

Hedge funds – trouble-makers?

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Last autumn's turbulence in global financial markets was accentuated by the instability spread by the near collapse of Long-Term Capital Management (LTCM). The huge losses of this hedge fund in the wake of Russia's August 1998 international payments suspension and the subsequent capital flight from emerging and other markets caused both market players and the Federal Reserve to worry about the consequences of an uncontrolled unwinding of outstanding positions. In practice, only systemic risks related to a financial market failure justify the intervention of a central bank. In this context, there are many indications that the problems were mainly due to inadequate risk monitoring by banks.

Seemingly generous lending to hedge funds by banks have caused many observers to advocate more stringent regulations.

The now almost legendary hedge funds have been into the spotlight since the autumn 1998 financial market upheaval. Huge losses by the hedge fund Long-Term Capital Management (LTCM) and seemingly generous lending to hedge funds by banks have caused many observers to advocate regulation to overcome these problems. But what is the fundamental problem? What is a hedge fund? What was behind the collapse of LTCM? What can central banks and other public authorities do to prevent a recurrence of systemic risk? The purpose of this article is to answer these questions, within the limits of this article, to the greatest possible extent.

The article is organised as follows: first it provides a schematic picture of hedge funds in general, followed by a recapitulation of the autumn 1998 financial turbulence, with emphasis on problems related to LTCM. It then discusses in detail why the payments system was threatened by so-called systemic risk, as well as possible reasons for this development. Finally, it briefly discusses the policy implications and arguments for greater official regulation of hedge funds and banks.

Hedge funds – an overview

What is a hedge fund? There is no simple, uniform definition of the hedge fund concept. The investment strategies of these funds vary sharply. Hedge funds nevertheless have many characteristics in common.

- **The formal structure of these companies** is often a *limited partnership*, with the number of partners not exceeding 100. General partners are responsible for the day-to-day management. The obligations of limited partners are restricted to their invested capital and they have no direct influence on management. Unlike other types of funds, managers risk their own money in the company. This is one reason why hedge funds often focus on optimising return and risk in absolute terms, and not like other funds in relation to a comparative index (benchmarking). Their structure thus helps give managers a powerful incentive to monitor risk/return, which is reinforced by high return-related fees (often up to 20 per cent of return).¹
- **Limited official supervision and extensive freedom.** Around half of all hedge funds have the United States as their country of origin, but due to American legislation many funds are registered in countries with a less extensive regulatory system and an absence of official supervision – among them the Cayman Islands and Bermuda. In the United States, for example, a fund with more than 100 partners is under the supervision of the Securities and Exchange Commission (SEC). This is not the case with offshore funds, which can ordinarily have an unlimited number of partners (open ended funds) or in American funds structured as limited partnerships. Limited official supervision helps provide extensive freedom when it comes to risk-taking and investment strategies typical of hedge funds. Managers also have greater freedom of choice since partners often commit their capital for a long period, sometimes several years. Swedish hedge funds – such as ZENIT and NEKTAR – are, however, under the jurisdiction of the Financial Supervisory Authority.²
- **Limited transparency.** Hedge funds are secret by nature. Often only a

¹ However, because of profit-related management fees, all else being equal, a manager does not share the losses of other partners in case of a negative return. This asymmetry may provide incentives for greater risk-taking, which is nevertheless offset by the fact that managers have invested their own capital in the fund.

² In 1994, a change in legislation introduced the concept of national funds and made it possible to establish a Swedish hedge fund. The legal framework and main criteria for investment rules etc. are the same as for other securities companies, but via licences from the Financial Supervision Authority, a hedge fund may deviate from these rules in specified respects. The prerequisite is that they aim only at professional investors and do not market their products to the broad general public. Certain risk limitations have been formally imposed, and the portfolio must be reported openly on a quarterly basis. The Financial Supervisory Authority is also entitled to make on-the-spot inspections without prior notice.

small circle of managers are familiar with the portfolio's total exposure and contents. Partners and lenders often have to accept very sketchy information. The limited official supervision enjoyed by most hedge funds facilitates this secretiveness. Research in this field is naturally also made more difficult by the limited amount of public information.³

- **Not for small investors.** The minimum investment is often one million dollars. Hedge fund investors are often wealthy private individuals, although institutional investors have become more common as partners in recent years.

