Dynamic Documents

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1. Before We Begin

- Take-home Exam
- We will start presentation soon!

2. Why Dynamic Documents?

Dynamic Documents are a part of the bigger picture of Reproducible Science. Sure, there is a fixed cost; **BUT**, they make my life easier in these ways:

- Short term: Easier to document fresh out of the oven results
- Medium term: Fast, reliable and tractable new results
- Long term: You can see how everything was created

3. What are Dynamic Documents?

Based on principles of literate programming, we aim at combining code and paper in one single document

- Best framework to achieve the holy grail of one-click reproducible workflow
- Best implementations: Quarto.

4. The State of Things Now

Currently, the code and the narrative components live in separate universes

5. Part of Larger Workflow

- Dynamic documents are best used as part of a larger organized workflow
  - Structuring folders: Data, analysis, output
  - Documenting code
  - Combining both into a final document: Pre analysis or final paper

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- We have already been using jupyter notebooks, but what if you want to turn that notebook into a publishable format for sharing or even submission?

6. Using Markdown

- In terms of writing the "paper"/documentation part of dynamic documents, there are many solutions
  - Latex, HTML, RST (ReStructured Text)
- But most have honed in on using Markdown
  - Markdown is an easy way to write formatted text in a plain text format
  - But without as verbose and difficult of a syntax like latex/HTML
- Although basic markdown has the basics for formatting, creating tables, adding figures
- We will use Pandoc, which is used in both the Stata and R sessions

7. What is Pandoc?

- Pandoc is sort of what it says: pan (all), doc (document)
- It's a way to convert between and across different file formats
  - Word -> HTML
  - Latex -> Markdown
  - HTML -> XML
  - Anything to anything
- See Pandoc's website for all input and output filetypes

8. The Magic of Pandoc

- Pandoc and Markdown allows you to create one file that can then be used in many different places
- Example:
  - You're writing your CV and want to put it up in various places.
  - Your website needs HTML
  - One job posting allows PDF
  - One job posting only allows Word
- Ordinarily, you would need to have three versions, Word, HTML, PDF
  - This might get unruly as you change one but forget to change the other
  - What if there's another file format you might need?
- With Pandoc and markdown, you would:
  - write your CV in markdown
  - convert to PDF, Word and PDF with pandoc

9. Quarto

- Quarto is the successor or RMarkdown, a very powerful dynamic document software developed for RStudio
- Now it also applies to jupyter notebooks and allows for creating nice documents from the notebooks you create!
- Dynamic documents usually have a `yaml` header at the top, that defines global options
  - We will talk about three special types of yaml options in Quarto:
    * output type
    * hiding code or output
    * execution options

10. What is YAML?

- YAML is a very basic language created by Ansible (I think?) to define options for its software in a way that didn't require lots of coding.

```
---
title: "Toward a Unified Theory of High-Energy Metaphysics: Silly String Theory"
date: 2008-02-29
author:
  - name: Josiah Carberry
    id: jc
    orcid: 0000-0002-1825-0097
    email: josiah@psychoceramics.org
    affiliation:
      - name: Brown University
        city: Providence
        state: RI
        url: www.brown.edu
abstract: >
  The characteristic theme of the works of Stone is
  the bridge between culture and society. ...
keywords:
  - Metaphysics
  - String Theory
license: "CC BY"
copyright:
  holder: Josiah Carberry
  year: 2008
citation:
  container-title: Journal of Psychoceramics
  volume: 1
  issue: 1
  doi: 10.5555/12345678
```

```
funding: "The author received no specific funding for this work."
---
```

11. YAML

- But the basic thing you need in order to get the paper is:

```
---
title: My paper
author: Aleksandr Michuda
---
```

12. Preview of what we will talk about

- Quarto is VERY expansive, you can write websites, books or dissertations with it
  - All with jupyter notebooks
- Today, we will focus on the basics that you will need if you wanted to write paper using a jupyter notebooks:
  1. Tables
  2. Figures
  3. Cross-references
  4. Citations

13. Tables

- You can create tables easily in three ways:
  - Create your own markdown table (Not dynamic)
  - Put in a latex table directly (Not dynamic)
  - Generate a table from code (Dynamic)

Table 1: Demonstration of pipe table syntax

Default	Left	Right	Center
12	12	12	12
123	123	123	123
1	1	1	1

Table 3: Demonstration of generated table

	A	B	C	D
0	1.764052	0.400157	0.978738	2.240893
1	1.867558	-0.977278	0.950088	-0.151357

	A	B	C	D
2	-0.103219	0.410599	0.144044	1.454274
3	0.761038	0.121675	0.443863	0.333674
4	1.494079	-0.205158	0.313068	-0.854096
5	-2.552990	0.653619	0.864436	-0.742165
6	2.269755	-1.454366	0.045759	-0.187184
7	1.532779	1.469359	0.154947	0.378163
8	-0.887786	-1.980796	-0.347912	0.156349
9	1.230291	1.202380	-0.387327	-0.302303

14. Figures

- You can add figures that are generated or from a folder
- It's like figures markdown but with more options

