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8

Long-Term Capital *Mis*management

"JM and the Arb Boys"

Introduction

Long-Term Capital Management (LTCM) began operations in 1994 with more than $1 billion in capital and what looked like an unbridled potential to succeed. Among its principals was a virtual who's who of world-class academics and seasoned Wall Street practitioners. A string of outstanding successes[1] built LTCM's equity position in three short years to $7.1 billion. In 1996 alone, the company cleared more than $2 billion. LTCM's principals, who had invested $146 million in 1994, watched as their share of the pie grew to $1.9 billion. They were all multimillionaires, and so was everyone lucky enough to have a piece of the action. In fact, one LTCM principal was already half way to becoming a billionaire.

Who would have guessed that, by 1998, LTCM would be bankrupt, its principals heavily in debt, and the world's financial system would have barely escaped a financial meltdown? The story of LTCM's precipitous decline is told with a smile, a tear, and a smirk. After all, it's not every day

[1]Profits for the first 10 months of operation in 1994 were 20%, and for the three years thereafter, they were 43%, 41%, and 17%.

that the best, the brightest, and the most arrogant fail so astoundingly and so visibly.

This chapter is divided into seven major parts. It begins by describing LTCM—the company, its business, and who ran it. The second part of the chapter explains LTCM's investment strategy. It clarifies how a hedge fund,[2] like LTCM, can structure an investment portfolio that earns profits regardless of whether the market moves up or down (i.e., a market-neutral portfolio). Spreads, convergence and relative value trades, volatility plays, and leverage enter heavily into this explanation. The discussion then turns to LTCM's rise to stardom from 1994 to 1997, followed by an explanation of the considerable value this company added, for three years, to the global financial markets. The next part focuses on why LTCM failed and how it managed to lose $4.5 billion in less than two months without the complicity of rogue traders, deception, or market manipulation. Part six describes how LTCM was rescued, and the final section suggests some conclusions and lessons to be learned from this very unfortunate financial debacle.

Risk Notepad 8.1

What Is a Hedge Fund?

The term *hedge fund* is an oxymoron because these funds often take positions—large positions—that are anything but hedged. In fact, the name has little or nothing to do with the functions these funds perform. Hedge funds are mostly unregulated,[3] highly diversified portfolios of assets that may or may not specialize in opportunities associated with specific risks.

They are usually privately organized limited partnerships or limited liability companies that professionally manage investment funds for *qualified purchasers* (e.g., wealthy individuals

[2]See Risk Notepad 8.1: What Is a Hedge Fund?

[3]In the United States, hedge funds are not regulated by the Securities and Exchange Commission, but they do come under the supervisory powers of the Commodity Futures Trading Commission and National Futures Association.

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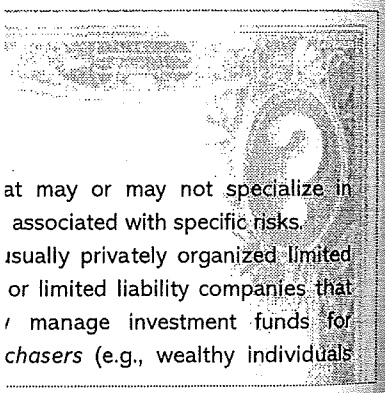

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and institutional investors), who do not need all the regulatory protections from risk-taking that many of us find helpful. Hedge funds often employ aggressive, short-term trading strategies and have high leverage ratios compared to other financial intermediaries. They earn revenues from fees that are based partly on the amount of assets under management and partly on performance. To remain unregulated in the United States, they limit the number of beneficial owners, abstain from raising funds via public offerings, and refrain from advertising or soliciting widely. Hedge funds compete directly with the trading desks of banks, security firms, insurance companies, mutual funds, and other managed funds.

When LTCM failed in 1998, there were between 2,500 and 3,500 hedge funds in the United States combined with capital between $200 billion and $350 billion and assets ranging from $800 billion to $1 trillion. Compared to other broad types of financial intermediaries, hedge funds were relatively small, ranging from 20% to 40% the size of mutual funds, pension funds, commercial banks, insurance companies, and retirement funds.[4]

There is no "typical" hedge fund. They vary enormously and take a variety of positions, ranging from outright purchases and sales of assets to arbitrage transactions, spread trades, and derivative positions (e.g., options, futures, forwards, and swaps). In short, they can do almost anything their investors, creditors, counterparties, and management allow them to do. To the typical investor, these funds bring value because they provide wide diversification, economies of scale in purchasing, and professional investment expertise.

It is a misconception to think that all hedge funds are highly volatile, speculative ventures, but it is equally misguided to think that they are safe, just because the word "hedge" is in the name. The rule of thumb is *buyer beware*; remember that you must not underestimate the danger of a rattlesnake just because the word "rattle" is in its name. Investments in hedge funds may or may not be hedged. Hedge funds can pursue a wide range of investment strategies, including highly leveraged speculative positions. Depending on your age, as well as family and financial status, you can choose among hedge funds with larger or smaller risks.

Normally, hedge fund portfolios are revalued (i.e., marked-to-market) daily. They differentiate themselves by the strategies they use to select investments and by how much risk they take with clients' funds. Many use proprietary strategies, analytical methods, and trading models. They achieve economies of scale by making large transactions, and then distribute the benefits to their clients.

Just as animals can be classified into major species, hedge funds can also be classified into a few broad categories. The major categories of hedge funds are aggressive growth, convergence, distressed-security, emerging-market, equity, income-generating, macro, market-neutral, pooled, relative-value, and risk-management.

Over the years, some hedge fund managers have gained almost celebrity status and their generous salaries have made them among the richest people in the world. People like George Soros (Soros Fund), Stanley Druckenmiller (Soros Fund), Henry Kravis (Kohlberg Kravis Roberts), Thomas Lee (Thomas H. Lee Co.), and Julian Robertson (Tiger Management) have become familiar names both for their brilliant performance and sometimes self-aggrandizing behavior.

[4]President's Working Group on Financial Markets. *Hedge Funds, Leverage, and the Lessons of Long-Term Capital Management: Report of the President's Working Group on Financial Markets.* Washington, DC: Department of Treasury, 28 April 1999.

LTCM: The Company

LTCM opened its doors for business at the end of February 1994. Its capital was about half the $2.5 billion that John Meriwether, its founder, had set as a goal for beginning equity when he left Salomon Brothers, but then, not many hedge funds start operations so well endowed. Long-Term Capital Portfolio L.P. (LTCP) was the actual "Fund," and this Cayman Islands limited partnership was managed by Long-Term Capital Management L.P., which was a Delaware-chartered limited partnership that was operated from Greenwich, Connecticut and owned by John Meriwether and the 11 other principals.[5]

Investors did not invest directly in LTCP. Rather, the Fund had a hub-and-spoke-type structure, with a network of global conduits collecting funds and investing in LTCP. Each conduit tailored its investment terms to the regulatory, tax, and accounting idiosyncrasies of a particular nation or region. By 1997, all of LTCM's investors were multimillionaires, but that was not a high hurdle to clear because they were all millionaires in 1994, when LTCM began. The minimum investment needed to claim a piece of LTCM's action was $10 million; so, it was an exclusive club, with only the rich and a host of domestic and foreign financial intermediaries as members.

THE LTCM BUSINESS

The company's initial trades were primarily arbitraging the global bond markets; though, by 1995, it had already diversified its portfolio by entering into domestic and foreign equity arbitrage trades. And why not? LTCM's strategy, after all, did not require an in-depth knowledge of any particular underlier (e.g., Microsoft stock), but rather it required a keen understanding of the *spreads between the yields or prices of underliers*—and that was largely the domain of statistical modeling and security market wisdom that came from years of experience—or at least they thought.

THE PRINCIPALS

One of the exceptional features of LTCM was the cast of characters who founded and ran the company. It was a distinguished and impressive group, among whom were two Nobel laureates, a vice chairman of the Federal Reserve System, and some of the brightest, most successful bond arbitragers

[5]LTCM's *limited partners* presented themselves as *principals* and *not as partners* because they felt it might be viewed as deceptive to have titles that implied unlimited liability. The LTCM principals also did not want a hierarchy of corporate titles; so they chose the title "principal" for all limited-partner-type people at LTCM. Unless otherwise noted, the management company (LTCM) and Fund (LTCP) are treated as one in this chapter and generically called Long-Term Capital Management (LTCM).

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on Wall Street (known as the "arb boys"). Initially, LTCM had 12 principals, but four of them deserve special mention.

John Meriwether

John Meriwether ("JM," as he was called), the founder of LTCM, was clearly the company's guiding light. He was a tough, respected, nice guy, who started LTCM after leaving his former job at Salomon Brothers. In the late 1970s and 1980s, Meriwether built a highly profitable bond arbitrage group at Salomon Brothers and went on to become vice chairman in charge of Salomon's global fixed-income trading, arbitrage, and foreign exchange businesses.

His trading operation at Salomon Brothers was so successful that, by 1986, the company was devoting half its equity to JM and his team, but in 1991, one of his traders, Paul Mozer, confessed to making false bids at U.S. government security auctions. Meriwether knew the violations were significant and reported them to his bosses, Thomas (Tommy) Strauss and CEO John Gutfreund. All three men understood the infractions were serious and should have been reported immediately to the Federal Reserve and U.S. Treasury; Mozer should have been dealt with deliberately—perhaps fired.

Astonishingly, Mozer was not reprimanded; in fact, he was kept as the head of Salomon Brothers' government bond trading desk, and Salomon delayed too long before disclosing the infractions to the Federal Reserve and U.S. Treasury. The scandal blossomed and resulted in the 1991 resignations of both Gutfreund and Strauss. Leaderless, Salomon Brothers convinced Warren Buffett, a premier investor, head of Berkshire Hathaway Holding Company, and major shareholder in Salomon Brothers, to become its temporary CEO, saving Salomon from a potentially worse situation.

Meriwether's resignation came just a few days after Buffett took the helm at Salomon Brothers. As part of a Securities and Exchange Commission administrative proceeding, Meriwether agreed to pay a $50,000 fine and suffered a three-month suspension.[6] After a brief hiatus, Meriwether founded LTCM in 1994, and, by 1995, he plucked from Salomon Brothers eight members of his old team, who were responsible for almost 90% of Salomon's trading profits.

Robert C. Merton shared the 1997 Nobel Prize in Economics with Myron Scholes for their trailblazing work on option pricing. Merton was a brilliant mathematician, who earned an undergraduate degree in engineering at Columbia University, a Ph.D. in applied mathematics at the California

[6]Meriwether neither admitted nor denied culpability. As for the fine, it did not hit his bank account too hard. In December 1992, Meriwether and Thomas Strauss settled a suit for back pay against Salomon Brothers. Meriwether's share of the compensation settlement was $18 million. Kevin Muehring, "John Meriwether by the Numbers," *Institutional Investor* 30 (11) (November 1996), 68–81.

Institute of Technology, and a Ph.D. in economics from the Massachusetts Institute of Technology (MIT). While teaching at MIT's Sloan School of Management and later at the Harvard Business School, Merton made significant contributions to finance in the area of option pricing models. His research linked continuous-time stochastic processes with continuous-decision-making by agents, and this led him into pricing contingent contracts, like options.