Varying investment strategies

Although the investment strategies of hedge funds vary considerably two main categories are discernible.

Although the investment strategies of hedge funds vary greatly, in our opinion two main categories are discernible. The first can be labelled archetypal, traditional hedge funds.

For example, such a fund combines sales (a short position) and purchases (a long position) in an asset that is under- or overvalued, respectively, and seeks a return that is independent of overall market developments. Put simply, the fund is thus protected against “market risk”, since a general price fall helps the changes in the value of long and short positions offset each other. Thus the name “hedge” fund, since hedging means protection. Returns and risks originate from the price difference between assets and the leveraging effect that may be achieved via loan financing and derivatives (see, for example, pages 27–29). LTCM belongs to this category of hedge funds.

The other main category of hedge funds takes speculative positions based on assessments of the price trend of individual assets (for example shares of a company threatened by bankruptcy) or of a market as a whole (for example a general stock market decline). These funds thus often analyse major changes in the global economy as well as micro-economic conditions in detail. The point is that these funds do not systematically protect themselves (“hedge”) against all other risks. Consequently these funds can hardly be called hedge funds in the traditional sense. Instead, they are funds that utilise the typical company structure of a hedge fund and its extensive freedom for purely speculative purposes. The box below presents a classification of various types of hedge funds and their investment strategy.

To achieve the desired exposure, hedge funds use a variety of financial instruments in virtually all markets: foreign exchange, fixed-interest and equity

³ There are nevertheless a few institutions that continuously monitor developments among hedge funds. Examples of these are MAR/Hedge, Van Hedge Fund Advisors, TASS and Financial Risk Management Limited.

markets. For example, by utilising a derivative – an instrument in which agreement is reached today on the future price of an asset – the risk profile of investments can be refined by selling certain risks and keeping others.

Hedge funds operate globally. In recent years, they have been very active in the “new” markets of Russia, Asia and South America. Hedge funds became well known earlier, however, for instance through currency speculation during the European Exchange Rate Mechanism (ERM) crisis of 1992 and the Mexican crisis of 1994–95. They are well known for convergence trading in interest rates on government bonds in the run-up to the Economic and Monetary Union (EMU) and in connection with the fall of the Thai currency in July 1997.

Different types of hedge funds⁴

Market Neutral

Funds that operate in essentially all types of financial markets and that try to take advantage of temporary “pricing anomalies”. Return is thus largely independent of the direction of market developments. This is the archetypal hedge fund in the traditional sense.

Macro

Funds that speculate in global changes at the macro level which are reflected in interest rates, currencies and equities. They take positions in direct market developments and attempt to maximise return via the “leveraging effect” that can be achieved via loan-financed investments and derivatives.

Global

Like *Macro* but more focused on developing markets and other specific regions of the world.

Event-driven

Funds that speculate in specific events – corporate mergers, bankruptcies etc – and that take positions based on these speculations.

Long only

Traditional equity mutual funds, structured like hedge funds (working with loan-financed holdings for their long positions).

Dedicated short-sellers

Funds that take short positions in securities, borrowing securities and selling them immediately in the hope of buying them back at a lower price and thereby earning money when prices fall.

Sectorial

Funds that take positions in equities based on an industry perspective.

Funds of funds

Funds that invest their portfolios in other hedge funds. The minimum investments in these funds are very high, often more than one million dollars.

⁴ This classification is taken from MAR/Hedge, a company that continuously publishes facts about hedge funds. Other classifications exist.

