The Quantitative Analysis Certificate: Capstone Guidance

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Capstones must be completed and submitted at least one week before the last day of classes in the semester one plans to graduate. Earlier submission is recommended to allow for revisions.

Overview

The capstone for the Quantitative Analysis Certificate requires students to demonstrate the ability to integrate statistical methods, social science research methodology, programming skills, and communication skills. There are many experiences that can be used for the certificate capstone, including but not limited to: extension of independent or group projects from upper-level coursework, faculty-led research projects, independent study with a faculty mentor, CSBS or departmental internships, UROPs, and honors theses. The goal is to produce a tangible product (e.g., paper or thesis, poster/slides & a recording of a presentation) that can be reviewed by 2 reviewers for approval.

To have a capstone approved, readers will have to agree or strongly agree that:

> *The capstone demonstrates the student has the ability to interpret and communicate results in a meaningful and accessible manner.*

And agree or strongly agree with at least two of the following:

> *The capstone demonstrates a substantial application of descriptive statistics (e.g., central tendency, such as means, variances, correlations, histograms, density plots), an application of inferential statistics (e.g., t-test, regression) or other quantitative statistical analysis.*
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> *The capstone demonstrates the application of knowledge about social science research methodology either through the use of existing data or the collection of new data.*
>
> *The capstone demonstrates knowledge of statistical software programs to analyze data.*

Process

The process for completing the capstone is as follows:

1) Identify coursework, an ongoing project, faculty-led research, independent study research, or other for-credit opportunity with the University of Utah that can demonstrate your ability to integrate statistical methods, research methodology, programming skills, and communication skills. UROPs, while not for credit, can also be used as the basis for the capstone project.
    a. Make plans to produce a tangible product. The next section (*Research Paper*) provides a general guide for a paper, although a paper is only one option. The

presentation of a project in a class, at a research fair, or conference is another avenue, provided a recording can be made. Other avenues that produce a tangible product are also welcome; to make an alternative proposal, please contact the Certificate Director.

b. Review the section *Specific Considerations,* which highlights some issues raised with prior capstones that may apply to your project.

2) Notify the Certificate Director and CSBS Advisor of your intention to complete the capstone. Provide:
    a. Information about the credits or UROP to which capstone will be associated (e.g., class number, thesis hours, internship credits, etc.) and the name and email address of the associated faculty member.
    b. A 1-2 paragraph description of how you intend to complete the capstone. The certificate director will provide feedback as to whether your plans are likely to result in an approved capstone. Be sure to address:
        i. What experience will be the basis for the capstone? (Thesis, individual/group classwork, internship, etc.)
        ii. What plans do you have for demonstrating 1) skills in quantitative analyses, 2) knowledge of social science research methodology, and/or 3) experience using statistical software programs?
        iii. How do you plan to communicate the results? (paper, recording of presentation, other?)
3) Complete the capstone work, ideally in collaboration with the faculty member associated with the capstone credits. If the faculty member has any questions or concerns, these can be addressed to the Certificate Director.
4) Complete the "Capstone Completion Application" and submit with supporting materials (paper, thesis, poster, recordings, etc.) to the Certificate Director and CSBS Advisor. Review of capstones usually takes at least 2-3 weeks, and can be longer near the end of the semester. Early submission will allow for revision of the capstone, if the reviewers do not approve a capstone and suggest revisions/additions.

Research Paper

Many projects can serve as the capstone for the Quantitative Analysis Certificate, so the requirements are not one-size-fits-all. The following guidance has been provided for multiple projects in recent years and has served as a template that is readily adaptable to courses that have a research and writing component, internships, UROPs, or when working with a faculty member's research lab or via independent study.

Many class projects, independent studies, analyses with faculty, and other pieces of research can be turned into a concise paper for completion of the capstone. To convey the necessary information this paper is generally longer than required for many classes, which might require adding to existing material, but much shorter than a typical honor's thesis. The paper should follow a format common to your field of study. For example, one common format consists of five sections: Introduction, Methods, Results, Discussion, and References.

1) Introduction: Introduce the issue that will be examined. Describe the purpose of your work. What is the rational for the project? Summarize and integrate prior research that

has been done, including references to prior work. Discuss the relevant questions of interest that will be addressed in your paper, including any hypotheses.
2) Methods: Describe the details of how the data were collected. Discuss details about the participants, how the study was conducted, the materials that were used in the study, the procedure describing how the data were collected, or other information that would be essential for replicating the data collection. What are the characteristics of the sample? What scales or other tools were used? How were the data collected?
3) Results: Describe the analyses that were done on the data, and report the outcome of those analyses.
4) Discussion/Conclusion: Review the questions of interest from the introduction and/or any hypotheses. Discuss how the outcomes in the results section address the questions of interest. How do the results add to our understanding of the questions posed in the introduction? Subsequently, consider how addressing these questions informs this area of research. Given the existing research, how do the results add to our understanding of your topic of interest? Finally, consider limitations of your results. Were there factors that could affect your interpretation of the results? Are there things that could have been done different or could be improved if this project continues?
5) References

One to two pages (double spaced) are likely required, at a minimum, to address each section well. There are no set limits, however, as the goal is to write a sufficient amount to clearly convey the relevant information about your work. Be sure to incorporate relevant references.

Specific Considerations

Depending on the basis for the capstone project, prior capstones have highlighted some specific considerations.

Class Work (Individual): Many upper-level classes require students to complete individual projects that involve collection, analysis, and/or interpretation of data. These projects readily can be turned into a capstone project, often by just adding a bit more depth to the existing project. Depending on the contents of the work, this might mean adding to the introduction more information about the rational of the project, adding an additional hypothesis to be addressed in the analysis, or expanding the discussion to include more consideration of the results.

Class Work (Group): Like individual class work above, group projects are often amendable to becoming capstone projects, but with additional effort. While one might be only required to complete part of a group project, for a capstone it becomes imperative that all parts of the project become the individual student's own work. In order to demonstrate that the student is not merely rewording the work of other students, it is often necessary to add some additional hypotheses, analyses, and discussion, although the same original data may be used. The students and instructor of the course will be asked to indicate how the capstone project differs from the prior group project.

Internship: Several capstone projects have been completed with internship data. Internships that require the collection and/or summarizing of some form of data (e.g., market research,

user experience, etc.) could be turned into a capstone project. Depending on the organization with which one is working, however, it may or may not be possible to share a report derived from data within a particular organization. This requires communication with the supervisor. If the supervisor is amenable to the work being shared with faculty members at the University of Utah for review, often internship work is like individual class work (above) where the addition of just a few pieces or some additional depth is sufficient for the work to become a capstone project.

Honor's Thesis: Honor's theses that involve substantive analysis of empirical data (e.g., work with a research lab or original analysis of existing data) have been readily counted at capstone project, often as-is. A thesis without any analysis of data or interpretation of results would not be amendable to being a capstone project for this certificate.