



Curriculum Reform and Construction of Financial Engineering under the Background of Financial Technology¹

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Authors' contributions

This work was carried out in collaboration between both authors. Author CZ designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors CZ and LC managed the analyses of the study. Author LC managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

With technological innovations such as big data, cloud computing, artificial intelligence, and blockchain, it has been fully applied to payment and settlement, loan financing, wealth management, retail banking, insurance, transaction settlement, etc. In the big financial field, the integration of finance and technology is becoming a new trend in the future development of the financial industry. In the current development of financial technology, the training of financial engineering professionals is also facing many opportunities and challenges. The financial engineering major of our school started late. Although many achievements have been made, there

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are still some shortcomings. Especially with the development of financial technology, the original curriculum system needs to be adjusted and improved in time, so this article will proceed discuss the reform and construction of financial engineering courses.

Keywords: Financial technology; financial engineering; curriculum reform.

1. INTRODUCTION

Recently, the new major undergraduate financial technology major declared by Shanghai Lixin Accounting and Finance College was filed and approved by the Ministry of Education. The financial technology major is the only new major in the country outside the national catalog, and it is also the only domestic university approved for the financial technology major. This means that the development of financial technology has been widely recognized by the society, and professional courses related to financial technology need to be reformed simultaneously.

2. THE NECESSITY OF FINANCIAL ENGINEERING CURRICULUM REFORM UNDER THE BACKGROUND OF FINANCIAL TECHNOLOGY

2.1 The Development Status of Financial Technology

According to the definition of the international authoritative organization Financial Stability Board (FSB), financial technology refers to the financial innovation brought by technology, which is currently used in finance. The industry's technology and technology mainly include big data, cloud computing, artificial intelligence, and blockchain technology.

Big data technology mainly refers to collecting a large amount of data, and analyzing the internal correlation and characteristics of the data, so as to dig out valuable information. The amount of data in financial activities is very large, and the types of data are complex and scattered. Using big data can understand the needs, characteristics and preferences of potential customers from a large amount of financial data, which provides convenience for financial institutions to achieve precision marketing and increases profitability. It can also reduce the time of blindly attracting customers and greatly improve the efficiency in financial activities. In addition, through a large amount of data analysis, a set of financial scoring system can be established to improve the management level of risk early warning.

Cloud computing refers to a pay-per-use model. Cloud computing technology can configure network resources in real time according to the demand of financial services, realize the effective use of resources, reduce the operating costs of financial activities, and enable financial data resources to achieve centralized storage, centralized management, and centralized maintenance, and maximize the use of resources. Rate and use efficiency, while avoiding the waste of resources [1-4].

Artificial intelligence technology is mainly to give computers a human way of thinking and possess human intelligence. In financial activities, through technologies such as face recognition, language recognition, and touch perception, computers can quickly read the personal information of customers, communicate with customers like humans, and bring customers a faster and more accurate service experience. At the same time, artificial intelligence, through machine learning and other technologies, can also constantly adjust trading strategies like humans in continuous learning and trial and error, and manage risks more effectively.

Blockchain technology mainly uses cryptographic encryption technology and distributed accounting technology to achieve a point-to-point network structure, a distributed system architecture, and a decentralized storage mode. This mode can ensure that transaction records cannot be artificially tampered with, thereby maximizing. The privacy and security of wealth are guaranteed to a limited extent. At this stage, digital currency is a major application of blockchain technology. In the future, blockchain technology can also be applied to Internet lending, financial product identification transactions and other fields. This technology can effectively solve the trust problem of both parties in the transaction, thereby providing financial activities. A safe and trustworthy environment.

2.2 Opportunities and Challenges Faced by the Financial Engineering Major

Financial engineering is a major with strong theory and application. On the one hand, the financial engineering major has higher

requirements for science and engineering; on the other hand, the financial theory knowledge of financial engineering is also relatively comprehensive. The professional courses are set up to meet the theoretical requirements of financial technology, and have more cross-cutting content with financial technology content, which can output many talents to the financial technology industry. For example, the financial engineering major of Shanghai Lixin Accounting and Finance College had previously set in the direction of financial technology, the project was established as a pilot program for applied undergraduate programs in Shanghai.

The major of financial engineering originated abroad, and many textbooks are translated from foreign textbooks. Domestic textbooks have not yet been recognized internationally, and there is a shortage of domestic teachers and talents. Since financial engineering requires a large amount of knowledge reserves for prerequisite courses, this course is offered at the undergraduate level in my country. The foundation of students is relatively weak and the knowledge system is not complete. In the context of the development of financial technology, the theoretical and technical requirements of students are higher than in the past, so the traditional curriculum system needs to be reformed and revised. The main difficulty at this stage is that China's financial technology is in the forefront of the world, and there is no financial technology major in the world, so there is no international experience worth learning, especially the curriculum system construction and talent training programs of higher education institutions need to explore themselves.