Hedge funds – a growing industry

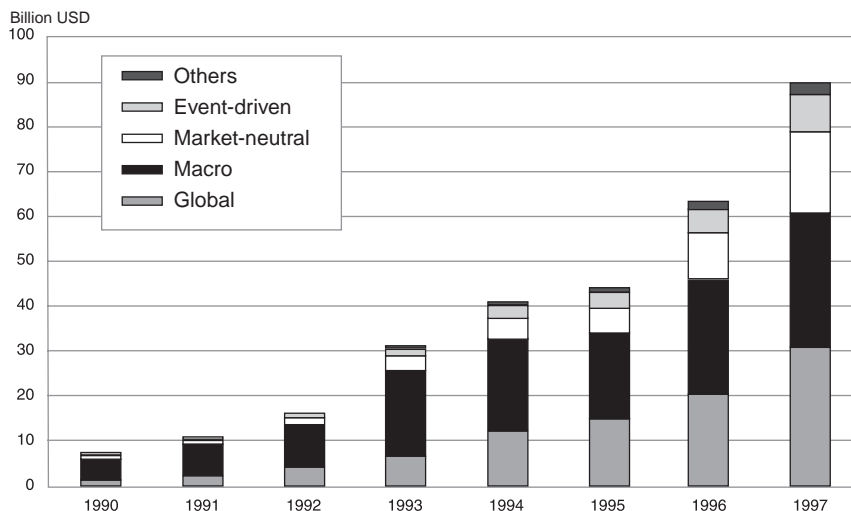
Today there are about 3,000–5,000 hedge funds, managing assets equivalent to about 100–400 billion dollars.

Since access to information about hedge funds is very limited and uncertain, figures on the size of the hedge fund industry vary greatly. One thing is certain, however: the operations of hedge funds have grown very rapidly in

recent years. Today there are about 3,000–5,000 hedge funds, managing assets equivalent to about 100–400 billion dollars. By way of comparison, in the early 1990s there were only about one hundred hedge funds, with about 10 billion dollars under management. As Chart 1 indicates, the assets invested in hedge funds have grown sharply during the 1990s. The *macro*, *global* and *market neutral* categories dominate, accounting for about 90 per cent of total managed assets in 1997.⁵

The *macro* category includes George Soros' well-known Quantum Fund and Robertson's Tiger Management, which as of 1998 reportedly managed around 30 billion dollars.⁶ Aside from a handful of major funds, however, most hedge funds are small. About 50 per cent of hedge funds each manage less than 100 million dollars.⁷ Relative to dominant investor vehicles in the global financial markets, hedge funds also manage only a small fraction of total savings.

Chart 1. Managed assets* by type of hedge fund, 1990–97



Source: MAR/Hedge. At the end of each year.

⁵ MAR/Hedge, exclusive fund of funds.

⁶ Steinberger, *Euromoney*, August 1998.

⁷ TASS, P. Cottier.



Partly due to their lack of transparency as well as rumours of highly leveraged speculation strategies, hedge funds have often been singled out as scapegoats at times of dramatic events in financial markets. They are blamed for having profited from and having caused –

or at least aggravated – such events as the October 1987 stock market crash and the fall of the Thai baht in 1997, to give two examples. However, to date it has been difficult to prove that hedge funds have de facto profited from or caused these events, as evidenced by studies published in 1998 by the International Monetary Fund and the National Bureau of Economic Research,⁸ among others. It is difficult to find empirical support for the thesis that hedge funds in general can systematically drive markets and take advantage of investors’ herd instincts. Furthermore, the fact that Soros’ hedge fund made large profits in connection with the fall of the British pound in 1992 does not necessarily mean that the actions of this fund made the currency fall.

Another widespread perception is, as indicated, that hedge funds are generally more risky and more highly leveraged than other funds and financial players. However, there is some evidence that creates a more nuanced picture (see box on page 24).

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The rise and fall of LTCM

The hedge fund known as Long-Term Capital Management (LTCM) was founded in 1994, among others by the well-known financial strategist John Meriwether. The fund established a registered office in the United States (Greenwich, Connecticut) and avoided