Myron S. Scholes, a native Canadian, was one of the most creative dreamers in the LTCM group. He graduated from McMaster University in Canada with a degree in economics and went on to receive a Ph.D. from the University of Chicago. Afterwards, Scholes taught at prestigious academic institutions, such as MIT's Sloan School of Management, the University of Chicago's Graduate School of Business, and Stanford University's Business School and Law School. From the start, Scholes was interested in factors determining the demand for traded securities and the characteristics that differentiated one security's risk/return profile from another. Scholes met Robert Merton while they were both teaching at MIT and began collaborating on the work that won them the Nobel Prize. Later, they renewed contact when they were hired by Salomon Brothers as consultants.

David W. Mullins, Jr., became a professor at Harvard University's Graduate School of Business Administration after completing his undergraduate work at Yale University, receiving his M.S. degree in finance from MIT's Sloan School of Management, and earning a Ph.D. in finance and economics at MIT. In March 1989, Mullins was selected by President George H. W. Bush to be Assistant Secretary for Domestic Finance, and in December of the same year, he became one of the seven members of the Federal Reserve System's Board of Governors. Highly regarded and well connected, especially in international circles, some thought that Mullins might one day replace Alan Greenspan as Chairman of the Federal Reserve.

These four principals joined a handful of others from academia and practice to form LTCM. Together they helped to develop trading strategies, which they were confident would bring them all unheard-of profits.

LTCM'S Strategy

The principles guiding LTCM's strategy were focused and clear: identify small imperfections in the market; exploit these imperfections mercilessly, using as little equity capital as possible by taking leveraged positions that elevate risks to relatively high, but controlled, levels; secure long-term funding to be able to ride out aberrations in price movements; and charge hefty fees for the world-class talent employed to develop and implement trading strategies.

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IDENTIFYING SMALL MARKET IMPERFECTIONS

LTCM earned its profits during the transition periods when markets were out of equilibrium (i.e., moving from one equilibrium to another). The company was not trying to find a needle in the haystack; rather, it was trying to find a haystack of needles. In other words, LTCM did not devote research time and effort trying to discover rising stars, like Microsoft or IBM. Rather, it searched for a multitude of low-risk arbitrage deals, each earning relatively miniscule returns, but, using its billions of dollars of investment funds, LTCM was able to accumulate substantial earnings. Relatively few of LTCM's trades were outright bets on the direction of individual assets' prices, but rather they were wagers on the spread between asset prices and the spread between yields. The goal was to construct a market-neutral portfolio that gained value in rising and falling markets.

To execute its strategies and attain the desired risk-return goals, LTCM needed abundant sources of credit and substantial market liquidity to reverse positions quickly and at firm prices. Therefore, maintaining a high credit rating was essential because, without it, LTCM's sources of finance and trade counterparties would surely disappear.

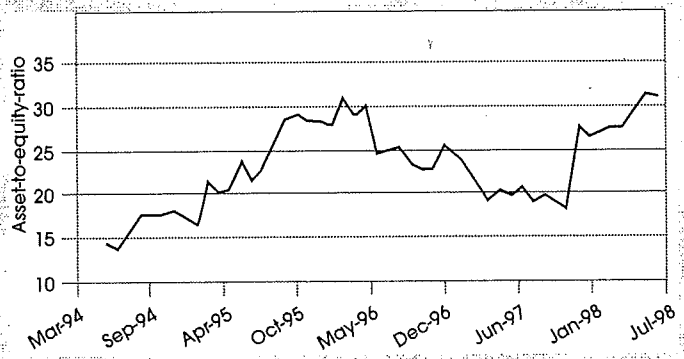
LTCM used its high-powered research team and expert understanding of security markets to study relationships between the prices of different investment assets, assorted maturities of the same asset, assets and their derivative counterparts, as well as various types of derivatives. Whenever two assets' *relative values* looked out of whack and a rational explanation could be given for why they should converge to the historic norm, LTCM traders exploited the opportunity with as much financial firepower as they could muster, purchasing the relatively underpriced asset and simultaneously selling the relatively overpriced asset.

USING A MINIMUM OF EQUITY CAPITAL

The second facet of LTCM's strategy was to exploit market imperfections, using as little equity capital as possible. Equity was conserved to pay for necessities, like margin requirements on LTCM's leveraged (equity and derivative) positions and *haircuts* on its reverse repurchase agreements.[7] The company also earmarked risk capital in case unfavorable price movements caused cash outflows on contracts that were marked to market. Exhibit 8.1

[7]This leverage ratio put LTCM nearly on par with the top five investment banks and approximately double the ratio of the top five banks. See President's Working Group on Financial Markets. *Hedge Funds, Leverage, and the Lessons of Long-Term Capital Management: Report of the President's Working Group on Financial Markets.* Washington, DC: Department of Treasury, 28 April 1999, 29.

Exhibit 8.1 LTCM's Asset-to-Equity Ratio: March 1994 to July 1998



Source: André F. Perold, "Long-Term Capital Management, L.P. (A)," Harvard Business School, Case 9-200-007, 22.

shows LTCM's asset-to-equity ratio from March 1994 to July 1998. At times during this period, LTCM's leverage exceeded 30-to-1.

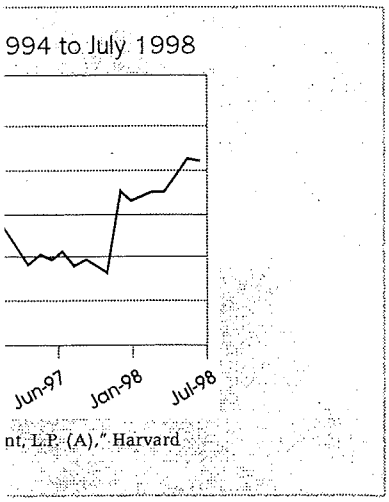
In the absence of equity, LTCM financed most of its security purchases with reverse repurchase agreements (reverse repos) having six-month to 12-month maturities.[8] Under a reverse repo agreement, LTCM bought a bond, and then used it as collateral for a loan, the proceeds from which LTCM used to pay for a new bond. So long as LTCM's interest costs were less than the return on its securities, profits could be earned.[9]

With limited equity at its disposal, LTCM also leveraged its positions by entering into over-the-counter total return swaps. In exchange for paying a fixed or floating rate of interest, these financial instruments gave LTCM the financial benefits of owning the underliers (e.g., equity indices, bundles of loans, or portfolios of bonds) but at a fraction of the cost in terms of equity expended. For example, with a total return swap on a share index, LTCM could acquire the risk-return profile of a diversified stock portfolio, finance it with fixed-rate or floating-rate borrowings, and use a relatively small portion of its own capital to meet any collateral requirements and/or mark-to-market obligations.[10] The U.S. margin requirement on stocks is 50%; so, the savings, in terms of capital conservation, can be considerable.

[8]Under a *reverse repurchase agreement,* an individual sells securities at a specified price to a securities dealer with a simultaneous commitment to repurchase the same or similar securities at a fixed price on a specific date in the future. Usually, reverse repos have very short-term maturities (e.g. overnight), but term repos are also available. The yields on repo loans are among the lowest, because they are colateralized with securities.

[9]LTCM had about 75 counterparties for its repurchase and reverse repurchase agreements.

[10]Collateral requirements are negotiated based on a hedge fund's overall level of perceived risk.



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An example might help to clarify these swaps. Suppose LTCM entered into a total return swap on the S&P Stock Index with no collateral or mark-to-market provisions. The swap had a maturity of two years and a $100 million notional principal.[11] LTCM was required to pay the London interbank offered rate (LIBOR) plus 1.5%, and LTCM received the total return earned on the S&P Stock Index. At the end of Year 1, if dividends equaled 2%, and the S&P Stock Index *appreciated* by 10%, then LTCM would receive 12% of the notional principal and have to pay LIBOR plus 1.5%. If LIBOR were 5%, then LTCM would receive a net payment equal to 5.5% (i.e., $5.5 million) from its swap counterparty.[12] By contrast at the end of Year 2, if dividends equaled 1%, the S&P Index *fell* by 8%, and LIBOR were 6%, then LTCM would pay its swap counterparty 14.5% (i.e., $14.5 million).[13]

The Effects of Leverage on Risk and Return

LTCM's leveraged positions elevated both risk and potential return. Leverage created an enormous difference between the company's return on total assets and its return on equity. To understand why there was such a large difference, let's round off LTCM's 1997 equity at $5 billion and see what difference leverage has on the company's return on equity.

If LTCM started with $5 billion of equity and invested only these funds (i.e., it borrowed nothing) in assets earning 5%, at year's end, it would have earned $250 million, which would be a 5% return on both its assets and its equity (see Exhibit 8.2). By contrast, assume that LTCM leveraged its $5 billion equity by borrowing $120 billion and earning a net return on these assets of 5%. At year's end, the $5 billion of equity-financed assets would have earned $250 million (just as before) and its $120 billion of debt-financed assets would have earned $6 billion. The total return on assets would be 5% (i.e., [$250 million + 6 billion]/[$5 billion + $120 billion] = 5%), but the return on equity would be 125% (i.e., [$250 million + $6 billion]/[$5 billion] = 125%); see Exhibit 8.2. In other words, the return on assets was exactly the same as before, but borrowed funds increased the return on equity 25 times.

For highly leveraged firms like LTCM, any profits on the mountain of debt-financed assets causes the return on equity to skyrocket, but at the same time, losses could quickly wipe out the skimpy equity backing these

[11]The $100 million principal is *notional* because it is in the background from the beginning to the end of the swap. Neither counterparty is required to pay or expects to receive it. The $100 million principal is used only to figure out the counterparties' net payment/receipt each period.

[12]LTCM would earn 2% in dividends, plus 10% in capital gains, and be required to pay LIBOR plus 1.5% (i.e., 6.5%), which yields a *net return* of 5.5% (i.e., 10% + 2% − 6.5% = 5.5%).

[13]LTCM would earn 1% in dividends, lose 8% on the S&P Stock Index, and be required to pay a LIBOR plus 1.5% (i.e., 7.5%), which yields a *net loss* of 14.5% (i.e., 1% − 8% − 7.5% = −14.5%).

Exhibit 8.2 Is Return on Equity Meaningful for Highly Leveraged Companies?

	Equity (Millions $)	*Assets (Millions $)*	*Dollar Returnn on Assets (Millions $)*	*Return on Equity*	*Return on Assets*
Case 1	5,000	5,000	250	250/5,000 = 5%	250/5,000 = 5%
Case 2	5,000	125,000	250 +6,000 6,250	6,250/5,000 = 125%	6,250/125,000 = 5%

assets. At the beginning of 1998, LTCM had assets equal to approximately $125 billion and equity equal to $4.7 billion, so a mere 3.8% decline in asset value would have eliminated all of the firm's equity.

Elevate Risks to Relatively High, but Controlled, Levels

LTCM increased the risk of its portfolio because the company understood full well that greater risk brought the potential for greater returns. To control these risks, LTCM diversified its portfolio and used a statistical tool called Value at Risk. LTCM also employed an extensive and detailed working capital model that gave incentives to traders to finance their positions using term agreements, rather than use overnight financing to manage liquidity risks.

