

A Trend in Business Education

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Abstract

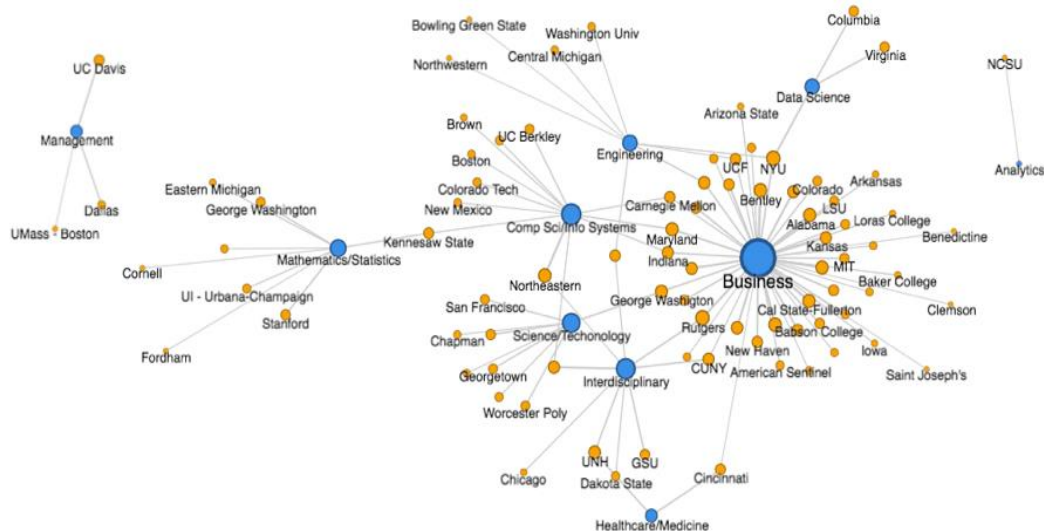
For business education, we identify a trend which could be summarized by two words: programming and data. For academic jobs in finance, marketing, accounting and economics, the keywords of R, Python, data analytics and big data started to pop up in the job advertisements in 2017. To our best knowledge, this is the first year when so many business schools looking for candidates with such a qualification. One reason is that since 2007 business schools have launched over 50 business analytics programs, Priestley (2017). There is no doubt in our minds that in the foreseeable future, all business schools would teach their students one programming language and train them on how to process and analyze data. Compared with research schools, teaching schools would benefit greatly from this trend for two reasons. First, many computational tools, such as R and Python, are free. Second, a huge amount of public data is available.

Keyword: Financial education, trend, programming, R, Python and big data

1. Introduction

In the last decade, various business schools have launched many data-oriented programs, such as Business analytics, Data Science at both graduate and undergraduate levels. Recently, Priestley (2017) classifies all programs roughly into two categories: Data Science vs. Business Analytics. For the Data Science programs, they are usually housed at Schools of Arts and Science. They put more weights on more quantitative approach such as strong mathematical training, and programming skills.

Figure 1: constellation of various data-oriented programs from Priestley (2017)



In this constellation, the larger nodes represent the colleges that house these programs within the individual universities. Source of figure: <http://www.mastersindatascience.org/blog/picking-a-data-science-program/>.

In this short paper, we will discuss one trend in financial education:. Since the view expressed here is purely based on our personal experience and some observations over the last decade, the opinions expressed in this paper might be biased. The trend of business education, especially for financial education, in the next 5 to 10 years could be summarized by two words: *programming* and *data*. In the rest of the paper, all my discussions and arguments are grouped into several sections: One programming language please, the evidence of a trend, which language should be taught to business school students, public data vs. professional databases, teaching schools vs. research schools.

2. Evidence of a trend

The year 2017 might be the first year to see the words of “big data”, “data analytics”, R, Python and SAS appear in the job advertisement looking for assistant, associate professor or full professor in finance, marketing or other area by business schools. For example, Wake Forest University has words of “a strong grasp of the roles and tools of big data and analytics”, see their job ad below.

