MIT Sloan School of Management

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E52-435

Finance Theory 15.415
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Assignment 5: Options

Due: April 1 (Thursday), 1999

1. **Baring Securities**

   Read the enclosed article, "Losses At Barings Grow to $1.24 Billion." Based on the article, answer the following questions.

   (a) Describe the strategy in Nikkei-options that Leeson was executing. In particular, describe the 'strangle.' (Hint: the payoff from a long position in stock-index futures is similar to a long position in stock.)

   (b) Draw a payoff chart to show for what values of the Nikkei the strategy will make a profit and when it will lose money.

2. **Investing in S&P 500 without downside risk**

   Consider an increasingly popular deposit contract with payoffs linked to the performance on the S&P 500 Index on the U.S. stock market. For every dollar invested in the contract, the rate of return in one year is equal to 60% of the realized rate of return of the S&P 500 Index during this year if this rate of return is positive; otherwise, you get your money back. In essence, you are protected from the downside risk of the S&P 500 Index, while you are still able to participate in the upside potential of the stock market. The one year riskless interest rate is 10%. For simplicity, assume that the stocks in the index do not pay dividends.

   (a) Draw a graph for the payoff one year from now for a one dollar investment in the contract with the horizontal axis being the realized rate of return on the S&P 500 Index. Also write down the payoff symbolically.

   (b) Show that the payoff one year from now for a one dollar investment in this contract is the payoff to a portfolio of a default-free bond and a European call option on the S&P 500 Index.

   (c) Suppose that the rates of return on the S&P 500 Index can take two possible values one year from now, 20% and -20% with probabilities 60% and 40%, respectively. Do you make money or lose money investing in this contract? If so, how much?

3. **Sally Jameson: Valuing stock options in a compensation package**

   Read the HBS case, "Sally Jameson: Valuing Stock Options in a Compensation Package," that is included the Readings Package. Then, please help Sally determine the value of the option that she has been offered.

Losses At Barings Grow to $1.24 Billion
British Authorities Begin Sale of Assets; Missing Trader Had Gone to Singapore To Help Solve Backroom Woes.

Jeremy Mark in Singapore, Michael R. Sesit in London, And Laura Jereski in New York

The Wall Street Journal, Tuesday Feb 28, 1995 Sec: A p: 3

(This article has been edited for class use.)

In the early 1990s, a pallid, twenty-something settlements specialist from Britain named Nicholas William Leeson joined Baring Securities in Singapore to help unravel some back-room problems.

Within a year, he had joined the Barings trading team on the floor of the Singapore International Monetary Exchange. By day, he executed trades in the Nikkei Stock Average futures contract under the tutelage of Barings traders in Japan. By night, he partied in the yuppie bars along the Singapore River.

Eventually, two former colleagues say, he became chief trader —while continuing to oversee settlement operations for his own trades. 'Once you win the trust of top management, you are left on your own,' said a broker who once worked alongside Mr. Leeson. 'Maybe he was left with too much discretion. When you have someone taking charge of both settlement and trading, it's just a bomb waiting to explode.'

The bomb exploded over the weekend, shattering a 233-year-old financial institution with losses now estimated at $1.24 billion. As regulators and auditors scrambled to pick up the pieces of Barings PLC and its subsidiaries yesterday, the whereabouts of the 28-year-old trader — last reported staying at the deluxe Regent Hotel in Kuala Lumpur, Malaysia, on Thursday — remained unknown.

Mr. Leeson's primary job at Baring Securities was to arbitrage Nikkei futures contracts in Singapore and Osaka, making relatively small amounts of money on the differences in the prices of two similar contracts. In recent months, Mr. Leeson began taking unauthorized long positions, exposing Barings to big losses if the Tokyo market fell. For awhile, he was able to fully hedge his positions by taking offsetting contracts in the Singapore and Osaka markets.

But Mr. Leeson ran into problems when the Tokyo market began sliding after the Jan. 17 earthquake in Kobe, Japan. (See figure on previous page—not created by *WSJ*.) Rather than cut his losses, Mr. Leeson compounded his risk by adding to his positions.

Stunned money men were left wondering how a trader could have amassed such huge losses, apparently without drawing the attention of his own firm and Singapore's regulators. That question is particularly puzzling because the markets had known for weeks that Barings was building up huge obligations in the Nikkei average stock-index futures contract, leaving its mounting positions open day after day. Stock-index futures allow traders to bet on the level at which a market index will stand at a specified date; while often used for hedging risks, they also provide a potent tool for speculation.

'I find it inconceivable that Barings was unaware of the situation,' said a former Barings executive who once was a senior futures trader in Japan. 'Japanese houses have been out there [in the futures market] telling clients to go short for weeks because of Barings' long positions.'