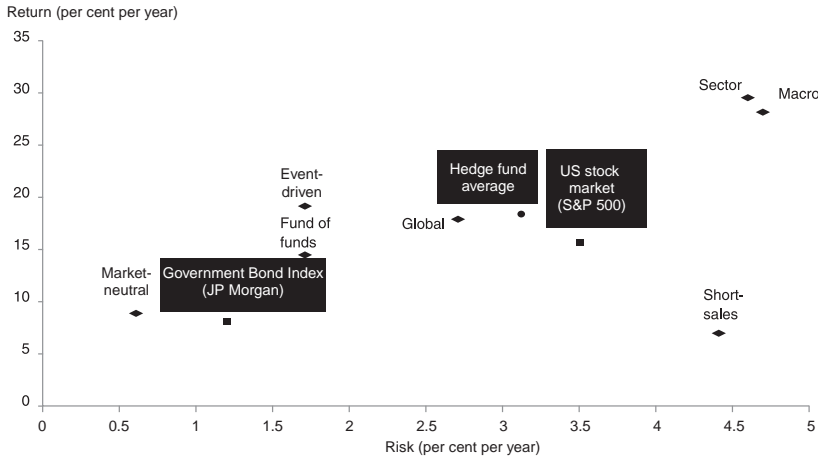
government supervision by means of its company structure (limited partnership). Wealthy private individuals who invested in the fund had to commit their capital for a long period and meanwhile accept not being informed of LTCM’s risk exposure. LTCM characterised itself as a fund of the “market neutral” type. One element of LTCM’s mission was to attempt to utilise statistical/mathematical models to find “pricing anomalies” between assets – primarily in fixed-rate markets – and exploit these with the help of financial derivatives and leveraged invest-

One key element of LTCM’s business concept was to utilise statistical/mathematical models to find “pricing anomalies” between assets.

⁸ See Chadha, B. & Jansen, A. (May 1998), IMF, as well as Brown, Goetzmann & Park (February 1998), NBER.

Risk and return – a surprise?

One common perception is that return, but also risks, are substantially higher for hedge funds than for other financial investments such as equity mutual funds, individual equities or fixed-rate investments. However, the chart below indicates that during the period 1990–97, the American stock market was more risky (measured as annualised volatility) than most hedge funds, including the average hedge fund. Yet the average annual yield of most hedge funds has been higher. In other words, this indicates that hedge funds in general have managed assets well. All types of hedge funds – except *short sellers* – have had higher risk-adjusted return (return/risk) than the US stock market during the period in question.



Source: MAR/Hedge. Hedge funds do not include Long only and Fund of funds. There are no details for Long only, but this category represents less than 1 per cent of the total amount invested in hedge funds.

Statistics can be misleading, however. Investment strategies and the earnings trend show relatively wide variations within each hedge fund category, with low correlation as a consequence. The risk in an individual hedge fund may thus be very large (the case of LTCM is a good example of this). The low correlation within each category, combined with the fact that hedge funds in general show low correlation with traditional investments, are factors that enable portfolio managers to utilise investments in hedge funds for diversification purposes.

One contributing reason why hedge funds in general are not as risky as often claimed may be that the scale of leveraged investments is exaggerated. According to Van Hedge Fund Advisors, a research institution, about 30 per cent of hedge funds do not use leveraged investments at all, 54 per cent have a debt ratio (liabilities/equity) of less than 2, and leveraging of 10 times is very rare.⁹ By way of comparison, leveraging of 20 or higher is reportedly common in investment banks' own portfolio investments. In August 1998, LTCM reportedly had leveraged investments a full 50 times larger than its equity. This indicates that LTCM took extremely large risks. Leverage – liabilities divided by equity in the balance sheet – is nevertheless a crude yardstick of portfolio risk, since it does not take into account off-balance sheet positions (derivatives) that may operate in a risk-reducing direction.

⁹ See *Statement to Members of Congress (USA)* by S.A. Lonsdorf, VHA President (October 1, 1998).



ments in securities. This strategy was probably facilitated by the expertise contributed by the 1997 Nobel laureates in economics – Myron Scholes¹⁰ and Robert Merton. In 1995 and 1996 the fund (after subtracting management fees) yielded a return of more than 40 per cent annually – considerably higher than the American stock market – and its reputation for success spread.¹¹

WHAT MADE THE TIDE TURN?