Diversification LTCM's managers tried to acquire a portfolio that was diversified by geographic region, security market, and currency. By owning positions with uncorrelated returns, unexpected negative shocks were expected to offset (fully or partially) unexpected positive shocks, thereby smoothing the portfolio's average return. For example, if LTCM was long European swaps but short U.K. swaps, the unanticipated gains (or losses) on the U.K. swaps might offset (fully or partially) the unanticipated losses (or gains) on the European swaps. Similarly by making diversified currency bets, LTCM's returns could be stabilized because the depreciation of one currency might be offset by the appreciation of another.

Value at Risk (VaR) To determine the appropriate level of risk, LTCM relied heavily on Value at Risk (VaR) analysis to quantify the vulnerability of its portfolio to changes in market prices and returns. VaR is a statistical measure, which is used mainly by institutions that want to determine the downside vulnerability of their actively traded portfolios. With VaR, a company can make statements like: "We are 99% certain that our portfolio

will lose no more than $105 million during any one day" or "For 99 of the next 100 days, we should lose no more than $105 million."[14]

VaR analyses are based on estimates of volatility, and typically the historical standard deviation of the asset returns in a portfolio is used as a proxy for this volatility. The academic superstars at LTCM were skilled in advanced econometric and computer techniques; so, they could interpret past data in very sophisticated and meaningful ways. But for all their sophistication, the results of these analyses were meaningless if the future turned out to be significantly different from the past.[15]

The operational goal at LTCM was to lift the risk of its portfolio to 20% of net asset value (NAV)[16] per year (i.e., it wanted its portfolio to have a yearly range of fluctuation equal to 20% of its value),[17] but the company found this goal was almost impossible to achieve. Despite the leverage it maintained, LTCM could not raise its portfolio's risk level to the desired height. One reason LTCM found this task to be so difficult was because it was engaged mainly in spread trades, which are inherently less risky than outright positions.

Another reason for LTCM's inability to increase its level of portfolio risk can be traced to the fund's size. LTCM was so large that, when an opportunity presented itself, the fund would quickly try to build a position, but in doing so, LTCM would buy and sell in such volumes that market prices would change and erode the potential profits. As a result, LTCM's ability to make large trades was curtailed. Similarly, when LTCM tried to liquidate its positions, the size of its transactions and the illiquidity of the assets in its portfolio caused prices to move adversely and erode the company's gains. As a result, LTCM had to take smaller positions than desired because it was not sure that they could be liquidated at profitable rates.

Finally, LTCM had difficulty increasing its level of risk because success breeds imitators. Try as LTCM did to keep its strategies, positions, and transactions secret, the financial world was not blind to the sources of this company's success. Imitators with similar strategies and portfolios began to dot the financial landscape like dandelions in spring. Competition made the markets more competitive, which reduced the opportunity to earn returns on mispriced assets.

[14]VaR estimates could be made for any desired time period (e.g., day, week, month, or year), as long as sufficient information was available.

[15]See Appendix 8.2: What Are the Problems With Value at Risk, which can be found at http://www.prenhall.com/marthinsen.

[16]"Net asset value" is the dollar value of a fund's assets minus its liabilities divided by the number of shares outstanding. Net asset values are closely watched statistics and usually updated every day.

[17]See André F. Perold, "Long-Term Capital Management, L.P. (A)," Harvard Business School, Product number: 9-200-007 (5 November 1999), 11–12.

SECURING LONG-TERM FUNDING

In developing its strategy, LTCM knew that some of its positions could take as long as six months to two years before they earned profits, and, therefore the company needed well-developed and extensive financial backing (liquidity) from banks and other financial institutions to be able to wait it out. LTCM arranged credit lines ($900 million),[18] a three-year, unsecured loan ($230 million), and financed most of its security purchases in the six-month to one-year (reverse) repo market, which gave the company a buffer that would not have been present if it had used the *short-term* reverse repo market. LTCM also stabilized its equity financing by writing a covenant into the investment contract that limited investors' ability to withdraw capital from the fund. At first, this covenant stipulated that equity remain invested for at least three years, but in 1996 this restriction was eased, allowing investors to cash out one third of their capital at the end of each year after the first one. Therefore, someone who invested $12 million at the end of 1996 could withdraw nothing in 1997, but thereafter could withdraw $4 million at the end of 1998, 1999, and 2000.

It is fair to say that without these immense and, at times, unquestioned funding sources, LTCM could never have pyramided its positions to the towering levels it achieved. Brimming with funds during the boom years of the 1990s and eager to do business with the best and the brightest, many banks and dealers ignored time-tested banking principles, like demanding collateral for loans, ensuring that charges were sufficient for the risks taken, properly accounting for (off-balance-sheet) derivative positions that increased their exposures to LTCM, and demanding business relationships that were transparent instead of obfuscated with crafty legerdemain. LTCM's secretive practices created a shield behind which the fund could conceal the extent to which it was indebted. As a result, each counterparty saw only its piece of the business and not the total structure of risks and returns that LTCM had built.

Long-term funding was crucial to LTCM's strategy because it allowed the company to take positions and then hold them, if necessary, for extended periods. LTCM was a risk taker and often took positions that few others would touch. Of course, LTCM took these positions because it felt the expected rewards were adequate for the risks being assumed. As the company's portfolio grew and became more diversified, additional risk became easier to take on because most of the nonsystematic risks associated with the new positions dissolved in the vast melting pot of LTCM's other assets.

[18]This credit facility was syndicated by Chase Manhattan Bank with about 24 other financial institutions. In general, credit lines are relatively expensive sources of financing for hedge funds. Therefore, they usually increase their leverage with reverse repurchase agreements and derivatives.

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To ensure that LTCM had sufficient liquidity, long-term sources of financing were crucial, but equally important were the roles of LTCM's back office and Bear Stearns, LTCM's agent for clearing, settling, and keeping track of trades. At times, LTCM had thousands of open derivative positions with a total notional value of about $1.25 trillion. Many of LTCM's contracts were marked to market, which meant that the company had to pay out funds daily to settle its losing trades and, of course, it had to make sure payments were received on its winning trades. Tracking the cash flows connected to LTCM's numerous positions was a sophisticated operation. What made this task even harder was LTCM's custom of hiding its positions by transacting complicated deals using multiple counterparties for different legs of the transactions. As a result, netting margin payments was often impossible.

CHARGING HEFTY FEES

LTCM's fees were head-and-shoulders above the industry average (some would say excessive), charging an annual 2% base fee on the fund's NAV. Most other hedge funds charged 1%. In addition, an incentive fee amounting to 25% of the increase in the company's NAV was charged. Most other funds charged 20%, but if LTCM's NAV fell, the 25% charge did not kick in until the fund's all-time high was surpassed.

How could LTCM charge fees that were so much above the industry standards? What would *you* pay to have the intellectual power this company brought to the table? An article in *Institutional Investor* characterized LTCM as having "...in effect the best finance faculty in the world."[19] Seven of its 12 founding principals were connected, in some way, to Harvard University or MIT, either as graduates, faculty members, or both. Clearly, the LTCM principals were able to convince investors that their strategy would work; for a while, it seemed they were right.

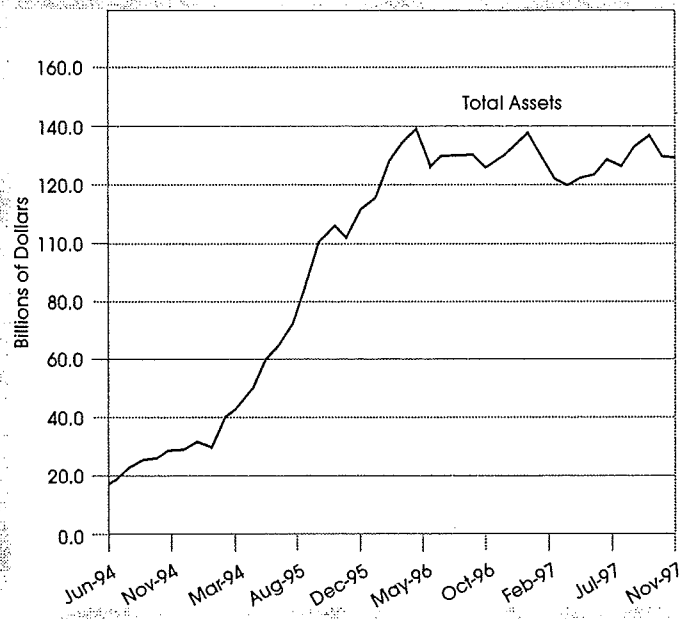
LTCM'S Impressive Performance: 1994–1997

In the early years, LTCM's record spoke for itself. From 1994 to 1997, LTCM's total assets increased from approximately $20 billion to $130 billion (Exhibit 8.3).

One of the main reasons for the rapid increase in LTCM's assets was because of the company's outstanding earnings record. Exhibit 8.4 shows

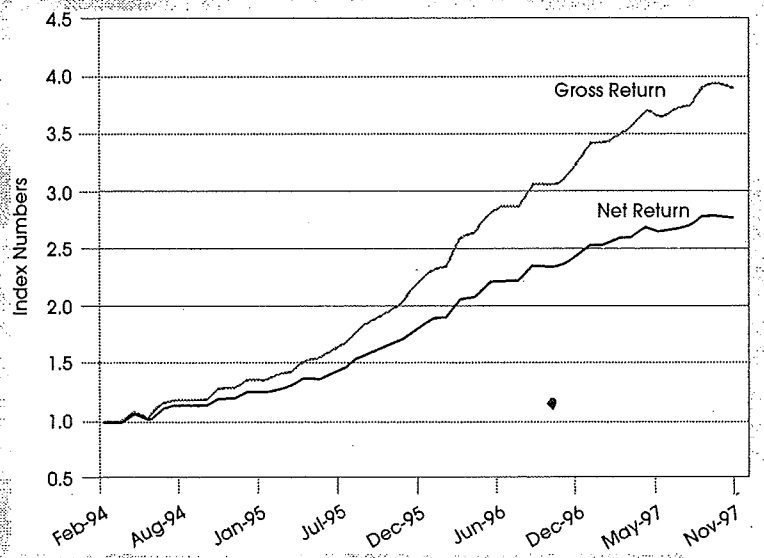
[19]Comment by Douglas Breeden, professor at Duke University and principal at Smith Breeden Associates. See Kevin Muehring, "John Meriwether by the Numbers," *Institutional Investor* 30 (11) (November 1996), 68–81.

Exhibit 8.3 The Meteoric Rise in LTCM's Assets: June 1994 to November 1997

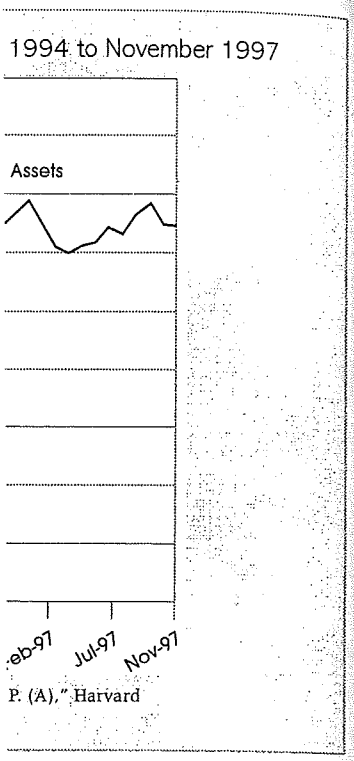


Source: André F. Perold, "Long-Term Capital Management, L.P. (A)," Harvard Business School, Case 9-200-007, 22.

