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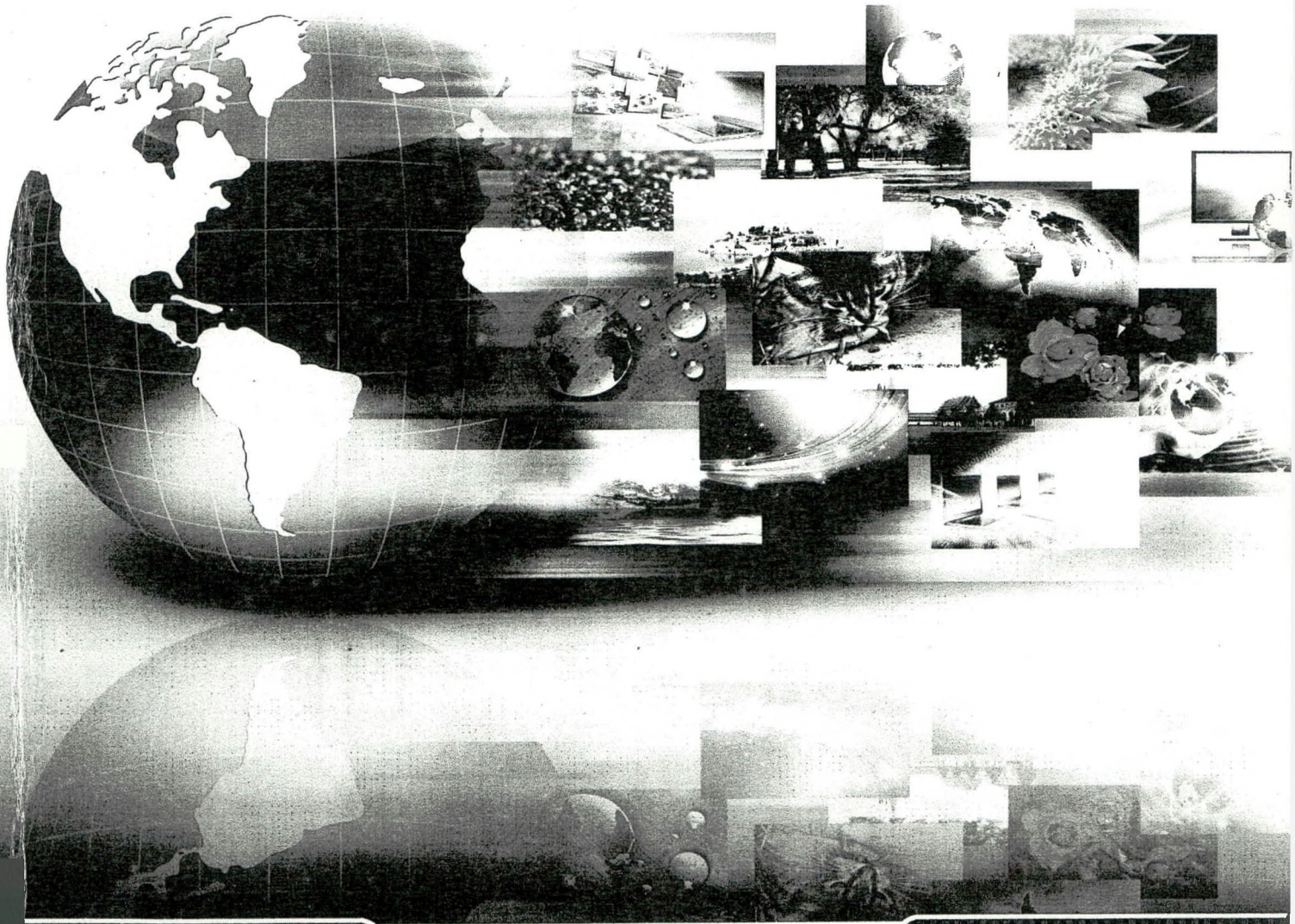

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APPLICATIONS OF FINANCIAL ENGINEERING - A BIRD'S EYE VIEW BY

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ABSTRACT

Financial Engineering is the use of mathematical techniques to solve financial problems. Financial engineering uses tools and knowledge from the fields of computer science, statistics, economics and applied mathematics to address current financial issues as well as to devise new and innovative financial products. Financial engineering is sometimes referred to as quantitative analysis and is used by regular commercial banks, investment banks, insurance agencies and hedge funds. Financial engineering has led to the explosion of derivative trading that we see today. Since the Chicago Board Options Exchange was formed in 1973 and two of the first financial engineers, Fischer Black and Myron Scholes, published their option pricing model, trading in options and other derivatives has grown dramatically. Financial engineering makes use of heavy duty quantitative tools, the uses for which were once thought to be limited to physics and engineering. But also included in the financial engineer's tool kit is the entire spectrum of financial instruments. Perhaps most important among these financial instruments are derivatives. Financial Engineering addresses financial issues in all areas of finance including corporate finance, asset management, investment finance, and financial institutions.

