systems for writing and citing that are designed to be specific to certain disciplines and fields of study. At WQU, our lesson notes and course materials follow the Modern Language Association's (MLA) style guidelines, so we'll provide examples and guidelines for how to create in-text citations and references in MLA style. But please note that you can use any citation style you'd like. Other common citation styles, for example, include the American Psychological Association (APA) and Chicago style.

How to Create an In-Text Citation:

To create an in-text citation in MLA style, you need two pieces of information: 1.) the author's last name(s) (or the name of the organization), and 2.) the page number where the cited material can be located within the source. If your source doesn't have page numbers, then you can just omit that information from the citation. Put a space between the author and the page number, but do not include any punctuation between them.

Here are a few examples of how to create in-text citations for your sources:

One Author: (Hughes 50)
Two Authors: (Hughes and Throughton 102)
Three or More Authors*: (Hughes et al. 234)
Organization as Author: (U.S. Department of Labor 109)
No Page Number: (U.S. Department of Labor)
***Note:** For sources with three or more authors, you only need to list the first author's last name followed by the phrase "et al." Fun fact: Et al. means "and others" in Latin.

How to Create a Reference:

To create a reference in MLA style, you'll need a lot more information about your source. The reference provides all the information your reader will need about the source in case they'd like to locate and read the source on their own. As such, references typically include much more information than in-text citations do.

Here, we include examples of how to create references for a few common source types: books, journal articles, and YouTube videos. Please note that your reference might vary depending on how many authors you have, whether you're citing a chapter in an edited book, whether you're citing a specific edition of a book, and other factors. In order to create an accurate reference for your source, it's important that you first identify what kind of source you're using. Then, find an example citation to use as a model for your own source information.

Book:

Format:

Last Name, First Name. *Book Title*. Publisher, Year.

Examples:

Sorkin, Andrew Ross. *Too Big to Fail: The Inside Story of How Wall Street and Washington Fought to Save the Financial System–and Themselves*. Penguin Books, 2010.

For ebooks, simply add the URL after the period that follows the year:

Sutton, Richard S., and Andrew G. Barto. *Reinforcement Learning: An Introduction*. MIT Press, 2018. http://incompleteideas.net/sutton/book/the-book.html.

Journal Article:

Format:

Last name, First name. “Article Title.” *Journal Title*, volume number, issue number, year, page range, URL.

Examples:

Akansu, Ali. "The Flash Crash: A Review." *Journal of Capital Market Studies*, vol. 1, no. 1, 2017, pp. 89–100, https://www.emerald.com/insight/content/doi/10.1108/JCMS-10-2017-001/full/html.

Sanger, William, and Thierry Warin. "High Frequency and Unstructured Data in Finance: An Exploratory Study of Twitter.” *Journal of Global Research in Computer Science*, vol. 7, no. 4, 2016, pp. 6–16, https://www.rroij.com/open-access/high-frequency-and-unstructured-data-in-finance-an-exploratory-study-oftwitter-.php?aid=70514.

Booth, Anthony, and Boudewijn de Bruin. "Stakes Sensitivity and Credit Rating: A New Challenge for Regulators." *Journal of Business Ethics*, vol. 169, 2021, pp. 169–179, https://link.springer.com/article/10.1007.

Hattingh, Marié, et al. "The Use of Critical Thinking to Identify Fake News: A Systematic Literature Review." *Responsible Design, Implementation and Use of Information and Communication Technology*, 2020, pp. 235–246, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7134234/.

***Note:** For open-access journals, oftentimes, there may be no volume number, issue number, or page numbers. In this case, simply omit this info from your reference.

YouTube Video:

Format:

Username. “Video Title.” *YouTube*, Upload date, URL.

Examples:

Ben Lambert. "Characteristic Functions Introduction." *YouTube,* 18 June 2013, https://www.youtube.com/watch?v=mYhca1p26n4.

Harvard University. “Lecture 31: Markov Chains | Statistics 110.” *YouTube*, 29 April 2013, https://www.youtube.com/watch?v=8AJPs3gvNlY.

Integrating Source Material into Your Writing

These tips and guidelines can help you learn to effectively introduce and incorporate source material into your own writing.

- When quoting source material directly, introduce the quotation with a signal phrase ("According to…") and end the quotation with the page number, if there is one. Alternatively, you can also position all the citation information at the end of the quotation. Read the examples below:

  According to Hughes, "the principles of supply and demand dictate how the injections (supply) of money cause the price cost of money to decrease" (65).