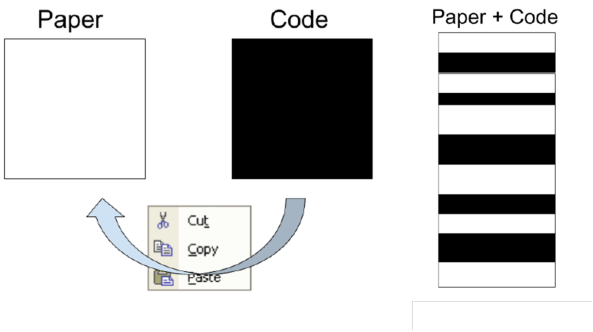

Figure 1: My figure 1, width 300

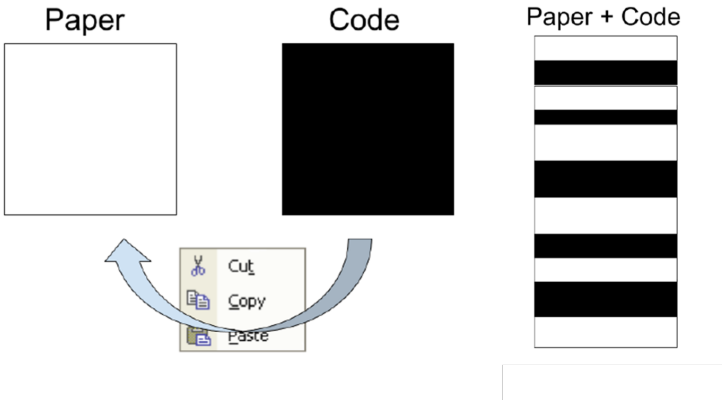

Figure 2: My figure width 80

Table 2: copy-pasted table

	A	B	C	D
0	1.764052	0.400157	0.978738	2.240893
1	1.867558	-0.977278	0.950088	-0.151357
2	-0.103219	0.410599	0.144044	1.454274
3	0.761038	0.121675	0.443863	0.333674
4	1.494079	-0.205158	0.313068	-0.854096
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9	1.230291	1.202380	-0.387327	-0.302303

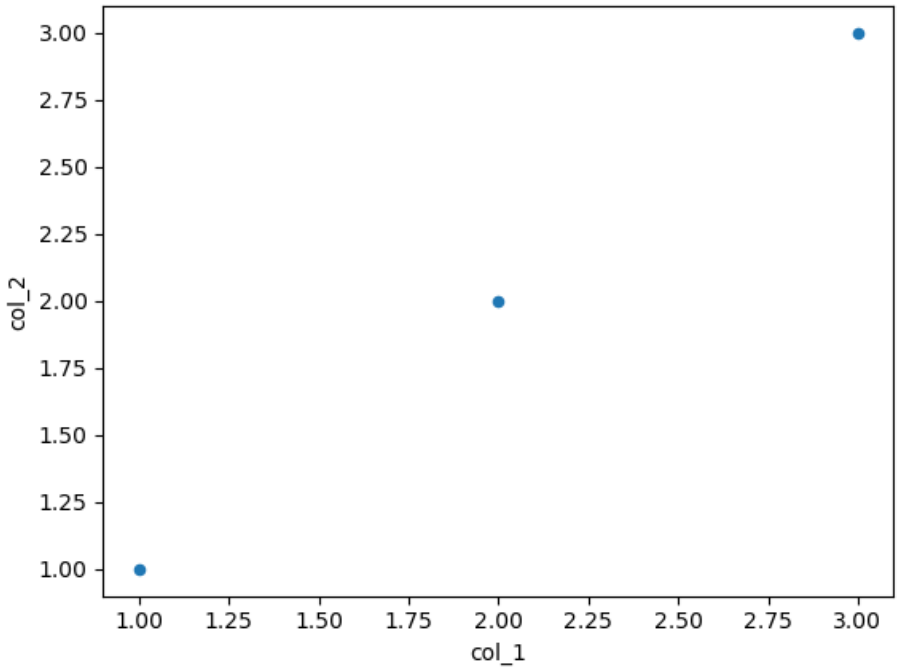
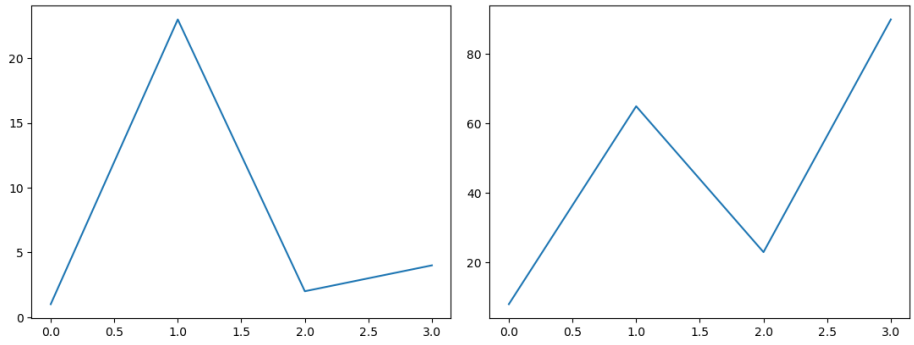


Figure 3: A scatter plot



(a) First (b) Second

Figure 4: Charts

15. Cross References

- To reference a figure, table or section, just use its label!
- See Table 3
- See Figure 4
- See Section 15

16. Citations and Footnotes

- For citations, You can use a standard bibtex file, just specify it in the YAML

```
---
bibliography: references.bib
---
```

- See [1] [1]
- This is true [1].

References

[1] A. Gupta, H. Zhu, M. K. Doan, A. Michuda, B. Majumder, Economic impacts of the covid- 19 lockdown in a remittance-dependent region, American Journal of Agricultural Economics 103 (2) (2021) 466–485.

[1] This is footnote.