Key Words: Derivatives, Asset Management, Investment Finance, Globalisation

Introduction

Leaders of successful businesses build long-term relationships with customers, suppliers, employees, and shareholders. They make farsighted investments to support and develop their core competencies. They act quickly to ensure that short-term obstacles do not disrupt their long-term strategies. In conceiving and implementing corporate strategies, managers have always drawn on the skills of many specialists, from marketers to production experts. Now a small but growing number of senior managers have found that practitioners of a new technical specialty-financial engineering-can help them achieve their companies' strategic objectives.

They have found that, like other technological breakthroughs such as cheap computing power, financial engineering has the potential not only to reduce the cost of existing activities but also to make possible the development of new products, services, and markets. The notion that financial engineering-the use of derivatives to manage risk and create customized financial instruments-can advance a company's strategic goals might contradict the impression one gets from recent stories in the press. In many of these tales, traders within the finance staff use derivatives to speculate on the steepness of the yield curve or on movements of exchange rates. It appears that these bets have not been driven by the company's business strategy and that senior managers have been unaware of choices made deep within their finance organizations.

Financial engineering is the application of engineering methods and the engineer's problem-solving skills to important problems in finance. This interdisciplinary field integrates methods and knowledge from mathematics, statistics, economics, operations research, and computer science. Financial engineers develop mathematical and statistical tools to manage financial risk optimize investment portfolios, and design and value financial products. Financial engineers also devise computational algorithms to implement the tools and calibrate them to financial market data.

Financial risk management include measuring the risk of a financial transaction (transaction risk) or of a large investment portfolio (portfolio risk), an entire financial institution (enterprise risk), or a network of financial institutions (systemic risk), exploring ways to reduce risk, and determining an adequate capital reserve against potential losses. Portfolio optimization finds an investment strategy that best fits a decision-makers objectives and preferences. Derivative securities, such as stock options and commodities futures, have payoffs that are related to the value of an underlying asset, such as a stock or a commodity. Financial engineering helps to find the relationship between the derivative security's price and that of the underlying asset.

The term financial engineering means different things to different people. But in general financial engineering can accurately be described as "the development and creative application of financial technology to solve financial problems and exploit financial opportunities." Financial engineering makes use of heavy duty quantitative tools, the uses for which were once thought to be limited to physics and engineering. But also included in the financial engineer's tool kit is the entire spectrum of

financial instruments. Perhaps most important among these financial instruments are derivatives. Financial Engineering addresses financial issues in all areas of finance including corporate finance, asset management, investment finance, and financial institutions.

Financial Engineering Application Areas

- Financial risk management for financial institutions, corporations, and public institutions (from hedging risks of individual transactions to enterprise-wide risk management systems)
- Derivative securities (contract design, pricing, market making, and investment, trading, and hedging applications)
- Modeling stochastic dynamics of stock prices, interest rates, foreign exchange rates, commodity and energy prices
- Asset / liability management technology for corporations, banks, pension funds
- Credit risk modeling and management and credit derivatives
- Energy industry and energy derivatives
- Real options: valuing businesses and strategic managerial decisions by applying option pricing technology

Financial Engineering and Corporate Finance

These are structured by financial engineers working for banks who "pitch" their "solutions" to corporate managements and boards. The use of currency swaps to obtain funding in currencies other than a corporation's domestic currency, perhaps to fund foreign operations, or funding in currencies other than the domestic currency and then swapping into the domestic currency because funding costs are cheaper in the foreign currency. Other applications include hedging the risks that corporations are exposed to including interest rate risk, credit risk, commodity price risk etc.,

Derivatives forms of financial engineering

New financial products, including new types of derivatives, are forms of financial engineering.

Financial Engineering and Asset management

Financial engineers structure new financial products to better appeal to the risk-reward appetites of investors. e.g. equity-linked notes, commodity-linked notes, credit-linked notes, asset swaps.