Barings' lack of basic controls also surprised Wall Street risk managers. 'It is so fundamental that it's taken for granted' that traders should never be allowed such latitude, says Leslie Rahl of Capital Markets Risk Advisors. Most Wall Street firms maintain strict fire walls separating the responsibility for trading securities, pricing them and settling with counterparties. What's more, most firms add a further layer of oversight by creating independent risk-management departments that report to top brass.

Not so at Barings. Mr. Leeson 'talked with clients, he published research, he put on trades, he ran the back office,' says a bemused rival. 'There were no controls there. It was arcane.' Traders say that Barings' unusual structure stemmed from its business: unlike most investment banks, the firm did little trading for its own, but typically made its money handling trades for clients. Indeed, the firm pitched itself as a bank that wouldn't compete for trades with its clients, rivals say.

'They aren't known for proprietary trading,' says David De Rosa, a director of Swiss Bank Corp. 'In fact, they are known as a client-driven firm.'

As a result, the lack of control fostered a freewheeling climate that Mr. Leeson was quick to seize on. Unlike most salesmen, Mr. Leeson was allowed to go to the trading floor. What's more, Barings didn't limit the size of Mr. Leeson's positions, because he wasn't specifically a proprietary trader but a salesman, according to traders familiar with the firm's Far East management practices.

Relatives and neighbors say there was little in Mr. Leeson's youth in Watford, England, a working-class suburb north of London, to hint at his eventual impact on world financial markets. The son of a homemaker and a plasterer, Mr. Leeson was known as an efficient and polite but unremarkable young man.

What surprised former Barings people who knew him was the risks Mr. Leeson took on as he traded his employer into financial collapse. 'What's ironic is that Nick was never really a trader,' a former Barings trader in Japan says. 'Nick was more an execution guy, following our orders. He was never taking risk positions.'

Acquaintances say that Mr. Leeson began to change during the past year or so. 'In recent years he became a success,' another former colleague says. 'It sort of went to his head little bit; maybe [he was] a bit full of himself.'

Last fall, even as he was being hailed within the firm for his prowess as a salesman, Mr. Leeson took the first step that put Barings on the road to disaster, say London traders and a former colleague. Mr. Leeson began to set up dummy companies to create fictitious client accounts. And he began executing his trades, betting that the Japanese stock market would stay within a narrow range, a strategy traders call 'selling volatility.'

Mr. Leeson's strategy involved not only buying stock-index futures but selling options on the Nikkei-225 index. Together, these trades obligated Barings to sell the Nikkei-225 index when it neared 20,000 and to buy it when it fell close to 18,000, positions that would generate huge losses if the market moved sharply in either direction.

This so-called 'strangle' strategy fell apart when the Japanese stock market began tumbling after the Kobe earthquake. Instead of cutting his losses by closing out positions as the market declined, Mr. Leeson appears to have compounded them by doubling up on his positions. From its 19331.17 level on Jan. 16, the day before the Kobe earthquake, the Nikkei index has plunged 13% to a 16808.70 close in Tokyo last night – representing staggering losses to Barings.

'What Barings did was buy futures, increasing their liability. Once the market moves outside those [18,000 and 20,000] levels, you begin to lose money fast,' says a trader who adds that his firm has been 'tracking Barings' for several weeks.

By the time Barings collapsed, Mr. Leeson had accumulated Nikkei-225 index positions that effectively amounted to a $7 billion 'long' bet on the Tokyo stock market, according to Eddie George, governor of the Bank of England.

'Basically every 1% the market went down, they [Barings] were losing another $70 million,' says another trader.

At their height, Mr. Leeson's trades accounted for about half of the open interest, or outstanding positions, in the Nikkei-225 futures, according to a dealer whose firm clears trades on both Singapore and Osaka exchanges. That 'should have set off a lot of bells, but didn't,' he says of exchange regulators and Barings management.

Meanwhile, as the losses accelerated, Barings' London executives and international traders alike continued to think Mr. Leeson was acting on behalf of clients. First they thought it was big commodity traders Tudor Investment Corp. But after that firm made it known it wasn't involved, they turned their suspicions to Ross Capital, a Bermuda-based hedge fund. The firms couldn't be reached for comment.

'No one in the market could conceive that these were Barings positions,' says a London trader. 'We assumed it could only be big hedge funds or aggressive central banks like [Malaysia's Bank] Negara and the Monetary Authority of Singapore' and that Barings was acting on their behalf, he says.

As the losses mounted, Mr. Leeson apparently realized that his situation had become untenable. On Thursday, he left Singapore with his wife. On Friday, a Barings executive said, Mr. Leeson sent a fax to the firm announcing his resignation.

Glenn Whitney in London also contributed to this article.