2.3 The Needs of Talent Training and Social Development

Financial engineering is an interdisciplinary subject integrated with mathematics and computers. It aims to cultivate financial compound talents, which can provide many professionals for the financial technology industry. The CFA exam will be added to the Fintech subjects in 2019. The development of financial technology has received widespread attention and recognition from the society. The cultivation of financial technology talents is urgent, and the financial engineering profession is to send many talents to the financial technology industry an important training base

for financial engineering, the reform and construction of the financial engineering professional curriculum system meets the latest needs of the development of financial technology. The development of financial technology has also put forward higher requirements for the training of traditional financial engineering talents. The innovation of science and technology has driven the development of finance, and the innovation of science and technology requires talents. Only by accelerating the process of talent training can we promote the development of financial technology, promote school-enterprise cooperation, and achieve a win-win situation.

3. THE MAIN PROBLEMS EXISTING IN

our school's financial engineering major The financial engineering major of our school started late, the construction time is short, and the construction of professional courses is still relatively weak. Especially in the context of the development of financial technology, the financial engineering courses of our school mainly have the following four problems.

3.1 The Degree of Integration with Computer Science is Not Enough

At present, although our school is also equipped with corresponding experimental courses, such as MATLAB and financial computing. However, in general, the types of computer languages that students are exposed to are relatively single, which makes the content of practical courses relatively easy and difficult to deepen, and the degree of cross integration with computer majors is not enough. In the context of the development of financial technology, big data technology, crawler technology, data mining and other technologies require students to master and be proficient in more than one computer language. At present, the mainstream language in the financial technology industry is Python, and most companies require applicants when recruiting Proficient in Python language, but our school has not included Python language into professional elective courses or experimental practice courses in the curriculum, which will cause students to be employed, which is likely to reduce the two-way recognition and recognition of graduates and companies for our school's undergraduate training. Satisfaction.

3.2 The Breadth and Depth of Courses Related to Mathematics are Not Enough

In terms of course setting, students have studied calculus, probability and statistics and other prerequisite courses in the freshman year, which is helpful to the understanding of financial engineering professional courses, but other mathematics related courses such as stochastic processes, partial differential equations, etc. Students know very little, and professional courses such as financial engineering and derivatives pricing will involve a lot of knowledge of stochastic processes and partial differential equations. In the current teaching, due to the lack of mathematical knowledge of students, this part of related knowledge is generally slightly Speaking or not speaking leads to superficial understanding of students. In fact, there is a certain connection between partial differential equations and stochastic differential equations. When the underlying asset is no longer a simple geometric Brownian motion, but a more complex stochastic process, the European option price may no longer have an accurate analysis. At this time, the traditional methods of probability theory are no longer applicable, so more general methods of partial differential equations should be used to solve them.

3.3 The Curriculum Setting is not Scientific Enough

Due to the short construction time of our school's financial engineering major, there are still many inadequate talent training programs. For example, financial engineering and derivatives pricing courses, but in terms of content and difficulty, derivatives pricing is an extension and expansion of financial engineering content, and the difficulty is also greater. If these two courses are put in one semester, they are not scientific enough. You should learn financial engineering first, and then derivative pricing. In addition, the basic courses related to the professional core courses are not complete, such as the random process closely related to financial engineering, and some grades are not set in the training program or set in the same semester as financial engineering. It is not very reasonable; it is best to finish it before financial engineering. Furthermore, there are currently fewer computer software experimental courses

related to majors. At present, our school offers courses related to Matlab and financial computing, but professional computer programming languages such as C language, Python language, and R language are in the undergraduate stage of financial engineering. There are fewer opportunities for students to contact. Under the background of the development of financial technology, the lack of such courses is not scientific enough.

3.4 The Core Courses Emphasize Theory over Application and the School-Enterprise Connection is Not Close Enough

The core courses of financial engineering, such as financial engineering, are more partial to mathematical analysis, and the practical applications of forwards, futures, swaps, and options are rarely mentioned. This has caused a disconnect between curriculum knowledge and practical application, so a certain amount of time can be appropriately increased to show students practical application knowledge of financial engineering. Under the background of the development of financial technology, the requirements for students' hands-on ability and practical application ability are higher than in the past. While mastering theoretical knowledge, financial engineering students should also be familiar with big data technology, machine learning, cloud Knowledge and mastery of the latest technology such as computing and blockchain technology has a positive impact on the promotion of innovative applications of financial engineering. At present, our school has opened some professional experimental courses in the school, but has not established a long-term joint training relationship with some outstanding enterprises, and the off-campus training base needs further construction.