Exhibit 8.4 Index of LTCM's Gross and Net Returns: February 1994 to November 1997 *(February 1994 = 1.0)*



Source: André F. Perold, "Long-Term Capital Management, L.P. (A)," Harvard Business School, Case 9-200-007, 19.



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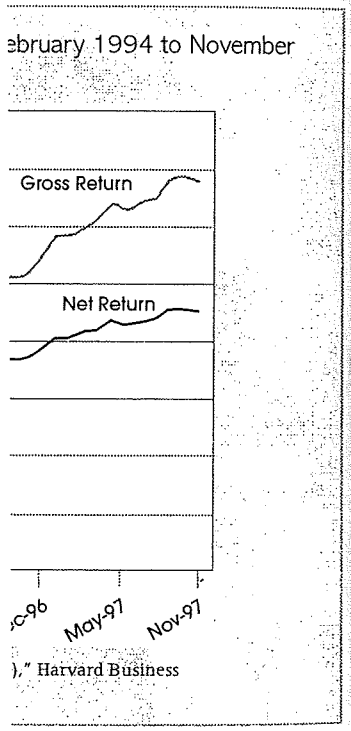

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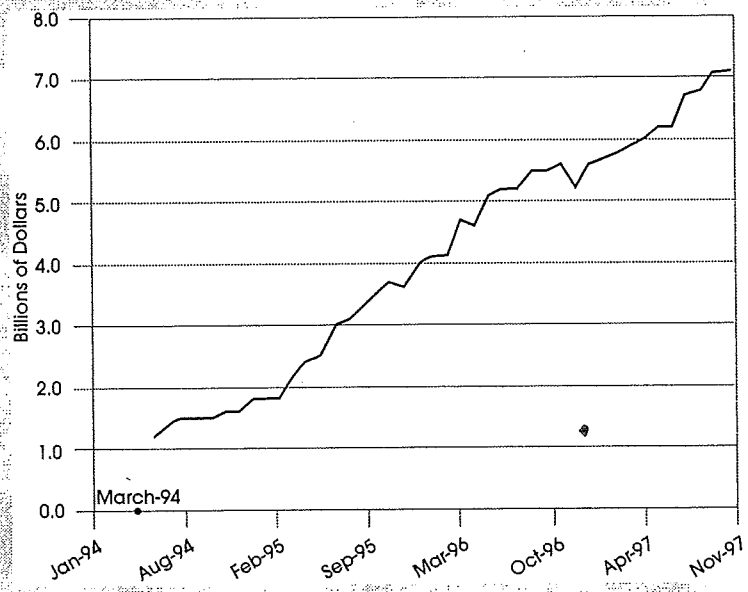
the gravity-defying increase in LTCM's earnings from February 1994 to November 1997, as LTCM's gross returns and net returns (i.e., returns net of LTCM fees) increased by approximately 290% and 180%, respectively. Not only were these returns high, they were also stable, with only occasional monthly declines, which were quickly offset the following months by gains.

From 1994 to the end of 1997, LTCM's investors, along with its principals and hundred-fifty or so employees, were elated with the fund's performance. The principals were especially happy. Between March 1994 and November 1997, LTCM built its equity base from $1.25 billion to $7.1 billion (Exhibit 8.5). Principals, who invested $146 million, had their LTCM equity grow in three short years to $1.9 billion.

"Phenomenal" and "sensational" were adjectives attached to LTCM's performance. During the first three years of its life, the annual return on equity exceeded 40%. But can success be judged only by looking at the growth of assets and equity and the return on equity? Shouldn't risk also be considered? Most of LTCM's return on equity was due to the stratospheric levels to which the company leveraged itself. Despite LTCM's exceptional returns from 1994 to 1997, estimates indicate that the company's gross return on assets was mediocre, between 0.67% and 2.45%, and when its off-balance-sheet

Exhibit 8.5 LTCM's Equity: March 1994 to November 1997



Source: André F. Perold, "Long-Term Capital Management, L.P. (C)," Harvard Business School, Case 9-200-007, 8.

positions were considered, the return was 1% or lower.[20] But even at a paltry 1%, when leveraged by a 30-to-1 ratio, translated into a 30% return on equity.

Evaluating LTCM based on its risk-adjusted rate of return is an even-handed way of assessing the company's performance relative to other hedge funds and investments. At the same time, any overall evaluation of LTCM should recognize the company's positive impact on the development and functioning of the global financial system.

LTCM'S Contributions to Efficient Markets

LTCM's contributions go beyond the return on equity it gave to its principals and investors during the three-year period of extraordinary growth. For a brief while, LTCM contributed significantly to the functioning and efficiency of the national and international capital markets. LTCM provided liquidity to markets that needed buyers *and* sellers. Many of its positions were illiquid because no one else dared to accept the risks at quoted market prices. LTCM was willing to do so only because its expertise (and there was enormous expertise in the company) in finding mispriced opportunities led it to accept such risks. LTCM was the willing counterparty to which numerous market participants could transfer risks, and its profits came from valuing the risks more accurately than other market participants.

LTCM's return on assets was small, but it made extraordinary profits by borrowing a mountain of funds and using them to sweep up money that was left sitting on the table due to capital market inefficiencies. As a result of its buying and selling (and LTCM was willing to take either side of a misaligned market), the markets came closer into alignment, which ensured that thousands of other participants got fairer prices for their transactions.

Despite its contributions to market efficiency and its initial successes, in the end, LTCM failed—and in spectacular fashion. Understanding the causes of this collapse provides insight into why no strategy is bulletproof and no bet is a sure thing when global financial markets are involved.

Why and How LTCM Failed

LTCM was an extraordinary company that failed because of extraordinary circumstances. Just as a well-built house can collapse if it is constructed

[20]See Roger Lowenstein, *When Genius Failed: The Rise and Fall of Long-Term Capital Management*. New York: Random House, 2000, 78, and Carol Loomis, "A House Built on Sand," *Fortune* 138 (8) (26 October 1998), 110–118.

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on a geological fault line, a well-built hedge fund can crumble if it is constructed on faulty assumptions about the market and the inherent risks in its portfolio. The risks associated with LTCM's enormous size and high leverage ratios were supposed to be controlled by a diversified portfolio and state-of-the-art risk management tools. The company was supposed to earn stable returns regardless of whether the markets were rising or falling. What happened?

LTCM's failure was the result of a chain reaction involving three major catalysts. The first was a series of *exogenous macroeconomic shocks* that acted like economic lightening bolts to shake the entire hedge fund industry. Once shaken, the hedge fund industry attacked itself, causing many self-inflicted wounds. These *endogenous, hedge-fund-related reactions* undermined many of LTCM's basic risk-management assumptions and called into question the company's risk-management measures. The final catalyst in this chain reaction of events involved *feedback effects* that jeopardized LTCM's creditworthiness and, therefore, threatened its sources of financing and its clearing arrangements. Even though LTCM was able to meet every margin and collateral call, there was considerable fear (especially in September 1998) that it would not be able to do so.

EXOGENOUS MACROECONOMIC SHOCKS: U.S. AND GLOBAL SPREADS WIDEN

LTCM and its many imitators placed major bets on spreads narrowing in worldwide markets. But because of a series of major economic catastrophes, spreads widened in almost every market, and everywhere you looked (i.e., domestically, internationally, and cross-border) these bets began to hemorrhage cash.

U.S. Yield Spreads Widen

During 1998, U.S. spreads skyrocketed. For example, relative to U.S. Treasury bonds, the spread on mortgage rates surged from 95 basis points to 120 basis points; the spread on corporate bonds rose from 99 to 105 basis points; junk bond spreads rose from 224 to 276 basis points; swaps rose from 35 to nearly 100 basis points, and the spread on B-rated bonds relative to triple-A-rated bonds rose from 200 to 570 basis points. Emerging country debt rose from 300 to 1,700 basis points above the U.S. Treasury bond rate. The same pattern appeared throughout the world. Remember, LTCM's strategy was to bet that spreads would return to a normal range. As spreads continued to widen, LTCM began to record deep losses.

Yield Spreads Widen Globally

Numerous events converged on LTCM (and the world at large) in 1997 and 1998 to widen the spreads on virtually all financial assets. A statistician, trying to estimate the probability of *all* these events happening at once, would probably have calculated the odds at about the same level as someone being struck multiple times by lightning or being killed by falling space debris.

Asian Tiger Crisis of 1997 One of the first significant events to hit LTCM was the Asian Tiger crisis, which started in Thailand during the summer of 1997, spread to other East Asian countries (the Philippines, Malaysia, South Korea, Indonesia, and Hong Kong), and went on to affect countries as far away as Argentina, Brazil, and (yes) the United States. The source of the 1997 problem was the Asian countries had long pegged their currencies to the U.S. dollar, but their exchange rates had become unsustainably overvalued. Speculators, sensing devaluations were imminent, pounded the markets tenaciously by selling baht, rupiahs, ringitts, and pesos. The central banks of these Asian nations supported their fixed exchange rates until they ran out of international reserves. When they did, their currencies were cut loose to float untethered to the moorings of the U.S. dollar.

When currency crises like these happen, investors typically respond by investing heavily in safe assets and sound currencies. As a result, they bought dollar-denominated U.S. government bonds and invested deeply in stable assets denominated in European currencies, such as German marks and Swiss francs. This flight to quality pushed down the yields on financial assets in the developed nations and pushed up the return on assets in the emerging markets, causing spreads to widen. LTCM had bet continuously that the spreads would narrow, so when they widened, the company lost on both sides of its spread positions. But in the stormy clouds of this international crisis, LTCM saw a glimmer of light because wider spreads meant new opportunities to increase its positions and to benefit later when the spreads converged to their historically normal ranges. The problem was finding ways to finance these new opportunities in a stressed economic environment.

Because its Asian investments were concentrated mainly in Japan, LTCM weathered the Asian storm and managed to end 1997 with a respectable, albeit diminished, return. Even after refunding $2.7 billion[21] to investors at the end of 1997, LTCM's equity capital was still at a healthy $4.7 billion

[21]At the end of 1997, LTCM forced investors to take back $2.7 billion of their investment funds, but the company did not reduce its investment positions. This forced refund is discussed later in this chapter and also in the Epilogue: What Happened to the Partners, Creditors, Investors, and Consortium? at the end of the chapter.

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level. *What doesn't kill you, makes you stronger* might have been the credo at LTCM as 1998 began.

Russian Default No sooner had the Asian crisis left the front pages of the press than the financial crisis in Russia began. Like the Asian Tigers' currencies, capital flight put enormous pressure on the international value of the ruble; to complicate matters, the price of oil (a major Russian export) was falling. Russia tripled its interest rates to encourage investors to stay in rubles, but these efforts only served to undermine the ability of domestic businesses to borrow at reasonable rates in order to finance normal business activities (e.g., working capital, capital expenditures, and expansion). Who can afford to borrow when interest rates are more than 200%?