During 1998, LTCM reportedly speculated mainly in interest rate differentials between the bond markets in the United States, Europe and Japan. The sustaining concept

“Flight to quality and liquidity” was the dominant theme in financial markets and spelled doom for LTCM.

was expectations that “abnormally” large interest rate differentials would narrow between bonds carrying different liquidity and credit risks, for example between mortgage, corporate and government bonds. In 1998, the market trend went against LTCM, however (see examples in the box below). In the wake of the Asian crisis and the summer’s stock market decline, financial market players became increasingly cautious. The Russian devaluation and the moratorium on portions of Russian foreign debt on August 17 contributed to major losses for several players and marked the beginning of a downward trend in financial markets. The need to sell assets to cover losses generally increased. Together with great risk aversion among investors, this contributed to rising liquidity and credit risk premiums on world fixed-interest markets, as well as massive capital flight from emerging markets and other risky investments. During this period of instability, only certain bonds, for example 10-year American and German government bonds, were considered safe. Escalating demand caused interest rates on these bonds to fall sharply. “Flight to quality and liquidity” was the dominant theme in financial markets and spelled doom for LTCM.

¹⁰ Together with Black, Scholes developed the Black & Scholes model for option pricing, which today is still the model that most market players use.

¹¹ By way of comparison, the return on the S&P 500 was 35 per cent in 1995 (LTCM 43 per cent) and 20 per cent in 1996 (LTCM 41 per cent).

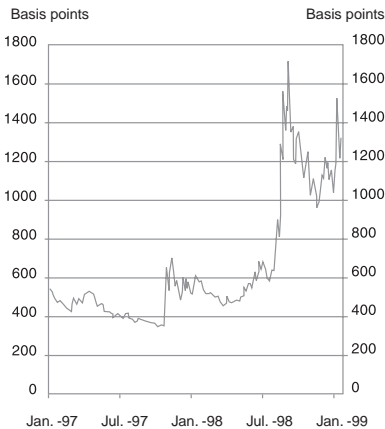
LTCM – A PRACTICAL EXAMPLE

What did LTCM do? Aided by loan-financed investments in securities and financial derivatives, LTCM used limited equity to speculate in narrower interest rate differentials in the bond market. Most of these positions were reportedly quite simple in structure, rather than complex combinations of options or the like. Put simply, LTCM's strategy can be illustrated by saying that the fund took long forward positions (which rise in value when the price climbs) in more risky assets judged to be undervalued, for example American corporate or mortgage bonds.

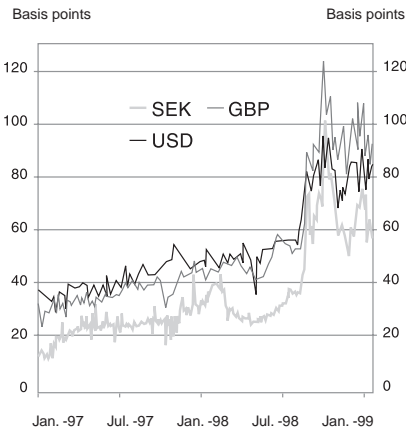
What had LTCM speculated in?

Among other things, LTCM had speculated in a convergence between American government bonds with different benchmark status – on-the-runs (benchmark) and off-the-runs (non-benchmark) – with a liquidity risk-related interest rate differential despite essentially the same maturity.¹² Like most other hedge funds, LTCM also reportedly bet on narrower interest rate differentials – “credit spreads” – between U.S. government bonds and dollar-denominated government bonds issued by developing countries (among them Russia).¹³ LTCM supposedly spiced its portfolio with option positions reflecting expectations that stock market volatility was exaggerated and would decline.¹⁴ LTCM's speculations went totally against the trend noted in the world's financial markets during the summer and autumn of 1998, with wider interest rate differentials plus greater volatility and generally poorer liquidity as a consequence (see chart below).

Emerging market credit spread*



Swap spread** (10 yr)



Source: ECOWIN

*The difference in interest rate between a weighted government bond rate (bonds denominated in USD) for emerging markets and American long-term bond yields. The developing countries included are Argentina, Brazil, Bulgaria, Ecuador, Mexico, Panama, Peru, Poland, Russia and Venezuela.

** A swap spread is the difference between fixed interest in an interest-rate swap and the government bond yield for the same maturity. It provides a rough estimate of market pricing of the credit risk differential between private and state sectors.



At the same time, it took short forward positions (which rise in value when the price falls) in assets judged to be overvalued relative to the former assets, for example American government bonds. The total position (long plus short) rises in value if the interest rate differential narrows and falls in value if the differential widens. On the other hand, the total position is protected against *general* interest rate movements – market risk – when forward assets and forward liabilities are equally large.¹⁵ Risk and return thus relate exclusively to the interest rate differential.

