

Math Finance Concentration Advising Document

Short Version:

- You should take as much coding, probability and statistics as you can.
- You should look at the official UCI course catalogue for the requirements and make sure you will be able to satisfy them:

http://catalogue.uci.edu/schoolofphysicalsciences/departmentofmathematics/mathematics_bs/#requirementstext

- In order to apply to the concentration, you must have satisfied all of the lower division course requirements for the concentration in both Mathematics and in Economics.
- Because this concentration is impacted we are requiring a 3.0 GPA in mathematics courses for admission.
- **You MUST take economics 105** to graduate with the concentration. Economics 100 does NOT count for this requirement and you cannot take both. If you have *already* taken Econ 100, you can still take the Math Finance courses but you are not eligible for the concentration.
- **You MUST take economics 132A** to graduate with the concentration. Management 141 does NOT count for this requirement and you cannot take both. If you have *already* taken Management 141, you can still take the Math Finance courses but you are not eligible for the concentration.
- **You may not use MGMT 109 to substitute ECON 134A**, even though these classes officially overlap. You may use ECON 161A as a substitute for ECON 134A.

More detailed version:

Most of the Mathematical Finance Concentration is specified by the requirements. What you need to plan are your electives and the courses are relevant but are not required by the concentration.

Mathematics has many applications in finance. Very broadly they fall into four categories:

1. Buy side
2. Sell side
3. Actuarial Science
4. Corporate Finance.

Some tools are relevant to all of these categories such as portfolio construction and risk management.

We discuss particularities of each of the categories.

Buy Side

The buy side refers to firms that purchase securities and other investment products. These firms include asset managers, pension funds, hedge funds, life insurance companies, proprietary trading firms, and private equity funds.

The buy side firms manage money for their investors. This involves the allocation of risk capital through quantitative, fundamental, or discretionary portfolio management. Gaining knowledge in the areas of probability theory, statistics, computer programming, and financial markets is important in preparing for a career at a buy side firm. Most often portfolio and risk management are accomplished in teams, so refined communication skills are also essential.

While New York City is the geographical center of the stock and bond markets in the United States, naturally many of the biggest and best buy side firms are headquartered there. Another city where leading buy side firms are found is Chicago, where the major derivatives exchanges are located. The global financial markets are highly interconnected, so most often buy side firms in the United States will have offices in the financial centers across Europe and Asia as well.

Electives that are particularly relevant for a career on the buy side are Math 176, Math 130C, and Math 134ABC.

Sell Side

The sell side part of finance deals with constructing and selling financial instruments that are tailored toward the needs of specific clients. The instruments can for instance be stocks bonds and foreign exchange products or various types of loans. Within this area there are different categories of jobs. Some are more client related, promoting deals involving financial products and following up with clients. Other jobs in this area are focused on the development and implementation

of various financial products and systems for quantification of risk. The sell side also provide insight and analysis about the financial markets to their clients and includes investment bankers that act as intermediaries between issuers of securities and investors.

The main employers are large investment banks that are mainly based in big cities like New York, Charlotte, Chicago and San Francisco, but opportunities can be found many other places as well.

Electives that are particularly relevant for a career on the buy side are Math 176 and Math 130C.

Actuarial Science

Actuarial science deals with the design and administration of various insurance products and analysis of financial and other types of risk. Actuaries often work in teams and with a rather extensive contact with clients to understand their specific needs and to present solutions. Important skills for an actuary include probability, statistics and computational skills.

Actuaries are usually employed by the insurance industry, where they “analyze statistical data, such as mortality, accident, sickness, disability, and retirement rates and construct probability tables to forecast risk and liability for payment of future benefits. They may ascertain insurance rates required and cash reserves necessary to ensure payment of future benefits.”¹ Actuaries also find jobs in government and help with overseeing companies and ensuring compliance with regulatory laws.

It is a profession with opportunities in many different geographic locations, but particularly on the east coast (e.g. Hartford Connecticut) and Iowa, Nebraska and Kansas.

The actuarial profession is supported by two actuarial societies that organize a set of exams. Students who are interested in a career in actuarial sciences should familiarize themselves with these societies and set up a plan for taking these exams.

Passing one or more of the exams while still an undergraduate can help students look for internships and accelerate a post graduation career. The mathematics coursework is well-suited to this.

Electives that are particularly relevant for a career on the actuarial science are Math 176 and Math 130ABC and Math 134BC.

¹ Quoted from <https://www.bls.gov/oes/current/oes152011.htm#st>

Corporate Finance

Corporate finance is primarily concerned with raising capital for corporations through the issuance of debt and equity as well as active management of financial resources within a corporation. It involves modeling the processes relevant to corporate decision making, such as appropriate levels of debt and equity, when to invest in a potential project, and financial accounting. The primary goal of corporate finance is to maximize returns to owners while minimizing risk.

Corporate finance is relatively decentralized—each large company has specialists on staff. Issuance of debt and IPO's often involve investment banks which are primarily headquartered in New York City.

Knowledge and skills in interest rate theory, risk management, financial accounting, and classical discounted cash flow analysis are important corporate finance. A strong work ethic and ability to adapt quickly to market-driven deal making deadlines are also essential for success in this career path.

Double Majors

The math finance concentration is particularly adapted to double majors with the Quantitative Economics major. While the material is compatible, there is currently no clear path for a double major with the UCI Business BA program.