Table 1: Job advertisements from different business schools

#	Name	Keywords or phrases	Date
1	Dept. Finance, University of San Francisco	Applicants should have mastery of Stata. Familiarity with Matlab, R, SAS and Python is desirable	2/20/2017
2	University of California, Riverside	fill a tenure track/tenured faculty position in Finance with an emphasis on Business Analytics.	10/6/2017
3	Hofstra University	Tenure-Track Assistant or Associate Prof. in Finance, a strong grasp of the roles, tools of big data, analytics	11/27/2017
4	Delaware State University	Assistant/Associate Professor, Business Analytics	3/22/2017
5	University of La Verne	Assistant or Associate Professor of Analytics	2017
6	Harrisburg University of Science & Technology	Professor of Data Analytics	7/25/2017
7	SUNY Polytechnic Institute	Areas as data analytics (“Big data”) financial analytics	5/24/2017
8	Montclair State University	Assistant/Associate professor, marketing Analytics	8/28/2017
9	Texas State University	Assistant/associate prof. of marketing, Marketing analytics	2017
10	Wake Forest University	Tenure-track assistant/associate prof in accounting, “a strong grasp of the roles, tools of big data, analytics”	2017
11	University of Washington	Business analytics	2017
12	DePaul University	Data analytics or financial accounting	2017
13	Dept of Finance, University of Central Florida	Assistant Professor, Finance, demonstrated skills such as fluency in R, Python and data visualization is highly desirable.	2018
14	New Jersey City University	Business analytics and data science	1/28/2018
15	U. of the District of Columbia	Assistant/Associate Professor of Business Analytics	2/6/2018
16	Dept. of Economics & Finance, Southern Utah University	Assistant/Associate Professor of Business Analytics	3/6/2018
17	Whitworth University	Assistant Prof. of Management/Business Analytics	3/9/2018
18	University of Maryland Eastern Shore	Assistant/Associate Prof. Business Analytics and Quantitative Method	4/10/2018
19	Dept. of Economics, UCF	Assistant or Associate Professor, Sports Analytics	4/26/2018
20	Bellevue Univ. - Bellevue, NE	Assistant Prof - Decision Sciences/Data Analytics	7/19/2018
21	Monmouth University	Assistant Prof.,Marketing Research and Data Analytic	8/6/2018
22	Department of Finance, Santa Clara University	with preference for those with advanced econometric/data analytics skills	8/7/2018
23	UC San Diego	Business Analytics	8/7/2018

In their job advertisement, University of California (River Side) mentions “faculty position in finance with a focus on business analytics”. The department of finance in the School of Manage at the University of San Francisco even mentions several computer languages in their job ad “Applicants should have mastery of Stata. Familiarity with Matlab, R, SAS and Python is desirable”. Actually, many schools have started to teach R, Python or SAS already. For example, at Canisius College and University of Buffalo, R was taught to their finance-major students. Prof. Sheng Xiao at Western Minster and Prof. Premal Vora at University of Penn State, taught Python to their students. At Stevens Institute of Technology, both R and SAS are introduced.

Actually, this trend is true for other disciplines at business schools. Recently (2017), Montclair State University is looking for marketing professor. They mention specifically “marketing analytics”. The keyword by Texas State University is “market analytics” as well. Unfortunately, current job seekers in the area of finance do not meet those requirements see the picture below. The picture is generated based on the frequency of keywords from the column of “research interests” from FMA job placement website¹.

Figure 2: Word frequency based on “research interests”, FMA finance candidates (2017)



3. One programming language please

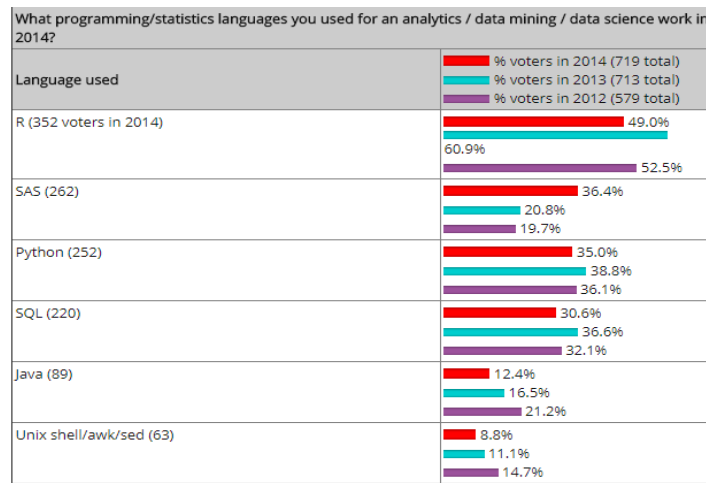
Nowadays, we are overwhelmed by a huge amount of information, e.g., see Shi, Zhang and Khan (2017), Fang and Zhang (2016). The catch phrase is “Big Data”. However, few know how to define it since many explanations are available. For college students, they should have one or two memory sticks, each with a capacity of 4GB. A simple answer is that if a student could generate and process 4GB data, then he/she could have the ability of dealing with “Big Data”. Obviously, this is not an accurate definition. Nevertheless, it is better than nothing and it is practical. How could instructors arm their students with such an ability of processing 4GB data? The answer is to teach them one computer language!

An ambitious finance-major student should master at least one programming language, and this is especially true for students from quantitative-finance, MSF (Master of Science in Finance), business analytics, computational finance, data analytics, or any other financial engineering programs. McDonald (2013) states that “If you're at all interested in media, technology or related fields, please learn a little computer programming”. In the next section, we try to answer the question: which language is appropriate for students major in finance, marketing or management at business schools.

4 Which language?

To answer the question of which programming language to be taught at business schools, Let us look at a few languages. Pointer (2016) compares several languages. On his list R and Python occupy the top two spots. The following image shows what programming/statistics languages researchers/practitioners used for analytics/data mining/data science work, KD (2014).

¹ We thank Michelle Lui for giving us access to the FMA job placements.