LTCM used the repo market to achieve these positions with little capital investment. Below is a somewhat simplified example of how this may have occurred.

**LTCM used the repo market to
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capital investment.**

LONG POSITION IN MORTGAGE BONDS (SEE FIGURE)

LTCM buys a mortgage bond in the spot market. It finances the payment via a short-term bank loan. The fund then gives the bond to the bank as security for the loan. In purely formal terms, the fund sells the bond to the bank with an agreement to repurchase the security at a predetermined price (a repo¹⁶). The hedge fund thus invests no capital.

When the loan, that is the repo, falls due (a common maturity in the repo market is two or three days¹⁷) the opposite occurs: the fund repays the loan and gets the collateral back (repurchases the mortgage bond). At the same time, it sells the bond in the market. The payment that the fund receives for the bond is what enables it to pay the bank loan (these transactions thus occur simultaneously). If

¹² Bonds with benchmark status (on-the-run) are included in bond indexes that several investors use. When a bond falls out of the index (off-the-run), trading and thus liquidity therefore often diminish.

¹³ These investments probably only comprised a small portion of the portfolio, however. According to LTCM's own information to its investors in September, only about 16 per cent of the fund's losses were directly related to emerging markets.

¹⁴ This position can be achieved, for example, by issuing a "straddle" where call and put options are issued on equity indexes with the same redemption price and maturity. Simply put, the market player has thereby "sold volatility" and taken a short position that will be profitable if future actual volatility is lower than the market's average expectations.

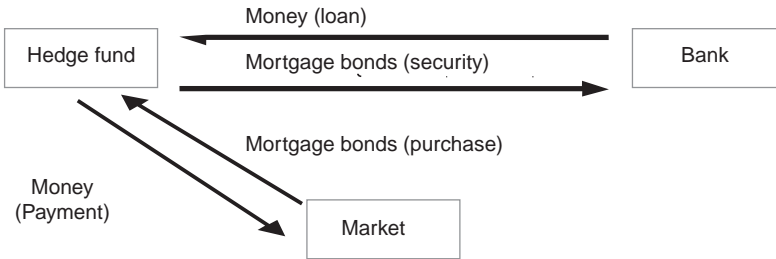
¹⁵ This is true provided that bond prices react exactly alike to general interest rate movements, which requires that the bonds have the same duration (and convexity).

¹⁶ A repo is defined as a spot market sale of securities (today) combined with a forward (future) purchase, which implies an obligation to implement the purchase at a price determined today. Since the spot and forward prices are known in advance, the interest can easily be calculated on the money that the market player is borrowing de facto. The transaction can thus also be viewed as a time-limited loan with collateral, where one player borrows money today and provides a bond as collateral. When the loan falls due, repayment including interest occurs at the same time as the collateral is returned.

¹⁷ In practice, repos are continuously renewed ("rolled over"), which means that, in reality, the maturity is longer.

Long forward position in mortgage bonds

Figure relates to spot transactions



SUMMARY

- * Purchase spot in market (long position)
- * Sell spot to bank (short position)
- * Repurchase agreement with bank (long position), that is, a forward purchase (not shown in figure)

Net: LONG FORWARD POSITION

the mortgage bond has fallen (the price has risen) during the life of the repo, the fund thus receives a higher spot market price than it paid a few days earlier. If this market profit exceeds the repo interest that the hedge fund pays to the bank, the fund has made a profit on its long mortgage bond position.

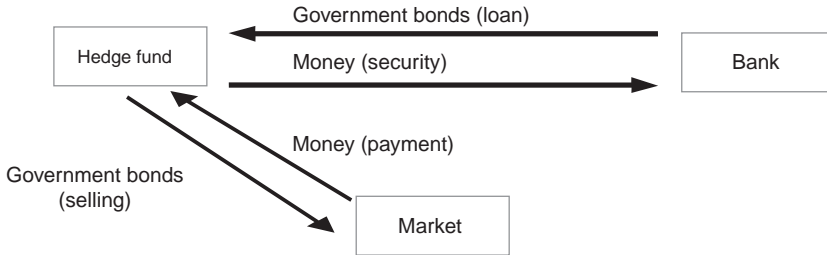
SHORT POSITION IN GOVERNMENT BONDS (SEE FIGURE)

LTCM borrows a government bond from the bank and puts money in the bank as collateral; in other words it buys a bond with an agreement to resell it at a pre-determined price (a reverse repo). The deposit in the bank, that is the collateral, is financed via a spot market sale of the government bond. Thus the hedge fund makes no capital investment.

