Research on the Undergraduate Financial Engineering Education in China

Haiyong Ma (Corresponding author)
College of Economic and Management, Changchun University of Science & Technology
Changchun,Jilin, 130022, P. R. China,
E-mail: mhymark@gmail.com

Weiwei Zhang
College of Economic and Management, Changchun University of Science & Technology
Changchun,Jilin, 130022, P. R. China,
E-mail: zhangsanxue@gmail.com

Received: August 28, 2011 Accepted: September 20, 2011 Published: October 1, 2011
doi:10.5430/wje.v1n2p69 URL: http://dx.doi.org/10.5430/wje.v1n2p69

Abstract
The rapid development of modern economy has put forward higher requirements for financial engineering education. This paper analyzes the status and problems in undergraduate financial engineering education in china, such as indistinct training objective, rigid curriculum structure, and superficial teaching methods, etc. and puts forward suggestions to improve undergraduate financial engineering education in China.

Keywords: Financial engineering, Undergraduate education, Teaching plan, Professional curriculum

1. Introduction

Financial Engineering, by definition, is the application of the mathematical tools and computational methods commonly used in engineering to financial problems, especially the pricing and hedging of derivative instruments. It involves the development and creative application of financial theory and financial instruments such as forwards, futures, swaps, options and related products to structure solutions to complex financial problems and to exploit financial opportunity.

According to university of Stanford, Financial Engineering is a multidisciplinary field involving financial theory, the methods of engineering, the tools of mathematics and the practice of developing a program. From this definition, we can learn that Financial Engineering is not a tool, It is a profession that uses tools, of which derivatives are one. Importantly, the term “Analysis” means to “decompose in order to understand”. The term “Engineering” means “Build”. Despite its name, financial engineering does not belong to any of the fields in traditional engineering. In the United States, the Accreditation Board for Engineering and Technology (ABET) does not accredit financial engineering degrees.

All over the world, it has become fashionable for Universities and Colleges to offer Masters Degree programs in financial engineering (FE) or quantitative finance. In such program, students are taught to use basic techniques in numerical analysis whenever the equation is either non-linear or does not lend itself to the standard analytical solution. As in the level of undergraduate degrees, financial engineering education was rarely in USA and other countries with well developed financial markets.

The theory of financial engineering was introduced into China by the late 1990s, With China's WTO accession, and its further opening up of financial markets. The demand of financial innovation increases ceaselessly. To meet this demand, China launching undergraduate financial engineering program in five universities in 2002.by the end of August, 2011, there are 45 Universities launched undergraduate financial engineering programs (see Figure 1). Among these universities, 25 are established in finance and economics colleges, 9 are established in universities and 7 are established in science and engineering College, 4 in other categories. After 10 years of development, for the undergraduate financial engineering education, a lot of achievement accomplished, it still had many problems existed. This has put forward higher requirements for undergraduate financial engineering education in china.

<Figure 1 about here>

2. Current Status of Undergraduate Financial engineering Education in China

2.1 Current status of training objectives

In Chinese universities, every bachelor's program has its specific training objectives. For example, Renmin University of China emphasizes "training high-level financial professionals with good moral training, a solid theoretical foundation, excellent professional ability, with fluent English and high-level computer skills." The training objective of Shanghai University of finance and economics(SHUFE) is "requiring students to have the basic theory of financial engineering, particularly international finance, and have the knowledge and capacity of handling banking, securities, investment and insurance business, familiar with the financial policies and regulations of china and the abroad, and understand theory frontier and developments of finance, requiring outstanding foreign language skills and computer skills, and requiring students to be competent for variety work of domestic and foreign banks, securities, investment, insurance and other financial management and business." Xiamen University requires students to "possess perfect knowledge of finance, economic, and management, integrate theory with practice, and have the ability of analyzing problems and solving problems. Students must master a foreign language, and be able to skillfully make use of computer.

In summary, despite the different training objectives, there is still similarity: emphasizing a solid theoretical knowledge of finance, emphasizing practical business skills, and generally stressing the importance of foreign language and computer use.