Based on the above list, R, SAS, and Python are the top three. Since SAS is quite expensive, free software such as R and Python are extremely attractive. Below is another survey conducted by CrowdFlower (2016). From that, for the two categories of among jobs that require programming and coding, and among jobs that require statistical tools, both Python and R occupy first place. Below is my summary of three languages of R, Python and SAS.

Table 2: Comparison between R, SAS and Python (5 being the best)

Parameter	Language		
	SAS	R	Python
Availability	2	5	5
Ease of learning	4.5	2.5	3.5
Data handling capabilities	4	4	4
Graphical capabilities	3	4.5	4
Advancements in tool	4	4.5	4
Job scenario	4.5	3.5	2.5
Customer services support and community	4	3.5	3

Many scores are quite reasonable such as cost and availability. However, a few are problematic. For example, SAS is superior to R and Python in terms of data handling capacities. The most critical disadvantage for both R and Python is their lack of support. This lack of support should be tolerable when compared with expensive software such as SAS and Matlab. Many good schools, such as New York University and Harvard, have adopted R as well.²

5. Sources of public data

In terms of data, for our classroom introduction, it is more than enough to use public data. There are several advantages to use public available economics, finance and accounting data. First, it is free. This means that any school including teaching schools could use them. In the next section: Teaching schools vs. research schools, we argue that teaching schools have, at last, certain advantages when compared with research schools. Below is a partial list for the publicly available data.

² See the links at http://www.nyu.edu/projects/politicsdatalab/learning_students.html and <http://online-learning.harvard.edu/course/data-analysis-life-sciences-1-statistics-and-r-0>

Table 3: a list of open data sources

Name	Web page	Data types	Related topics
Yahoo Finance	http://finance.yahoo.com	Current & historical pricing, analyst forecast, options, balance sheet, income	CAPM, portfolio theory, liquidity measure, momentum strategy, VaR, options
Google Finance	http://www.google.com/finance	Current, historical trading prices	Stock trading data
Federal Reserve	https://www.federalreserve.gov/datadownload/Choose.aspx?rel=H15	interest rates, rates for AAA, AA rated bonds	fixed income, bond, term structure
Marketwatch	http://www.marketwatch.com	Financial statements	Corporate finance, investment
SEC filing	http://www.sec.gov/edgar.shtml	Balance sheet, income statement, holdings	Ratio analysis, fundamental analysis
Prof. French data library	http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html	Fama-French factors, market index, risk-free rate, industry classification	Factor models, CAPM
Census Bureau	http://www.census.gov/	Census data	Real income, trading strategy
US. Dept. Treasury	http://www.treas.gov	US. Treasure yield	Fixed income
Bureau of Labor Statistics	https://www.bls.gov/home.htm	Inflation, Employment, unemployment, pay and benefits	Macro economics
Bureau of Economic Analysis	https://www.bea.gov/	GDP etc.	Macro economics
National Bureau of Economic Research	http://www.nber.org/	Business cycles, vital statistics, report of Presidents	Macroeconomics, financial stability

6. Teaching schools benefit greatly

In terms of teaching programming education to finance-major students, teaching schools might have a slight advantage over research schools. The reason is that we all could use free software such as R and Python, free data such as Yahoo!Finance, Prof. French's Data Library, Federal Reserve Bank's Data Library and the SEC filings. Because of this, there is no budget constraint for both professors and students. On the other hand, small class at teaching schools would be an ideal learning environment to learn a programming language. For example, when we were teaching at research schools, the class size is about 50. However, when teaching at teaching schools, such as Canisius College, the average of our class sizes about 23, less than half of regular class size at research schools.

In addition, for researchers who are doing empirical research in finance by manipulating a huge amount of data, their tools are SAS or Matlab. For example, most research schools have subscribed the WRDS (Wharton Research Data Services) platform. The major language of the platform is SAS. There is no incentive for assistant professors at research schools to learn R or Python. The last but not least, assistant and associate professors at teaching schools have more time to learn R or Python since they would have less publication pressures. Using ourselves as an example, when we were studying, working and teaching at several research schools, we had no incentive to learn any new language since the knowledge about SAS and Matlab is more than enough. Since returned to teaching in 2010, we taught at several universities and most of them are teaching schools. Because of such a new environment, we spent a huge amount of time on R and Python, see Yan(2017) and Yan(2018).

7. Conclusions

In this short paper, for business education in the next 5 to 10 years, we have discussed one trend which could be summarized by two words: *programming* and *data*. In 2017, over two dozen job advertisements included the keywords of R, Python, SAS, data analytics, big data for the positions of assistant, associate or full professors in finance, marketing, accounting and economics. To our best knowledge, this is the first year witnessed so many business schools looking for candidates with such qualifications. In addition, since 2007, business schools jointly have launched about 50 business analytics programs. There is no doubt in our minds that in the next decade, all business schools would teach their students one programming language and train them on how to process and analyze data. Compared with research schools, teaching schools would benefit greatly, relatively speaking, from this trend.

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