  When considering the rate of inflation, remember that "the principles of supply and demand dictate how the injections (supply) of money causes the price cost of money to decrease," (Hughes 65).

- When paraphrasing multiple sentences of source material, use a citation sandwich to show where source material begins and ends. Begin the paraphrased material with a signal phrase, a phrase designed to signal the start of outside source material. This is typically, "According to…" or "Smith argues that…" Then, at the end of the paraphrased material, restate the author information along with the page number of paraphrased information. This will show the reader that the material between the two citations is from that source. Read the examples below:

  Clayman, Fridson, and Throughton outline several conflicts between directors and shareholders. They explain that much conflict originates from a director's tendency to align with the values and needs of managers rather than shareholders. The board of directors serves an important role as an intermediary between managers and shareholders, so when perceived to align with one party over the other, a board of directors will be less able to enforce a system of checks and balances (Clayman et al. 10).

Online Writing Resources for Research

Research is an integral part for the completion of your assignments, particularly for the group work projects that you will complete for each course and for your Capstone project in the final Capstone Course.

The Information Literacy Tutorial by the University of Bologna is a helpful tutorial on locating, evaluating, and using outside research.

The Purdue Online Writing Lab (OWL) provides a rich and authoritative set of free online resources that you can use to learn how to conduct research and find what you need depending on the type of resources you use.

We have assembled a selection of useful links below. When you click on them, use the left navigation on the OWL website to click through the content for each topic:

- Conducting Research: This section serves as an introduction to conducting research and navigating through various types of sources.
- Evaluating Sources of Information: Check this out if you need guidance on whether a resource is credible and reliable enough to be included as a reference in your paper.
- Searching Online: This section discusses the pros and cons of using the internet as a source of information, explains how to select information, and teaches you strategies to make your internet research more meaningful and effective.
- Internet References: Click here for links to free online resources such as the Internet Public Library (IPL), the Library of Congress, and free ebooks.
- Using Research: This area will teach you how to incorporate and integrate the results of the research you have conducted into your assignment. It includes very important information on quoting and paraphrasing source material as well as information on how to avoid plagiarism.
- MLA Style Guide**:** This entire section is dedicated to the Modern Language Association (MLA) citation and format style. We strongly recommend that you familiarize yourself with this style and refer back to this site whenever you are unsure of how to properly cite your sources.

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Academic Policy - Use of AI

The purpose of this academic policy is to provide guidelines on the use of AI in completing WQU course assignments. The University recognizes and embraces the potential of generative AI to aid student learning. However, it is critical that students be aware of AI's inherent limitations and use it in ways that honestly support their learning journey.

The field of AI is moving quickly, and the University's policies will evolve and adapt as the technology changes. For this reason, students should regularly check for updated policies that capture these changes.

AI Limitations

Students must be aware of the following:

- **AI does not use authoritative references as input** (i.e. textbooks, peer-reviewed articles). Rather, the input data is taken from Internet sources of various quality, ranging from news articles and refereed journals to unverified and incorrect blog posts. The result is that it is not possible for the end user to cite the specific article from which the AI sourced the information. Students must be very familiar with the topic to be able to evaluate if the AI response is correct, and to effectively select the relevant text by applying their knowledge and critical thinking skills.
- **To emphasize**: AI itself is not capable of assessing whether the responses produced are factually or materially correct. Over time, the accuracy of queries is likely to improve, but solely relying on the "truth" of the AI output without consulting other sources is misleading and not academically acceptable.

Requirements for the Use of AI

Unless different rules are specified in the Group Work Project assignment, students must abide by the following requirements for the use of AI when completing reports:

- **Students are not permitted to copy and paste** text exactly as is. This is considered plagiarism, which is a violation of the Academic Integrity Policy, and will be treated as such. Rather, students must evaluate the information retrieved for accuracy, and only use that information that is pertinent to the question asked in an assignment **as the basis for their own response**.

- Students must include in-text citations to clearly identify where AI has been used as the basis of one's own reasoning. **Using AI without proper citation is considered plagiarism.**
    - In-text citations are mandatory for any reference used to support students' work, the full reference must appear at the end of the report.
- Students must add a footnote explaining the advantage of using AI - (creating an outline? Needing less time to collect information and to evaluate it for accuracy as compared to using bibliographical research?).
- The purpose of AI is to assist in identifying and summarizing information. Critical analysis, reflection, interpretation, and application are the career skills being built in these assignments, and these simply cannot be developed by relying on AI.
- Students must follow the report length requirements as specified in the GWP submission requirements.

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