2.2 Current status of training scheme

Make specific training scheme is an important step in the implementation of training objectives. Chinese universities generally emphasize training scheme, especially curriculum design.

For example, In Changchun University of science and technology (CUST), every undergraduate student who is major in financial engineering must study same courses in the first two years. In the latter two years it is time to enter professional field according to the needs of society, score and individual voluntary. General Education courses of CUST include politics, calculus, linear algebra, computer, whose credit ratio is 33.29% and credit ratio of specialized course, is 19.67%. Specialized selective courses are classified into securities investment and financial analysis, personnel finance, whose credit ratio is 20.2%.

Skills and general education courses of Dongbei University of finance and economics (DUFE) mainly consist of English, politics, history, computer, physical education and mathematics, whose credit ratio is 40%. Credit ratio of specialized courses is 20%. Skills and general education courses are arranged up to 1162 hours, and specialized courses are arranged for 806 hours.

In summary, training scheme of undergraduate financial engineering education may be different, but the design of the curriculum of general education courses is generally regarded as an important part, and the credit ratio of general education courses is generally high. Most university can arrange specialized courses and elective courses changing with the times dynamically. All universities pay attention to strengthen the business skills training and opportunities for social practice. Some universities divide four years into basic stage and sub-professional learning phase. Every student must study same courses in the basic stage. In the sub-professional learning phase it is time to enter different professional field according to the needs of society, score and individual voluntary.

2.3 Current status of specialized curriculum

Our universities generally pay attention to the arrangements of prerequisite course to ensure the systematic knowledge. For example, before studying Money and Banking, students are required to study the basic economic courses such as Microeconomics, Macroeconomics, before studying Portfolio management, students are required to study the basic financial courses such as Corporate finance, Financial market, Derivatives and so on, so that students can understand and grasp the advanced courses.

Specialized courses of Chinese universities are similar. Economics, Corporate finance, International Finance, financial market, Money and Banking and other basic financial courses are included in the scope of specialized courses.

Specialized elective courses are various. Basically, every university can arrange appropriate elective courses according to the social needs and teacher's expertise. Financial engineering, Portfolio management, financial risk management, financial derivatives, financial economics and other directions are involved to some extent to meet students' different pursuit.

2.4 Current status of teaching methods

With the improvement of university facilities, Multimedia teaching has becomes popular. Multimedia teaching can make

the class easily understood, which improves the teaching effect. Multimedia teaching network has been widely used in colleges and universities, whereas classroom teaching still remains the foundational form. PPT teaching is well received by teachers because of vivid illustrations, more information and distinctive personality characteristics, especially for financial courses, which is more obvious.

At present, Chinese universities all promote case teaching method. Many teachers have used case teaching method in undergraduate financial engineering education, and have received good results. In addition, discussing mode of Case Teaching Method in the classroom not only benefits students, but also allows teachers themselves to be able to obtain some apperception and improvement in the discussion.

With the economic and financial globalization, According to the suggestion of China's Ministry of Education, The universities are required to offer 5%－10% bilingual courses which are based on importing original textbook and improving level of teachers ,especially for those majors such as Finance, biology and so forth. Some universities adopt bilingual teaching in the courses of deeper level of internationalization in financial engineering course, such as Financial derivatives, International Settlement, International finance and Portfolio management.etc.

3. Problems of Undergraduate Financial Engineering Education in China

3.1 Training objectives positioning is not clearly defined

At present, most universities still strive merely for quantity of programs launched, at the expense of quality. When a new undergraduate financial engineering program is launched, the Training objective is lacked theoretical study and analysis. And its training area is positioned too broad and ambiguous to abide by. There is little difference between training schemes of Finance, Investment, and Insurance Professional. Some are just copy from the training schemes of these related specialties; they just replace the name of finance with financial engineering.