Bankruptcies soared, unemployment rose, government budget deficits grew, many banks were threatened with insolvency, and the central bank's international reserves were depleted. With Russia's economic and financial systems staggering on the brink of collapse, the IMF arranged a $22.6 billion bailout in July 1998; unfortunately, the bailout was not enough to stave off the crisis. The ruble continued to fall. On 17 August, Russia devalued the ruble and announced a debt moratorium on $13.5 billion of *local currency* debt.[22]

LTCM lost on its Russian bond positions, but the company's exposures were limited relative to other hedge funds and securities firms. What was important about the Russian ruble crisis was that it triggered contagion,[23] which spread to other parts of the world (e.g., Brazil, Turkey, and Venezuela), to many other investment markets and, thereby, affected many other hedge funds in a similar way.

Volatile Political and Economic Climate

Bad economic and political news continued during late 1997 and 1998 and hit LTCM like relentless sledgehammers. In August 1997, Tellabs, Inc., a company in which LTCM held positions, announced that the shareholder vote for its acquisition of Ciena Corp. would be canceled. Spreads widened and LTCM incurred heavy cash outflows to meet compulsory margin requirements. In the end, losses amounted to about $150 million. LTCM's profits were further eroded when an International Monetary Fund (IMF)–led bailout of Indonesia ran into problems, and rioting forced President Mohamed Suharto to resign after 32 years of authoritarian rule; China threatened to devalue the yuan because the Japanese yen's depreciation had hurt China's export trade; Iraq was stirring Middle East tensions as it

[22]Russia had made a $3.5 billion Eurobond issue less than a month before the default, causing widespread speculation that Russia would default, as well, on these dollar-denominated securities.
[23]See Risk Notepad 8.2: What Is Contagion?

Risk Notepad 8.2

What Is Contagion?

Contagion occurs when events in one nation or region spill over to other nations or regions. The more closely linked the economies, the more likely changes in one will influence the other, and the more similar are countries' circumstances (e.g., in terms of current account and budget deficits, and rates of inflation, real GDP growth, and unemployment), the more likely currency speculators will select those countries as potential targets.

Contagion has been responsible for transmitting considerable economic hardship to many countries. For instance, when the Mexican peso (*Tequila*) crisis occurred in December 1994, investors panicked and tried to pull their funds out of countries like Argentina, Brazil, and Venezuela, which had similar economic characteristics (e.g., unsustainable fiscal and current account imbalances) as Mexico. Similarly, the Asian crisis in 1997 and 1998 had a significant impact on nearby countries as the core of the crisis spread from Thailand to the Philippines, Malaysia, South Korea, Indonesia, and Hong Kong, but it also spread as far as Latin America, where countries like Argentina and Brazil were impacted.

Contagion is herd behavior at its worst, and its cold, cruel touch can disrupt trade flows, capital markets, investment decisions, government and central bank policies, bank lending, inflation rates, and the size of government budget deficits.

thwarted U.N. weapon inspection teams. All of these events converged and drove a larger wedge between developing nations' yields and the yields of developed nations. As yield spreads widened, LTCM's losses mounted.

ENDOGENOUS SHOCKS: SPREADS GO HELTER SKELTER AND VAR GETS TWISTED

By 1998, many hedge funds were built to imitate the past successes of LTCM. As a result, the diversified portfolio that LTCM spent so much time constructing was duplicated many times over. Wider margins put these similarly structured hedge funds under pressure to cover their losses, as well as meet the collateral obligations, haircuts, and margin requirements on both new trades and existing positions. Investors fled to safer investments, and hedge fund managers tried, simultaneously, to reduce their exposures.[24]

The mass exodus of hedge funds from existing positions caused market spreads to change in predictable but bizarre ways. Relative value trades

[24]The importance of these endogenous reactions is highlighted in Donald MacKenzie, "Long-Term Capital Management and the Sociology of Arbitrage," *Economy and Society* 32(3) (August 2003), 349–380. A relatively recent empirical study casts some doubt on the importance of the endogenous effects. See Tobias Adrian, "Measuring Risk in the Hedge Fund Sector," *Federal Reserve Bank of New York Current Issues in Economics and Finance* 13(3) (March/April 2007), 1–7. This study is also available at: http://www.newyorkfed.org/research/current_issues. Accessed 28 December 2007.

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that were bets on wider spreads narrowed, and relative value trades that were bets on narrower spreads widened. It was as if all the care and thought that talented hedge fund managers had put into analyzing and then taking positions were suddenly thrown out the window.[25] In June and July of 1998, the situation got worse as Salomon Brothers began to liquidate its proprietary bond arbitrage business. Salomon's decision to exit resulted in a flood of security sales that coincided with LTCM's largest pre-crisis withdrawals and helped set the stage for even greater losses for LTCM later.

LTCM built *what it thought* was a portfolio of economically unrelated positions. What it missed seeing was that many of these positions were linked by similar investment fund owners with similar strategies. As a result, the price volatility of these positions was connected by parallel risk tolerances, funding needs, and liquidity requirements. Rather than being highly uncorrelated, the positions in LTCM's portfolio turned out to be highly correlated with the portfolios of other hedge funds. This misperception caused LTCM to underestimate its true level of risk, causing the company to move with abandon in the wrong direction. Under normal conditions, LTCM's asset distribution would have been fine, but when the correlations among returns converged to one (i.e., perfect correlation), the normal protections afforded by diversification were eliminated. Losses on one position were just as likely to be matched, rather than offset, by other positions.[26]

The situation was made even worse by hedge funds and proprietary shops selling positions in anticipation of LTCM liquidating its portfolio. In many cases, these trades were highly speculative because the sellers did not have accurate information about the composition of LTCM's portfolio.

Value at Risk Analysis Gone Awry

How could LTCM have suffered such heavy losses when it systematically used VaR analysis as a navigation tool for estimating its vulnerability to short-term changes in market prices? The fund had never lost more than 2% of its value (i.e., $100 million) in any month since operations began in 1994. At the 99% level of confidence, LTCM's econometricians assured the

[25]This result was anticipated in a research article published in 1997. The authors showed that even trades that will eventually be profitable may have to be abandoned early due to adverse price movements. Therefore, arbitrage may not be able to completely eliminate price anomalies. See Andrei Shleifer and Robert W. Vishney, "The Limits of Arbitrage," *Journal of Finance* LII(1) (March 1997), 35–55.

[26]Based on five-year historical data, the correlation among the asset returns in LTCM's portfolio was approximately 0.1 (or lower). LTCM used a more conservative correlation of 0.3 in its VaR analyses, but even that was not enough. Richard Leahy, a LTCM principal, felt that the true correlation in 1998 was seven times the historic level. See Donald MacKenzie, "Long-Term Capital Management and the Sociology of Arbitrage," *Economy and Society* 32(3) (August 2003), 358, 364.

principals and investors that the company should lose no more than $105 million per day.[27] With LTCM's sizeable equity, there seemed to be more than enough cushion to endure any major hit.

Model Risk

On two important levels, LTCM suffered from high model risk. First, the company adopted the risk-management system of Salomon Brothers, where JM and many of his traders had worked previously. But investment banks are different from hedge funds, and their risk-management systems should also be different. Investment banks usually have a larger number of independent income sources and better access to liquidity than hedge funds. These differences are significant because they influence these financial institutions' exposures to risk and their ability to sustain losses until positions become profitable.

A second source of model risk came from LTCM's use of VaR as its principal measure of portfolio risk. VaR assumes that the future will be like the past, and the world can be summarized by assuming all possible future events fit neatly into a normally distributed, bell-shaped distribution function.[28] Both of these assumptions may be true most of the time, but they are not true all the time.

Exhibit 8.6 summarizes the losses sustained by LTCM in 1998, which amounted to approximately $4.5 billion. Based on VaR, with 99% probability, this company's *yearly* returns should have varied by no more than about $714 million, which was only 10.5% of LTCM's $6.8 billion equity.[29] Otherwise stated, a yearly reduction in returns by an amount greater than $714 million should have occurred roughly *once every hundred years*. Nevertheless, just for the month of August, LTCM's performance was down 44%, and it was down 52% from the previous year.[30] On one day (Friday, 21 August) alone, LTCM lost $553 million, and four trading days later (Thursday, 27 August), it lost an additional $277 million. During the five trading

[27]This $105 million figure is an overestimate. Assuming a highly diversified poctfolio, the daily standard deviation of LTCM's portfolio in September 1997 was $45 million/day; which means that a 99% level of confidence would be 2.33 standard deviations (2.33 × $45 million/day = $105 million/day) from the *average* return. See André F. Perold, "Long-Term Capital Management, L.P. (A)," Harvard Business School, Product number: 9-200-007 (5 November 1999), 11–12.

[28]See Appendix 8.2: What Are the Problems With Value at Risk, which explains in more detail some of the deficiencies of VaR analysis. Available at http://www.prenhall.com/marthinsen.

[29]This $714 million figure was derived as follows: (Standard deviation per year) = (Standard deviation per day) × (Square root of 252 trading days per year). Therefore, $45 million/day × (252 working days/year)$^{0.5}$ = $714.4 million/year.

[30]John Meriwether, "Letter to Investors of LTCM" (2 September 1998). See André F. Perold, "Long-Term Capital Management, L.P. (D)," Harvard Business School, Product number: 9-200-010 (28 October 1999).

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Exhibit 8.6 Trades That Caused LTCM's Losses in 1998

Activity	*Losses*
Stock market volatility	$1,300 million
Swaps	$1,600 million
Emerging markets: Russia	$430 million
Directional trades	$371 million
Equity pairs (e.g., Volkswagen and Shell)	$286 million
Yield curve	$215 million
S&P stocks	$203 million
Junk bond arbitrage	$100 million
Risk arbitrage	Broke even
Total	**$4,505 million**

Source: Roger Lowenstein, *When Genius Failed: The Rise and Fall of Long-Term Capital Management*. New York: Random House, 2000, 234.

days from Thursday, 10 September to Wednesday, 16 September, LTCM lost $145 million, $120 million, $55 million, $87 million, and $122 million, respectively—accumulated losses of $529 million![31] On Monday, 21 September, LTCM again lost $553 million, and the following day racked up losses of $152 million.[32] According to VaR, losses of such magnitude should happen perhaps once every few millennia, but not during the course of one month.[33]

FEEDBACK SHOCKS

As LTCM's position worsened, liquidity dried up, its counterparties sought to protect themselves, and the services of LTCM's clearing agent became problematic. LTCM was desperate for funds and wanted to reduce its exposures, but many of these positions were illiquid. The company knew from the beginning that its positions might be hard to liquidate; so the company

[31]Roger Lowenstein, *When Genius Failed: The Rise and Fall of Long-Term Capital Management*. New York: Random House, 2000, 180.
[32]Ibid., pp. 191 and 197.
[33]Almost half of LTCM's cash outflows in September 1998 (about $1 billion) were from its index option positions. Swaps also accounted for a large portion of the losses. See Donald MacKenzie. "Long-Term Capital Management and the Sociology of Arbitrage," *Economy and Society* 32(3) (August 2003), 349–380.

positioned itself to have enough funding if things went wrong. Now, LTCM found itself with a portfolio of assets that few individuals wanted, and potential buyers, like Salomon Dean Whitter, Société Générale, Bankers Trust, and Morgan Stanley Smith Barney, were driving hard bargains because they knew how distressed LTCM had become.

