Math in the City - Fall 2011

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Before the semester

- Meet the collaborators
- Data collection and analysis
  - Data examples
- Topics and broad questions
  - Group 1 - Budgeting
  - Group 2 - Investing
  - Group 3 - Investing ++
Beginning of the semester

- Days 1 - 5:
  - Lay the ground rules: LyX (Journals and Homework), Dropbox, Doodle.
  - Assign homework 1 (writing assignment on relevant topics)
    - Homework 1 Example
  - Form groups and assign project topics.
  - Collaborators’ presentation and introduction to the data.

- Weeks 3 - 5.
  - Lectures: Mathematical Modeling (John Harte: Consider a Spherical Cow)
  - Lectures: Linear Programming (Course Materials 2010)
Middle of the semester

- Homework
  - Homework 2 - Estimation and Mathematical Modeling
  - Homework 3 - Linear Programming
- Sage presentation
- Memos
  1. An estimation problem
  2. Concrete questions (Student Example)
  3. Sage worksheet
- Visit the Collaborators’ workplace
- Writing Presentation
End of the semester

- Memos
  - Introduction
  - Math Section
- Presentations
  - Background and Questions
  - Mathematics
- Deadlines
  - Final report first draft
  - Presentation slides
Guidelines

- Readability
- Graphs and Tables
- Organization into Sections
- Grammar
- Credible and Relevant Sources and Resources
Grading the Writing Assignment/Report

1. Content
2. Examples
3. Clarity & Grammar
4. Overall Style & Presentation
5. Organization
6. Introduction & Conclusion
7. Accessibility
Overall Grading Scheme

- 20% Homeworks
- 30% Project participation (documented through student journals, communication with team and instructors, participation in special sessions)
- 35% Project (memos, intermediate drafts, final report)
- 15% Performance during oral presentation (understanding of the work, communication skills, quality of the slides)
Tools Used

- Sage: Mathematical Software for Linear Programming, etc.
- Dropbox: Sharing files online
- Blackboard: Sharing confidential files (e.g., Journals)
- LyX: Latex without the learning curve
- Doodle: Easy scheduling
- Other mathematical software and programming languages
The Investment Policy of the City of Lincoln

The City of Lincoln has a unique responsibility among investors—it must, as a legal necessity, carefully manage the money it collects from its taxpayers. As a result, the Lincoln City Council has set forth a relatively strict set of investment guidelines that the City Treasurer and Financial Director are responsible for upholding.

The Investment Policy dictates that the City has three main financial goals: the prudent management of public funds, the availability of funds to cover operating costs, and the gain of reasonable returns on investment. More succinctly, these goals can be articulated as, in order of priority, Safety, Liquidity, and Returns.

Because the City of Lincoln is entrusted with managing public funds, it has strict rules on which investments it can partake in. The maximum investment length the City can purchase is 24 months for investments using operating funds and ten years for investments using non-operating funds. This requirement in itself limits the kinds of investments the City can make. Additionally, the City Treasurer can only make investment deals with brokers that meet a strict set of legal registration requirements. Finally, the types of investments the City can make are limited to those listed in the City’s investment policy. The City Council has the final say on which investments are allowed.

Currently, Lincoln’s Finance Department separates its investments into two distinct categories: short-term and medium-term. Short-term investments are defined as those with a maturity date six months or less from the date of purchase. Medium-term investments are those investments with a maturity length longer than six months and less than ten years.

In an effort to clearly define how ‘safe’ the City’s Finance Department must be in its investing, the City Council has set definite limits on how much of the City’s total investment pool may be invested in particular assets. Additionally, only those assets that the City Council lists may be invested in by the City Treasurer.

<table>
<thead>
<tr>
<th>Investment Type</th>
<th>% of Total Funds Allowed</th>
<th>% Allowed in Each Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Government Securities</td>
<td>100</td>
<td>-</td>
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<tr>
<td>US Government Agencies</td>
<td>75</td>
<td>50</td>
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<tr>
<td>Federal Instrumentalities</td>
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<td>40</td>
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<tr>
<td>Interest-Bearing Time Deposits/Savings Accounts (CDs)</td>
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<td>15</td>
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<tr>
<td>Repurchase Agreements</td>
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<td>25</td>
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<tr>
<td>Commercial Papers</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>High Grade Corporate Notes</td>
<td>15</td>
<td>5</td>
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</tbody>
</table>
Things We Liked

- “Hands-off” approach
- Journals
- Memos
- Presentations
- Tools: Sage, Dropbox, LyX, Doodle
Summary

Things We Were Not Happy With

- “Hands-off” approach
- Fall Break
- Thanksgiving Break
- Presentations
- Tools: Blackboard
Challenges

- Open ended problems
- Making and justifying assumptions
- Data
- Student projects using high level mathematics
- Last minute programming issues
- End of the semester stress
Why we chose to teach this course

- Ananth
  - Mathematics and Talent Search Programme (India)
  - Adaptability
  - Real Life Mathematical Models
- Lauren
  - For the love of math
  - Experience to repeat
  - Learning
Questions?