4. THE IDEA OF ADVANCING THE REFORM AND CONSTRUCTION OF FINANCIAL ENGINEERING COURSES IN OUR SCHOOL

According to the actual situation of our school, we will make corresponding adjustments and improvements, and take targeted measures to actively promote the reform and construction of financial engineering courses.

4.1 Promote the In-depth Crossover and Integration of Computer and Mathematics-related Courses

To promote the crossover and integration of financial engineering and computer, mathematics, and other related majors, we need to do the following: First, pay attention to the study of theoretical courses. In the lower grades of freshmen and sophomores, strengthen the learning and assessment of basic courses such as calculus, probability, and statistics, and appropriately improve the requirements for computer skills, such as requiring students to master at least one computer language. The second is to encourage students to take cross-professional courses related to the Department of Mathematics and Computer Science, encourage interdisciplinary teachers to develop new courses, and promote the integration of financial engineering majors with other cross-professionals. The third is to enhance the communication between students of various cross-specialties and expand students' knowledge by organizing lectures, online courses, and club activities.

4.2 Set up Core Courses and Professional Elective Courses More Scientifically

Sort out the existing professional required courses, optimize the order of courses and the syllabus. For example, after students complete financial engineering, the next semester can set up pricing of financial derivatives, avoid duplication in content and pay attention to convergence. Different from the theory of financial engineering, the pricing of derivatives mainly focuses on the design of financial innovation derivatives. In the syllabus, the application of financial engineering theories in the pricing of derivatives should be emphasized. In addition, in order to cater to the development needs of financial technology and enhance students' computer operation and programming ability, it is recommended to set up a computer language Python as a professional compulsory course.

Since financial engineering is an interdisciplinary subject, it has a high degree of relevance to majors such as mathematics and computer. In order to improve students' comprehensive literacy, it is necessary to enrich students' professional elective courses. It is recommended to add mathematics-related elective courses

such as partial differential equations, ordinary differential equations, financial mathematical modeling, financial stochastic analysis, financial statistical analysis, etc.; add computer-related elective courses such as C language, Python language, big data science, and machinery Learning, artificial intelligence; in addition, courses related to financial technology such as Internet finance, blockchain technology, and digital currency theory can also be added.

4.3 Increase Investment and Assessment of Practical Courses

In the past, professional course assessments usually took the form of written examinations. This led to the fact that students only paid attention to the study of theoretical courses in the learning process, and often ignored the study of practical applications, but financial engineering majors It also belongs to a subject with strong application. Therefore, in future course teaching, it is recommended to increase the investment in experimental courses. In the future assessment, it is recommended to increase the assessment of experimental courses. For example, in MATLAB's financial experiment class, students can be required to use MATLAB software to use financial data on the market to solve practical financial problems, such as investment portfolio problems, derivative price calculations, cash flow calculations, etc. In the assessment of experimental courses, attention should be paid to assessing students' independent thinking ability and problem-solving ability [5-7].

4.4 Build a Team of Professional Teachers and Enhance School-enterprise Cooperation

In view of the fact that the major of financial engineering is a theory and a strong cross-discipline, the current teachers engaged in teaching and research activities usually have professional backgrounds in finance and mathematics, but there are few teachers who have academic backgrounds in finance, mathematics, and computer science. Therefore, it is necessary to introduce outstanding talents at home and abroad, encourage teachers to visit overseas for further studies, form a professional team of teachers, and develop supporting new courses. In addition, cooperation with off-campus enterprises should be strengthened to build off-campus training bases for students. In the senior year, students can carry out a one-year

corporate business project training, which will pave the way for students to go to work after graduation. Our school should also actively learn from the advanced experience of other universities and actively cooperate with off-campus enterprises to improve the quality of running schools [8-11].

5. CONCLUSION

The development of science and technology has promoted the development and innovation of finance. In the context of the development of financial technology, there are still many shortcomings in the construction of financial engineering professional courses in our school. Therefore, in order to cultivate higher-level financial industry talents, It is necessary to make appropriate adjustments and improvements in the construction of relevant professional courses in our school. In view of the current shortcomings in the construction of financial engineering courses, this article proposes some corresponding measures and suggestions for improvement, such as enriching the professional elective courses that students can choose, increasing the evaluation of experimental and practical courses, building a professional team of teachers, and enhancing school-enterprise cooperation And so on, I hope that these suggested measures can improve the quality of our school's financial engineering major and increase the professional influence.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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