3.2 Curriculum structure need to be improved

Firstly, the designing of curriculum tends to be rigid. Compared with the fast development of society, specialized courses in undergraduate financial engineering programs cannot be adjusted flexibly, Once determined, most universities' training scheme never changed, the phenomenon of 'designing courses to accommodate some lecturer' or 'not designing courses without suitable lectures' are very popular. For example, for those universities of science and engineering, they can set some courses in mathematics in their undergraduate financial engineering programs, such as mathematical analysis, real analysis, complex variables, differential equation, and stochastic process. But for those universities of the art, the requirements for mathematics are no difference from those for the non-financial engineering majors in economics department; usually only three courses of calculus, linear algebra, Probability theory and mathematical Statistics are opened. And this made the students face too many difficulties in the process of making a deep study in the specialized courses.

Secondly, too much duplicate content of specialized courses in undergraduate financial engineering programs. Finance is the core of modern economy, which has penetrated all aspects of economic life, so that there would always be some duplicate content among financial courses. In some universities, specialized courses system is irrationally designed due to lack of co-ordination, For example, the knowledge of debt valuation, which was taught in fixed income, investment, financial market, corporate finance, and other financial courses. All these lead to unnecessary duplication of knowledge, and results in hours waste.

3.3 Teaching methods are superficial

Firstly, Financial Engineering Case Teaching Method faces more challenges in Chinese universities. Either for students or their teachers, solid theories foundation is necessary for Case Teaching Method. More important, Financial Engineering cases are often provided with complex backgrounds, cases are often related to politics, economy, culture, system and law, even aspects of society with quite complex background. In addition to basics knowledge related to Financial Engineering, all knowledge above must be somewhat mastered. As application of Financial Engineering of China has just started, even in work of practical sectors, financial system is still subject to strict control, financial market is still immature, there is little opportunity to involve in application of Financial Engineering, but practice opportunities are more lack of in universities.

Secondly, not all the multimedia teaching behavioral are adequate. Some teachers only copy the contents of books without any chart and their own summary and conclusion in their PPT slides. Some lectures are reluctant to renew their slides. Some teachers just read PPT directly to students for convenience. All those weaken the effect of multimedia teaching.

Thirdly, bilingual teaching behavioral in undergraduate financial engineering education need to be strengthened. It needs

excellent bilingual teachers, especially for those lectures who are both familiar with the financial engineering and good at English. But most of Chinese universities are short of qualified professional teachers with great English level, which limits the effect of bilingual teaching in undergraduate financial engineering education. For now, most of those bilingual teaching turn into a 'To teach the same financial engineering courses twice using English and Chinese', which results in time-wasting.

4. Proposals to Improve Undergraduate Financial Engineering Education in China

4.1 Changing training objective

Since entering 21st century, the location of undergraduate financial engineering education's training objective have made major strategic adjustment, The mode for cultivating the talent in university have changed from specified and knowledge mode to the quality, liberal and application mode.(yang zhijian,2004).

Therefore, the training objectives of undergraduate financial engineering education should focus on two aspects: First, make systematical academic training, lay a deep foundation and broad extension of professional knowledge, attaching importance to rationales, skills in mathematics, economics, and financial theory. Second, the students should be proficient and skillful in using instruments of Mathematical model, software programming, and financial knowledge, use a combination of the options of financial instruments to analyze and solve financial problems.

4.2 Perfecting curriculum structure

In this regard, the curriculum system setting of undergraduate financial engineering education should focus on these aspects: firstly, to increase the breadth and depth of courses for mathematics, In addition to the traditional mathematics courses for economics major students ,the students should also required to learn real analysis, mathematical analysis , complex variables, differential equation, and stochastic process.etc. Secondly, to strengthen the students' ability of information processing and its application, to cultivate the students' ability of financial modeling and ability of using computers to conduct financial data Analysis. Thirdly, according to the Ministry of Education of China, in order to cultivate the students' ability of international financial analysis, at least 4-6 specialized courses should be taught in bilingual teaching means in undergraduate financial engineering programs, the lecturer should use original foreign textbooks (mainly in English) and lessons should be taught in both English and Chinese.

Beyond that, universities should usually adjust the curriculums according to the needs of social development. Strengthen the co-ordination of professional curriculum design and enhance the communication of the teaching focus among teachers to avoid duplication of content.