The handiwork of financial engineers, whether they are using that title or not, shows up in all variety of risk management applications, most efforts at funding cost reduction, the development of more efficient trading platforms (such as electronic markets), and on and on

Financial Engineering and Investment

- In financial investment, the aim of choosing and running the appropriate financial investment strategy is the maximum of the income with utilizing the idle money.
- On material investment, for inventory investment, the idea of hedging can be used, and use the futures and the option transaction to enhance the fund utilization rate and reduce inventory.
- For project investment, financial engineering breaks through the limitation of traditional net present value, and takes the real options to invest and analysis with claim on the project investment.
- Diversified investment in the world stock market can increase the efficient frontier of the stock portfolio and the international diversification can lower the risk of the securities investment, and add the income of the securities investment.
- For those small and medium-sized investors who can't invest in the overseas stock market because of the foreign exchange control and the limitation of capital flowing can adopt a new derivative instrument international stock-return swaps to decentralize the risk and add the income.

Financial Engineering in the management of the financial risk

The core of the Financial Engineering is keeping away the financial risk; this is the impulsion of promoting the financial engineering development. Based on controlling the financial information and the method of the exact forecast, through managing the financial instrument, the Financial Engineering makes the deposit and increment of the financial assets, and real-time trace and adjustment, so as to get the maximum benefit and keep away risk. This can be done with the help of controlling price risk and default risk. In order to realize the maximum of the corporate value, the enterprises can make use of the technology and the instrument of the financial engineering risk management efficiently in their financial management

operation, and lower the uncertainty risk that is difficult to forecast in the corporation operation, and control the risk in their scope. Financial Engineering in the financial management

The following strategy to be followed:

- Speed up the reform of the financial system, and boost the system building of the financial marketing steadily.
- the perfect financial supervision and control system, to build up the ability of resisting risk of the financial business
- reinforce the theory research of the financial engineering, and satisfy the needs of the modern risk management
- set up the financial risk defense system, and make great efforts to take precautions against and reduce financial risks

Method of approaching problems by financial engineers

- See a financial opportunity as a bundle of risks
- Look at each risk to determine whether or not to bear it
- Systematically hedge away the risks which do not wish to bear Factors that Drive the Growth of Financial Engineering
- Increasing Volatility of Global Financial Markets and the Need for Risk Management

(a) Volatility of equity prices, foreign exchange rates, commodity and energy prices, and interest rates increased dramatically over the past three decades

(b) Higher volatility increases risk (as well as more opportunities)

(c) Risk Management is crucial to the survival and competitiveness of organizations

- Global Nature of Financial Markets (a) Multinational firms produce, market, and obtain financing globally

(b) Every multinational firm has significant risk exposures to foreign currencies, domestic and foreign interest rates, energy and commodity prices, and global equity prices

- Information Technology

Advances in information technology drive the growth of financial engineering. Real-time worldwide information and data collection, analysis, decision-making, and trading are made possible.

Securities trading goes electronic and moves from exchange floors into cyberspace.

(c) Banks are the biggest users of information technology!

The obstacles in Financial Engineering

- Economic system obstacles: The financial aspects of the legal system works, which not only limits the free movement of financial capital and innovation, but also hinders the normal development of Financial Engineering to some extent.
- Market obstacles: The development and use of Financial Engineering should be based on developed and efficient financial market.
- Obstacles of Financial theory: As a product of financial innovation to a certain stage, meanwhile Financial Engineering provide the basis for a higher level of financial scientific innovation.
- Obstacles of financial supervision: Financial supervision is a necessary condition for normal operation of financial institutions.

Conclusion

The Financial Engineering makes use of the technology of the interest rate exchange to lower the cost of the financing and optimize the capital structure with the credit grade keeping invariable and the financial risk no increasing; on the financial investment, the Financial Engineering makes use of the derivative securities such as the index futures and the index option and so on to create all kinds of hedging portfolio in order to realize the maximum of the financial income with using the idle funds; on the management of corporation financial risk, the Financial Engineering provides the risk management tools such as forward, futures, option and exchange and so on, at the same time combined these derivative financial commodity and create the new financial tools to make up the risk produced by the frequently fluctuate of the interest rate, exchange rate and the commodity price.

Financial engineering is the design and construction of new financial contracts. These contracts are typically assembled from a modest number of basic financial instruments and indexes including stocks, bonds, options, forward contracts, and futures contracts. The need for properly engineered financial contracts is motivated by the client's interest in reducing risk, reducing costs associated with foreign exchange or other market transactions, and to provide the potential to enhance returns.

Financial engineering and an industry that praises innovations that don't benefit the real economy. The kind of innovation stemming from complex financial engineering in the run-up to the financial crisis was designed to simply "transfer risk elsewhere" and get

around regulation. "The biggest banks have talked about the cleverness of financial engineering" there is no true engineering involved in the financial world. Financial engineering has proved extremely effective in managing the increased financial risk witnessed over the past few decades, and particularly in the last decade. "It's rare that a day goes by in the financial markets without hearing of at least one new or hybrid product"

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