Aggressive Marking to Market

LTCM always negotiated two-way (i.e., LTCM and its counterparty) collateral and mark-to-market covenants in order to conserve and stabilize its supply of working capital. The company also negotiated term agreements for posting collateral; therefore, when LTCM ran into trouble, dealers could not change the haircuts or other financing terms on LTCM's existing positions. Without such recourse, dealers tried to collect as much as they could by aggressively marking to market LTCM's positions in favor of themselves. This aggressive mark-to-market pricing caused a systematic decline in LTCM's net asset value for virtually every position in its portfolio.

The problem was that, during the 1990s, competition for hedge fund business caused many banks and security firms to relax or discard parts of their internal risk-management policies. Rather than impose collateral requirements that accounted for a hedge fund's *potential* exposures, these financial institutions were satisfied if they covered just *current* exposures. Instead of analyzing the joint effects of credit, liquidity, and market risks, they analyzed each risk as if it were independent. Now, the tide had turned, and these counterparties were scurrying to protect themselves from these highly interdependent risks.

LTCM's penchant for secrecy and opaqueness exacerbated the problem. In an effort to conceal its profitable positions and trading strategies from the market, LTCM often used different counterparties for each leg of a complex deal. For example, it might take a long position in Royal Dutch Shell (RDS) and a short position in Shell Transport (ST), which as a pair has very little risk, but then use RDS as collateral for a margin loan from JP Morgan and borrow ST from Union Bank of Switzerland. Counterparties knew, at best, their own (bilateral) exposures to LTCM, but they had no idea of LTCM's overall level of risk. When LTCM came under financial pressure, these counterparties assumed the worst and panicked. En masse, they considered just their own unhedged legs of LTCM's deals and, therefore, overestimated the company's true level of risk. If they had access to LTCM's records, they would have seen that it had a closely related short position for almost every long instrument and a closely related long position for almost every short instrument. Therefore, the net risk on LTCM's deals was much smaller than the sum of their parts.

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Clearing Services and Legal Uncertainties

LTCM was also in danger of losing the services of Bear Stearns, its agent for clearing, settling, and recording trades.[34] Bear Stearns was adamant that it would stop performing these functions the minute LTCM's deposits fell below $500 million, and LTCM was rapidly approaching this critical threshold level. As conditions worsened, the noose got tighter.

Another problem was that rumors of LTCM's possible demise began to circulate with reports that the company might file for bankruptcy protection in the Cayman Islands. Creditors and counterparties were uncertain of their rights under Cayman law—especially, concerning their ability to net positions, close-out (i.e., terminate) contracts, and sell collateral. This added risk further reduced the willingness of market participants to deal with LTCM.

A Ray of Sunshine: LTCM's Credit Line

Fortunately for LTCM, one source of liquidity not threatened was its $900 million revolving credit line with a syndicate of banks led by Chase. When this credit line was negotiated in 1996, LTCM paid dearly to exclude the *material adverse change* (MAC) provision, which would have allowed the bank syndicate to cut or cancel LTCM's line of credit. LTCM figured (correctly) that, if these funds were ever needed, the MAC provision would probably be in effect. The credit-line agreement stipulated that only if LTCM's equity fell by 50% or more at the end of any accounting period could the facility be canceled.[35] But LTCM's accounting period ended 31 July 1998, and at that point, it had more than enough equity to meet this capital threshold.

The Beginning of the End

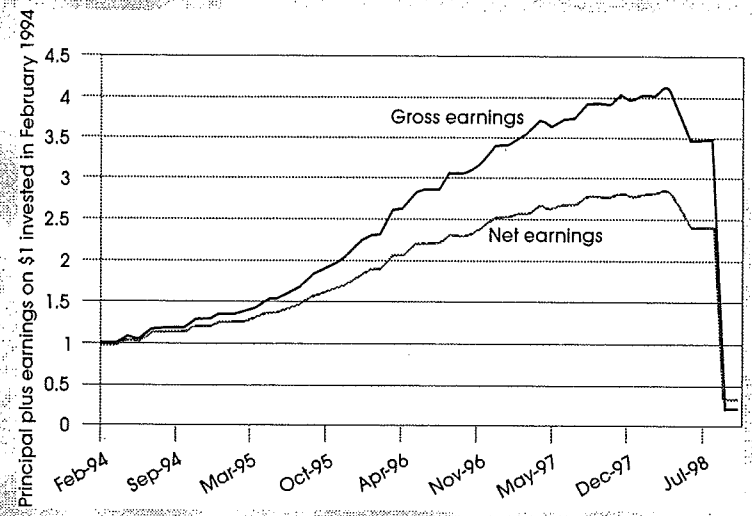
In May and June 1998, LTCM posted losses of approximately 7% and 10%, respectively, then, during July (the lull before the storm), the company almost broke even. The floodgates opened in August 1998, when LTCM's performance was down 44% with 82% of the losses coming from relative trades and 18% from directional trades.[36] Losses of $1.8 billion in August 1998 reduced LTCM's capital base to $2.3 billion, which was about 50%

[34]Bear Sterns was also responsible for financing LTCM's intraday foreign exchange and security transactions, providing margin to purchase securities, and borrowing securities for LTCM's short positions. Bear Sterns eventually stopped providing LTCM with intraday clearing credit and required it to collateralize *potential* settlement exposures.

[35]Covenants on the $900 million term credit prohibited LTCM from drawing down, from one accounting period to the next, more than 50% of the amount by which its equity exceeded $1 billion. See André F. Perold, "Long-Term Capital Management, L.P (C)," Harvard Business School, Product number: 9-200-009 (5 November 1999), 4.

[36]John Meriwether, "Letter to Investors of LTCM" (2 September 1998). See Perold, André F. "Long Term Capital Management, L.P. (D)." Harvard Business School, Product number: 9-200-010 (28 October 1999). See Appendix 8.1: LTCM's Major Trades, which can be found at http://www.prenhall.com/marthinsen.

Exhibit 8.7 LTCM's Accumulated (Normalized) Earnings: February 1994 to July 1998



Source: André F. Perold, "Long-Term Capital Management, L.P. (C)," Harvard Business School, Case 9-200-009, 8.

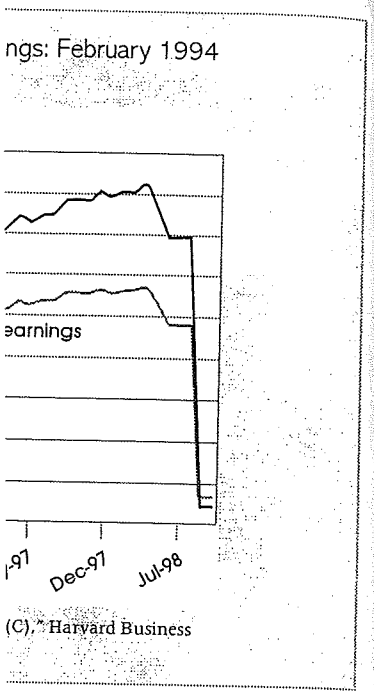
below its year-earlier level. Of these losses, 16% were from LTCM's positions in emerging markets. Despite the illiquidity of its portfolio and its size, LTCM still felt that its funding sources were more than adequate to ride out any storm, but it soon became apparent that the company's funding sources would be exhausted long before the profits on healthy trades could be realized.

Exhibit 8.7 shows the rise and fall of LTCM's earnings from 1994 to 1998. Between 1994 and the end of 1997, LTCM turned each dollar of invested funds into more than $4 of accumulated capital, but in 1998, investors watched in shock as their accumulated earnings fell from $4 to about 33 cents.[37]

The Fed, Warren Buffett, and the Rescue of LTCM

Banks and securities firms that had been funding LTCM and providing necessary services during the company's meteoric rise wanted nothing to do with it once losses started accumulating. No one at the Fed felt any particular responsibility to save LTCM's wealthy principals or its sophisticated investors. Nevertheless, there was fear that LTCM had grown so large and its tentacles had penetrated so deeply into such a wide cross section of the global financial markets that its bankruptcy could result in a financial meltdown of the

[37]Investors who were not principals or in the core investor group did not lose that much when LTCM failed because the company *forced them* in 1997 to take back $2.7 billion of their invested capital. Because LTCM had been so successful up until that point, investors resisted taking back these funds, but in the end, the forced refund saved them billions in losses.



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U.S. and worldwide capital markets. If the markets began to question the solvency of all their counterparties, liquidity in the market could dry up quickly. Globally, Germany's Dresdner Bank AG was facing LTCM-related losses of $144 million; Switzerland's UBS and Credit Suisse reported losses of $678.5 million and $55 million, respectively. Financial institutions in the United States also faced substantial write-offs.

At first, it looked as though LTCM's positions were distributed broadly enough among banks so that, for the most part, losses would not result in any large bank failure or systemic damage (i.e., a domino effect among banks and other financial institutions). Nevertheless, there were still too many hidden cards for the Fed to know how much to wager on this assumption. With LTCM's $80 billion in assets on the line, massive collateral sales could have led to horrific reductions in asset prices and resulted in complicated financial problems, such as the deterioration in bank assets and the withering of credit.

Until 1998, LTCM's records were closely guarded secrets,[38] but by mid-1998, the word was out that it was actively seeking a white knight. No suitors would buy a portfolio sight unseen; so, to convince them that its positions had long-term potential, LTCM had to open its books to Wall Street. The problem was that many of these suitors were LTCM's major competitors, and if they were allowed more than a peek at these records, they could have relayed LTCM's positions to their trading desks and fleeced LTCM like a lamb.

In September 1998, William (Bill) J. McDonough, President of the New York Federal Reserve Bank, called together a consortium of major banks to see if a rescue could be negotiated. Technically, the Fed was sailing in uncharted waters because it did not have jurisdiction over hedge funds like LTCM, but time was running out. On Friday, 18 September, when William McDonough convened the prestigious financial institutions, LTCM's equity stood at $1.5 billion. By the following Wednesday, it was already down to about $600 million. Something needed to be done quickly.[39]

On Wednesday (23 September), just a few days before a deal was struck, Warren Buffett, head of Berkshire Hathaway, along with American International Group Inc. (AIG), and Goldman, Sachs & Co. (GS) made an offer for the assets, liabilities (financing), and contractual positions of Long-Term Capital Portfolio L.P. (LTCP), which was the Cayman Islands–based fund that was managed by LTCM. Buffett wanted to purchase LTCP, keep the financing in place, buy off any net asset value of third-party investors, boot out LTCM's

[38]LTCM was so secretive that it kept its trades confidential even *after* the positions were closed.

[39]The negotiations among LTCM, consortium members, and the Federal Reserve can be analyzed in the context of a classic *prisoner's dilemma* game. This framework illuminates the tradeoffs between private and public incentives as well as the differences between one-time static games and repeated games. See Beth Seely, "Long-Term Capital Management: An Analysis of Intervention as a Prisoners' Dilemma," *Working Paper No. 99–01*, Division of Economic Analysis: Commodity Futures Trading Commission (Washington D.C., 24 February 1999), 1–20.

madcap traders, and take control of the board of directors. The $250 million offer would have gone to LTCM's shareholders with the promise of an additional $3.75 billion, if needed, to stem future losses. Most of the funds ($3 billion) were to come from Berkshire Hathaway.[40] Buffett made his offer at about 11:00 A.M. and gave LTCM an hour to respond. Given the strict time limit, JM was unable to secure the needed approvals.[41] As a result, Buffett's offer went unanswered and lapsed after one hour.

