PROFESSIONAL FINANCIAL COMPUTING USING EXCEL AND VBA

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with STEPHEN NG

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Preface

This book is a good company to Master degree programs in Financial Engineering, Financial Risk Management, Quantitative Investment, Computational Finance, or Mathematical Finance. Also, risk managers, traders, IT analysts, quantitative analysts working in investment banks and hedge fund will find it to be a good reference.

The book provides VBA examples on some widely-used finance and risk models. We expect that readers have prior training on these models because some of them require strong mathematical foundation. Through the examples, readers can easily build their implementable analytics and apply similar skills to other complex models.

Feedbacks from professors, students, analysts, and risk professionals are warmly welcome.

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CHAPTER 1

Financial Engineering and Computing

1.1 FINANCIAL ENGINEERING AND SPREADSHEET MODELING

“Spreadsheet Modeling for Finance” has long been a popular course in the MSc Financial Engineering program at the university we served in Hong Kong. The course is different from introductory Excel courses in financial management. It is an advanced course offered mainly to students with solid training in mathematical finance, option pricing, and risk modeling. Most of the students in the course have been designated a chartered financial analyst (CFA) or certified as a financial risk manager (FRM). The financial engineering program mainly recruits part-time students working in various financial institutions. There are around 40 to 60 new recruits each year. Many of them are derivatives traders, bank risk managers, bank IT specialists, fund managers, product structurers, bank regulators, and product auditors. In 1997–2008, the program trained more than 500 graduates. Most of them successfully applied the knowledge gained to their daily work.

Some may ask why no “quantitative analysts” are mentioned. Loosely speaking, these financial engineering graduates are quantitative analysts in nature. Strictly speaking, none of them carries the job title “quantitative analyst.” A global investment bank may have one or two quantitative analysts and/or financial engineers in Hong Kong. Given the presence of 15 global institutions, there are a maximum of 10 quantitative analyst job vacancies a year. This number cannot satisfy the continuous supply of financial engineering graduates every year. Although our graduates are not called quantitative analysts, their training in financial engineering did help their fast career development. Also, their quantitative skills have enabled Hong Kong to excel in financial services.
When we planned this book in 2007, the financial market in Hong Kong was very bullish. Many China initial public offering (IPO) deals were completed in Hong Kong. The Hang Seng Index reached over 30,000 points. Structured products and hedge funds were prevalent in corporate banking and private banking. Equity-linked notes, minibonds, and currency-linked products were common in retail banking.

In addition to sizable financial institutions, Hong Kong is a hub of boutique hedge funds. It is believed that there are 600 or more. These hedge funds employ few people, but their asset under management (AUM) can be over US$100 million each. In these hedge funds, financial and risk analysis is mostly based on Excel and Visual Basic for Applications (VBA) programming. This is a reason why the course “Spreadsheet Modeling” is very popular.

Our progress in writing this book was hindered by the financial tsunami in 2008. High market volatility, depreciation of wealth, and massive layoffs in the banking sector brought a lot of frustration to financial practitioners and financial educators. When we completed this book in June 2009, the market remained very weak. Many wealthy individuals suffered huge losses in the past 12 months; financial institutions cut their manpower seriously; selling complex products became difficult; and new regulations were enacted relating to structured products. In 2009, students in the course “Spreadsheet Modeling” still enjoyed the class but were slightly worried outside of the class. This is because the next round, which would be the fourth or fifth round, of massive layoffs would affect them. Investment banking follows obvious business cycles. This applies to study programs in financial engineering as well.

Mature students are always pragmatic in acquiring knowledge. Complex mathematics is very fancy, but our mature students tend to take it for granted and focus mostly on the applications of the mathematics. The course “Spreadsheet Modeling” makes those fancy mathematical concepts more easily applicable. From the perspective of educators, this mindset of the students is not harmful. After using Excel and VBA to build their models, some students become more interested in complex mathematics. What we would like them to know is not simply building models for financial analysis. We wish that they could understand model risks and estimate when these risks are likely to occur. The increased curiosity of our students after the course made us feel satisfied about our educational efforts.

Many new financial products have no mathematical models. Due to the advancement of technology, an analyst can easily apply Monte Carlo simulation on related variables and find out an average value. Our students especially like this analytical approach because there is less of a mathematical foundation required. In fact, Excel and VBA can easily handle Monte Carlo simulation.
1.2 LEHMAN BROTHERS’ PRODUCTS FOR RETAIL INVESTORS

Since 2005, Lehman Brothers began actively distributing a wide range of structured products via retail banks in Hong Kong, as well as in Singapore. One of our former financial engineering students came from France. After graduation, he worked in Lehman Brothers (Tokyo). A major part of his job was to structure products, which were finally sold to Hong Kong retail investors via local retail banks.

These products included equity-linked notes, minibonds (collateralized debt obligation [CDO] with total return swaps), and index-linked guaranteed notes. The equity-linked notes could provide an annual yield of 30 percent. Obviously the distribution of stock returns at that time was asymmetric with high upside potential and limited downside risk. The minibonds offered yields much better than bank deposits and the principle was guaranteed by an AA/A-rated institution—Lehman Brothers. This rating is better than that of many local banks.

Unfortunately, Lehman Brothers collapsed in September 2008. More than 40,000 retail investors in Hong Kong became victims. Some lost almost all their wealth. These victims continuously demonstrated in the street, at the front doors of various banks, and at the entrance of the Hong Kong Monetary Authority. Regulators encouraged banks to buy back the Lehman products. Banks were unwilling to do so. The Hong Kong banking industry experienced unprecedented exposure to reputational risk. In fact, this risk has never been discussed seriously and measured properly.

The Lehman incident made financial regulators extremely busy. Many of our financial engineering students are working for the regulatory bodies in Hong Kong. They were under serious pressure in the six-month period after September 2008. To mitigate regulatory risk, the regulators in Hong Kong announced a series of measures to prevent ordinary citizens from mistakenly buying high-risk products. These measures included mystery shopper programs (that is somebody pretending to be a bank client in order to test the selling process of frontline people) and audio-recording all relevant transactions. At the same time, the legal risk of banks intensified. Misrepresentation and insufficient duty of care became the words surrounding all financial institutions in Hong Kong. As a result, one of our authors was appointed to be an expert witness in some legal disputes relating to complex products. Risk management in banks suddenly became crisis management. Quantitative risk measures seemed less appealing.