4.3 Attaching importance to teaching methods

As an undergraduate major category of Finance, the curriculum design of financial engineering should cultivate composite, comprehensive and application-oriented talents to play relevant roles in financial practice activity. Teachers must pay attention to guide students to carry out discussions around the Financial Engineering. Appropriate financial engineering cases must be selected and established an abundant case bank gradually, which is the basis of case teaching method. For now, in the well developed capital market of those western countries, a number of Financial Engineering cases have been prepared, part of them can be apply to China's financial practice activity.

In recent years, China has launched a number of financial derivatives such as ABS , stock index futures and Exchange traded funds as well as asset securitization, while the convertible bond and executive stock option, etc., has been launched for years. All of those are very good cases of application of Financial Engineering in China. These applications of Financial Engineering in China must be paid close attention to and case bank of financial engineering must be established in China's leading financial education institution.

References

Finnerty, J (1988). The Financial Engineering in Corporate Finance: An overview. J. *Financial Management*. 4.14-33.

He X, Deng, C. (2010). Study of Restrictive Factors of Finance Engineering in China's Transition Economy: Countermeasures for Its Development. Third International Conference on Education Management Science and Engineering http://www.seiofbluemountain.com/en/search/download-file.php?id=4534

Liu,W.Q. (2006). On the Development and Application of Financial Engineering. *Shanxi University Philosophy & Social Science*.2006, 29:90-99.

Xing, M. (2008). On Interdisciplinary Approaches in Financial Engineering during Economic Transition Period in China. Proceedings of the 5th International Annual Conference on WTO and Financial Engineering http://www.seiofbluemountain.com/en/search/download-file.php?id=3847

Xing M. (2010). Research on Financial Undergraduate Education of China, Third International Conference on Education Management Science and Engineering http://www.seiofbluemountain.com/upload/product/201006/2010jyhy05a28.pdf

Zhang, X. (2008). Using financial engineering pioneering new ideas of financial management, *Anhui university journals*, (in Chinese).

Zeng W. (2005). In financial engineering education about some problems, *The Economist* (in Chinese).

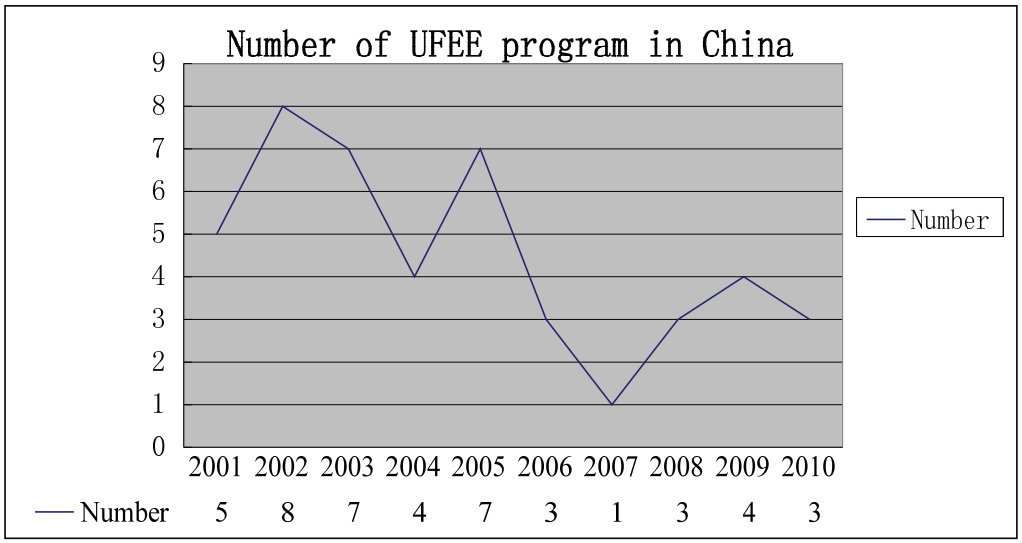

Figure 1.Undergraduate financial engineering education programs launched in China, Number, 2001-2010

(Sources: China's Ministry of Education 2001-2010)