Risk Notepad 8.3

Another Look at Warren Buffett's Offer for LTCM

LTCM might have accepted Warren Buffett's offer, but there was a major technical problem. JM and his management team had only one hour to respond. Many financial agreements (e.g., swaps) require counterparty approval before they can be assigned. Cleary, most of LTCM's counterparties would have been delighted to transfer their positions to BH-AIG-GS, but LTCM had more than 240 major counterparties and thousands of complicated deals to consider.[42] Under normal conditions, it would have taken more than an hour to get the necessary approvals. Accomplishing this feat under the threat of bankruptcy and while making sure to avoid claims of fraud or deception proved to be an impossible task in the space of 60 minutes. As a result, Buffett's offer was not rejected by JM. It simply lapsed without an answer.

To this day, the one-hour time limit imposed on JM is confusing. It makes sense from the perspective that LTCM's asset prices were changing dramatically, and any bid faced considerable risk. The short time fuse was also a precaution against having the bid shopped around. Still, Warren Buffett was one of the premier investors of the twentieth century and must have known (or been advised) that LTCM needed counterparty approval before positions could be transferred. Therefore, it is unclear why Buffett, the Sage from Omaha, structured this offer the way he did.

Ultimately, the consortium's $3.65 billion offer was accepted. It did not require counterparty approval because the offer was an investment in LTCM's equity, rather than the transfer of positions. The economic difference was subtle, but the legal difference was crucial. The consortium deal was head and shoulders better than the BH-AIG-GS offer, and this is important. The LTCM principals had a fiduciary responsibility to act with undivided loyalty and transparency, to avoid conflicts of interest and fraud, and to negotiate the best deal possible for its owners. The difference between the BH-AIG-GS offer and the consortium offer was unquestionably material.

[40]Goldman Sachs agreed to invest $300 million and manage LTCM's portfolio. Berkshire Hathaway Inc., agreed to contribute $3 billion, and AIG was willing to contribute $700 million. See Mitchell Pacelle, Leslie Scism, and Steven Lipin, "How Buffett, AIG and Goldman Sought Long-Term Capital, but Were Rejected," *Wall Street Journal* (30 September 1998), C1.

[41]See Risk Notepad 8.3: Another Look at Warren Buffett's Offer for LTCM.

[42]About 90% of LTCM's trades were with 15 counterparties, but in some cases, the counterparties were affiliates (e.g., JP Morgan, JP Morgan Tokyo, and JP Morgan London). Negotiating with 40 counterparties each having six affiliates meant involving 240 counterparties. The President's Working Group on Financial Markets reported that LTCM had more than 60,000 trades on its books. See President's Working Group on Financial Markets. *Hedge Funds, Leverage, and the Lessons of Long-Term Capital Management: Report of the President's Working Group on Financial Markets*. Washington, DC: Department of Treasury, 28 April 1999, 11.

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The recapitalization agreement for LTCM was finalized on 28 September, when 14 banks and brokerage houses contributed $3.65 billion to the rescue effort.[43] Contrary to some published reports, the Federal Reserve System did not advance a penny of the funds; its role was purely as a facilitator and a forum provider (and perhaps, as an arm-twisting persuader for the reluctant). Together with LTCM's $400 million in remaining equity, the cash infusion looked to be enough to get LTCM through this financial crisis. The consortium was expected to last for three years while LTCM was liquidated.

For most of the participants, rescuing LTCM was a bitter pill to swallow because they were being asked for help at a time when their own income statements, balance sheets, and credit ratings were being decimated by the slumping markets.[44] Shares of these financial institutions had been pummeled in the market; Goldman Sachs, a private company, had to postpone its IPO due to poor market conditions.[45] Now, these financial institutions were being asked to save a group whose arrogance, secrecy, and overbearing style of trading were of epic dimensions, which just added to the consortium members' chagrin. Nevertheless, the liquidation went smoothly, and by early 2000, LTCM's portfolio had been sold. In the end, none of the top six security firms incurred any realized or unrealized losses during the third quarter of 1998 as a result of the failure. LTCM's mark-to-market exposures in August and September were fully collateralized. Even in September 1998, when margin calls ran into tens of millions of dollars, LTCM had more than 300% of the needed funds in its margin account.[46]

Under the recapitalization plan, the consortium gained 90% ownership of the fund (i.e., LTCP) and operational control as general partner. The original owners' (i.e., LTCM's principals' and investors') claim on the company was written down to 10%, with the provision that the principals stay with LTCM for one year and help liquidate its trades in an orderly manner. By accepting 10% of a company that now had at least $3.65 billion in

[43]The banks were: 1. Bankers Trust ($300 million), 2. Barclays ($300 million), 3. Chase Manhattan ($300 million), 4. Deutsche Bank ($300 million), 5. Union Bank of Switzerland ($300 million), 6. Travelers/Salomon Smith Barney ($300 million), 7. J.P. Morgan ($300 million), 8. Goldman Sachs ($300 million), 9. Merrill Lynch ($300 million), 10. Crédit Suisse-First Boston ($300 million), 11. Morgan Stanley Dean Whitter ($300 million), 12. Société Générale ($125 million), 13. Bank Paribas ($100 million), and 14. Lehman Brothers ($100 million). Steven Lipin, Matt Murray, and Jacob M. Schlesinger, "Bailout Blues: How a Big Hedge Fund Marketed Its Expertise and Shrouded Its Risks—Regulators and Lenders Knew Little About the Gambles at Long-Term Capital—'Stardust' in Investors' Eyes," *Wall Street Journal* (25 September 1998), A1.

[44]Credit rating agencies, like Standard and Poor's, were threatening to downgrade the debt of investment banks, such as Lehman Brothers, Goldman Sachs, and Merrill Lynch.

[45]Goldman Sachs waited until May 1999 to go public.

[46]President's Working Group on Financial Markets. *Hedge Funds, Leverage, and the Lessons of Long-Term Capital Management: Report of the President's Working Group on Financial Markets.* Washington, DC: Department of Treasury, 28 April 1999, B-7 and C-12.

consortium-supplemented equity, the LTCM's shareholders had increased their take by $150 million more than the Buffett et. al proposal, but it was still only one-tenth of their positions one year earlier. The deal also came with an implied call option because, if LTCM recovered, the principals' interests would rise and, conceivably, they could repurchase LTCM from the consortium.

Reaction to the Fed-sponsored rescue was mixed. Those who favored it lauded the Fed and the consortium for saving the global financial system from immeasurable damage. At the same time, critics protested that the rescue was just another example of capitalist hypocrisy.[47] Why was the Fed willing to intervene on the behalf of rich investors, about 150 employees, and a handful of principals? Why should the LTCM principals be allowed to keep anything after inflicting such losses? Wasn't this the fund that was incorporated in the Cayman Islands to avoid paying U.S. taxes? Why was the Fed not giving such limousine service to countries like Russia, Brazil, and Argentina? Frustrations and anger ran deep.

One of the central issues involved *moral hazard*, a major cause of market failure.[48] For the Fed, the moral hazard issue boiled down to a simple question: If it bailed out LTCM, might the Fed be signaling to other hedge funds and financial institutions that there would always be a safety net for those companies deemed "too big to fail,"resulting in an even greater number of failures in the future? In other words, would the Fed be granting LTCM a free put option on its own portfolio, thereby providing an incentive for other companies to take greater financial risks in the future?[49] Although the Fed did not contribute a penny to the recapitalization, its presence might have raised the value of the implied protection (the put option) given to LTCM.

Conclusions and Lessons to Be Learned

LTCM was a creature of turmoil, structured to thrive in turbulence, regardless of whether the markets went up or down. The greater the volatility (and it made no difference whether this instability was company, industry, domestically, or globally based), the greater the opportunities. How ironic, then, that in the end, turbulence was a major cause of the company's undoing. The LTCM failure was like a huge plane crash in which all the passengers, crew, and crash site residents walked away with relatively minor

[47]Michael Schroeder and Jacob M. Schlesinger, "Fed May Face Recrimination over Handling of Fund Bailout," *Wall Street Journal* (25 September 1998), A8.

[48]Moral hazard occurs when individuals with insurance take greater risks (because they are protected) than they would have taken without insurance.

[49]See, Anonymous (editorial), "Decade of Moral Hazard," *Wall Street Journal* (25 September 1998), A14.

injuries. Despite the lack of extensive damage, there are many lessons to be learned from this episode.

BE CAREFUL WHAT YOU WISH FOR

LTCM tried to profit from mispriced spreads. When spreads facing the hedge fund industry widened and then went topsy-turvy, they undermined historically based risk management measures. Greater economic and financial turbulence gave rise to an abundance of new opportunities, but the market's *flight to quality, flight to liquidity,* and *flight from arbitrage* threatened LTCM's sources of credit as well as the willingness and ability of its counterparties to engage in new trades and to hold open positions.

BEWARE OF MODEL RISK

LTCM placed large bets using considerable practical experience and sophisticated statistical analyses, but its conclusions were based on a risk management model that ultimately proved to be faulty for two major reasons. First, it used risk management parameters that may have been better suited to an investment bank than a hedge fund; second, it did not account for those occasions when markets react and move in ways that are inconsistent with historical precedent.

LTCM made and deeply believed in four major assumptions that proved wrong. First, it assumed that prices would move continuously, which means large discrete price changes would not occur. It was wrong. Secondly, it assumed that price volatility would return quickly to its historic average. Again, it was wrong. Thirdly, LTCM assumed that asset returns were normally distributed, so that, with 99% accuracy, the company could calculate and control its risk levels. Again, it was wrong—the real world seems to have fat tails, which means extreme events have much larger probabilities of occurring than the normal distribution indicates (i.e., very bad and very good things happen more often than expected). Finally, LTCM assumed that investors' decisions were independent of one another in the sense that what someone decides today will not influence what he decides tomorrow, and what someone decides today will not influence anyone else. Again, LTCM was wrong. Momentum in the global financial markets kept spreads moving against LTCM, indicating that decisions are not independent.

ALL FOR ONE AND "1" FOR ALL

LTCM was not the only financial intermediary to experience profitability and cash flow problems. Losses were endemic to the industry. In part, the industry-wide losses were due to hedge funds that emulated LTCM's successes and

adopted similar strategies. When these imitator funds tried to liquidate their positions all at once, market prices turned sharply against them. Correlations among the prices of otherwise unrelated assets suddenly converged to one, their highest level. Portfolios that were once very diversified looked increasingly like a common, industry-wide portfolio. The new correlations made LTCM's VaR estimates virtually useless indicators of the true risks facing the company.

LEVERAGE IS A FAIR-WEATHER FRIEND

In its final report in 1999, the President's Working Group on Financial Markets concluded that the principal policy issue emerging from the LTCM collapse was excessive leverage.[50] At times, LTCM's leverage ratio rose above 30:1, which meant if investment returns increased assets by a little less than 3.5%, the company earned 100% on its equity, and if they fell by the same amount, the company was insolvent.[51] Leverage adds to risk and, therefore, gives companies more opportunities to succeed and also more opportunities to fail. It is for this reason that the credit risk of leveraged hedge funds, even those with market-neutral strategies and stellar past performances, must be objectively assessed and constantly monitored.

FINANCIAL TRANSPARENCY IS THE FIRST STEP IN MEANINGFUL REFORM

The lack of financial transparency was a major source of this debacle. LTCM hid its positions by dividing trades among half dozen or more counterparties, each having only a partial understanding of LTCM's overall position. Only part of these chain-linked trades surfaced to the balance sheets of these financial intermediaries because they were derivative positions, many of them highly leveraged. In the end, these positions increased substantially the systemic risks from LTCM's failure, and the contagion from LTCM's failure threatened to spill over into the global financial markets. Because hedge funds are here to stay, financial regulators (e.g., the Federal Reserve System, Securities and Exchange Commission, Japanese Ministry of Finance, and European Central Bank) are seeking efficient ways to balance regulation with open competition. Central banks worldwide are also searching for more effective methods to supervise the network of regulated banks that deal on a regular basis with hedge funds.

[50]President's Working Group on Financial Markets. *Hedge Funds, Leverage, and the Lessons of Long-Term Capital Management: Report of the President's Working Group on Financial Markets.* Washington, DC: Department of Treasury, 28 April 1999.

[51]Near the end, in the summer of 1998, LTCM's leverage rose above 100:1 because of the rapid decline in its equity and the more sluggish relative decline in its assets.

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assets.

IN THE LONG RUN, BET ON GLOBAL FINANCIAL MARKETS BEING EFFICIENT

In competitive markets, excess profits are difficult to achieve because success invites imitation, and imitation reduces the margins on which the original profits were made. Some markets may be slow to react, but over time, profiting from inefficient markets is like picking low-hanging fruit or sweeping money off a table. If it is that easy, then others will be sure to follow. LTCM soon had many imitators, and as a result, its proprietary techniques lost their distinctive edge, which meant the company fell victim, increasingly, to its own success.

YOU CAN'T FLOAT WITHOUT LIQUIDITY

If the first rule of mountain climbing is *Don't let go of one thing until you have a hold of something else*, then the first rule of hedge funds is *Don't buy what you can't sell*. When the going gets rough, liquidity is crucial, and if you do not have a ready market into which you can sell your assets, then maybe a second (or third) look at your assets is needed. Had LTCM not leveraged itself to such extreme levels, illiquidity would not have been such a problem, but when economic conditions in 1997 and 1998 unexpectedly went helter skelter, LTCM had to liquidate portions of its portfolio at fire sale prices just to meet its ever-increasing margin calls and collateral requirements.

The problem was that many financial intermediaries had very similar portfolios and risk management systems. As well, they were forced by the market to focus on short-term financial results because their portfolios were marked-to-market daily. In a liquidity crunch, these institutions acted in the same way. Their flight to liquidity depressed asset prices and threatened the solvency of these highly leveraged companies.

SOME THINGS ARE WORTH DOING FOR THE *GREATER GOOD*

By mere size alone, LTCM dominated the hedge fund landscape. When it was rescued in 1998, LTCM was the biggest and the most highly leveraged large hedge fund reporting to the U.S. Commodity Futures Trading Commission (CFTC). Its $125 billion of assets were nearly four times greater than the next largest fund.[52] By comparison, the 10 largest U.S. hedge funds had an average size of only about $36 billion.

LTCM's failure could have caused widespread contagion, which would have brought significant financial pressures on its large, direct counterparties, many of whom were losing considerable amounts because of

[52]See President's Working Group on Financial Markets. *Hedge Funds, Leverage, and the Lessons of Long-Term Capital Management: Report of the President's Working Group on Financial Markets*. Washington, DC: Department of Treasury, 28 April 1999, 14 and C-13.

their comparable portfolio positions.[53] The financial crisis could have also caused pressure on international exchanges where LTCM represented 5% to 10% of the open interest and an even greater percent of the daily turnover. But over and above this, if LTCM's counterparties were hedged beforehand, the failure of this fund could have caused a mass scramble to shore up the newly exposed positions. As a result, market prices could have moved even more unfavorably, causing wider and deeper consequences. Credit risks would have been reevaluated, which could have led to a credit squeeze, and the greater uncertainty could have increased the risk premium embedded in nominal yields.

When the greater good is larger than the sum of benefits accruing to the individual vested interests (i.e., in this case, the counterparties to LTCM's trades and its creditors), there needs to be a way to communicate fully and clearly what is at stake. If private parties have no incentive to limit their bilateral risks to reduce contagion effects, then perhaps, it is up to central banks, securities regulators, and private associations to open the eyes of key players about the externalities. The trick is doing this without rewarding irresponsibility or encouraging bad behavior in the future.

Epilogue

What Happened to the Principals, Creditors, Investors, and Consortium?

LTCM's management company, Long-Term Capital Management L.P., was transferred to the consortium. The recapitalization saved most of the parties involved in this debacle from serious collateral damage. Because the destruction seemed so small, after the dust settled, Myron Scholes called LTCM's failure the "non-fault bankruptcy of his hedge fund," but he was probably not considering the damaged reputations and lost jobs at hedge funds and financial institutions around the world.[54]

THE PRINCIPALS AND EMPLOYEES

Myron S. Scholes retired four months after LTCM collapsed, planning to return to California, where he would lecture and write at Stanford University.[55] In August 2000, Scholes began working for Oak Hill Platinum Partners

[53]LTCM estimated that its top 17 counterparties would have lost between $3 billion to $5 billion if it defaulted. Ibid. p. 17.

[54]This quote comes from a speech by Myron Scholes at an *Economist* magazine–sponsored symposium on the first anniversary of LTCM's failure. Cited in Anonymous, "Finance and Economics: Economics Focus: When the Sea Dries Up," *The Economist* 352 (8134) (25 September 1999), 93.

[55]Anita Raghavan and Mitchell Pacelle, "Key Figures Set to Leave Hedge Fund—Long-Term Capital Losing Two Partners," *Wall Street Journal* (3 February 1999), C1.

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Fund, a hedge fund backed by Robert M. Bass.[56] Robert C. Merton, who held a full-time professorship at Harvard University since 1988, continued his heavy schedule of lecturing, researching, and consulting. David W. Mullins, Jr., left LTCM to become chairman of vSimplify, a portal company.

Since the fund's inception, LTCM's staff members had been the servants of the arbitrage lords and routinely invested all their bonuses back into the company. Those invested bonuses were now gone, and by the end of October 1998, many of these employees (about 20%) were laid off. John Meriwether and the other principals lost most of their autonomy to make trading decisions, and their exorbitant management fees were slashed, sliced, and diced. Nevertheless, as part of the deal, LTCM's principals got to keep their homes[57] and received bonuses of $250,000 for the year they stayed with the company. Many of the principals still faced bitter financial set backs, but that should be expected because they caused the fiasco and deserved some downside consequences. Some of them were permitted to leave before year's end for lucrative jobs on Wall Street. Just over a year after the collapse, John Meriwether, along with five of his colleagues[58] at LTCM, had already started a new hedge fund.

CREDITORS AND INVESTORS

Because of the rescue, virtually all of LTCM creditors were paid in full; in an ironic twist of fate, investors who were not principals or part of LTCM's core group made out much better than you might at first expect. After trying unsuccessfully to amplify its risk to the desired 20% per year level, the LTCM principals decided that, for the level of risk it was taking, the company did not need such a large capital base. As a result, it took the bold step in December 1997 of *forcing* investors to take back $2.7 billion of their equity capital, but the company did not reduce its investment positions. As a result, LTCM began 1998 with approximately $4.7 billion in equity capital rather than over $7 billion, which it would have had.

Investors were upset and felt betrayed by the forced refund. The reason was clear. During the three years from February 1994 to December 1997, LTCM had quadrupled their portfolios. Investors asked: *What fund in its right mind would force its investors to take their money and go home?* But the LTCM principals had grown rich. The $146 million of equity capital they invested in 1994 had grown to $1.9 billion, and these funds along with the equity

[56]Robert Goldwyn Blumenthal. "Life After Long-Term Captial May Be Very Sweet, Indeed," *Barron's* 80(32) (7 August 2000), 10.
[57]John Meriwether's house was a 67-acre estate in Westchester County, NY, a wealthy suburb northeast of New York City.
[58]Eric Rosenfeld, Larry Hilibrand, Victor Haghani, Richard Leahy, and Arjun Krishnamachar.

and financial support of a core group of strategic investors and key banks were all it needed.

All together, during their four-year roller-coaster ride (i.e., from fortune to despair), John Meriwether and his band of arbitragers netted outside (non-principal) investors average annual returns of slightly less than 20%, which is not a bad return. But these investors made out as well as they did because they were forced to take a refund. Therefore, when the collapse occurred, they had nothing (or relatively less) invested in LTCM. In the end, it was John Meriwether and the other principals who were most harmed by the LTCM failure.

THE CONSORTIUM

The consortium had mixed results. Spreads did not converge rapidly and economic conditions remained tenuous. As a result, some, but not all, of LTCM's positions were closed with profits, but overall the results were satisfying because the full $3.65 billion invested by the consortium was paid back.[59]

Review Questions

1. Given the economic and political turmoil that took place in 1998, what bet would have earned John Meriwether and his team of arbitrageurs the highest profits?
2. Suppose the yield on a two-year Treasury note was 4%, and the yield on a five-year Treasury note was 6%. If you expected this yield spread to widen, explain the spread trade you would execute.
   a. After a year, suppose the yield on a two-year Treasury note fell to 3.5%, and the yield on a five-year Treasury note rose to 6.5%. Would you profit or lose on your trade? Explain.
   b. After a year, suppose the yield on a two-year Treasury note rose to 6% and the yield on a five-year Treasury note fell to 5.5%. Would you profit or lose on your trade? Explain.
3. Using the information from Exhibit 8.2, calculate the return on assets and the return on equity if LTCM had earned only a 1% net return (instead of a 5% net return) on the investment assets purchased with borrowed funds.

[59]Joseph Kahn, "Long-Term Capital Said to Earn a Small Profit for Its Rescuers," *New York Times* (11 November 1998), 10.

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4. Why did LTCM have difficulty raising its level of risk?
5. Why was long-term funding crucial to LTCM's strategy?
6. What were LTCM's major assets? What were its major financing sources?
7. Given its strategy, why was it vital for LTCM to have a high credit rating?
8. Explain how LTCM minimized its use of equity.
9. Explain the endogenous (i.e., hedge-fund-related) factors that caused LTCM's portfolio to lose the normal protections afforded by diversification.
10. How did LTCM secure long-term funding?
11. Explain the three major catalysts that caused LTCM to fail.
12. What is Value at Risk (VaR), and what role did it play in the LTCM failure?
13. Explain the major benefits of a total return swap.
14. Explain the causes of the Asian Tiger crisis and how it affected LTCM.
15. Explain the Russian ruble crisis and how it affected LTCM.
16. What role did the Federal Reserve play in the LTCM rescue? Why was the Fed involved?

Further Reading

Please visit http://www.prenhall.com/marthinsen, where you can find the following embellishments on and extensions of this chapter.

- Appendix 8.1: LTCM's Major Trades
- Appendix 8.2: What Are the Problems With Value at Risk?
- Appendix 8.3: UBS and the LTCM Warrant Fiasco

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