When the loan (reverse repo) falls due, the hedge fund returns the government bond to the bank, that is, resells it to the bank. The bond that is sold to the bank is thus bought in the spot market. The purchase is financed by the money that the fund gets back from the bank. If the government bond yield has risen (the price has fallen) during the life of the reverse repo, the market price that the fund pays for the bond is lower than what the fund paid the bank for the bond a few days earlier. The hedge fund thus makes a profit on its short position in government bonds.

Short forward position in government bonds

Figure relates to spot transactions



SUMMARY

- * Sell spot in market (short position)
- * Purchase spot from bank (long position)
- * Repurchase agreement with bank (short position), that is, a forward sale (not shown in figure)

Net: SHORT FORWARD POSITION

THE RISK IS RELATED TO THE INTEREST RATE DIFFERENTIAL¹⁸

Forward positions yield a large risk/chance (return) in terms of the growth in the interest rate differential per own krona invested (here zero) – that is, they generate powerful leverage. The reason is that a position was achieved without a capital investment. A narrower interest rate differential yields a high return on invested capital. However, leveraging quickly results in large losses in case of a wider interest rate differential (for example as a result of flight to quality and liquidity). Large losses can thereby occur despite the fact that the fund insured itself against market risk – these losses must be covered in some way, for example by equity. The fundamental problem is thus that the hedge fund can rapidly build up very large risks and quickly lose its equity. The threat of bankruptcy can thereby materialise very quickly, even though new loans may prolong the process.

Large losses can occur despite insurance against market risk, losses that must be covered by equity.

Banks require extra collateral. In practice, a small capital investment is initially required, compared to the example. In case of financial failure, the bank that received

¹⁸ If the bond is held until maturity, the hedge fund receives a fairly safe return. Simply put, this locks in the interest rate differential between the bonds. This return can be regarded as a substitute for credit risk, since the probability that the mortgage institution will fail is regarded as higher than the probability that the state will do so.

mortgage bonds as collateral for a loan to a hedge fund runs the risk that the collateral will no longer cover its lending. To protect itself against this, the bank will, for example, require mortgage bonds valued at SEK 105 as collateral in order to allow the counterparty to initially borrow SEK 100. In other words, it applies a 5 per cent *haircut*. If the mortgage bonds should fall by more than 5 per cent, the bank may react by demanding further collateral, known as a *margin call*, to compensate itself for the greater credit risk. If this obligation is not met, the bank (depending on the structure of the contract) is entitled to sell the collateral (the mortgage bonds) to cover the credit risk that has arisen. The bank's internally established counterparty limits may then force the suspension of all further transactions with the hedge fund. As a last resort, the bank can force the fund into bankruptcy.

Some claim that LTCM tried to give each bank the impression that it was an exclusive counterpart.

In their competition for status clients like LTCM, the banks reportedly granted the fund very generous haircut and margin call terms. There were also very generous counterparty limits and unsecured lending. Since they had no way to keep track of the fund's risk-taking, the banks were also unable to monitor the very large risk exposure that LTCM built up by using numerous banks. Some people claim that LTCM tried to give each bank the impression that it was an exclusive counterparty. Some banks were perhaps thereby fooled into believing that at least they had a fairly clear picture of LTCM's total risk exposure.

THE COLLAPSE OF LTCM

September 2, 1998, LTCM informed its partners that the value of the fund had fallen by no less than 44 per cent in August and by 52 per cent thus far during 1998.

Since market trends moved in the wrong direction, from LTCM's perspective, and interest rate differentials widened, the value of the fund's total position fell. LTCM thus became insolvent relatively quickly, since its chances of covering large losses with limited equity were small. In a letter dated September 2, 1998, LTCM informed its partners that the value of the fund had fallen by no less than 44 per cent in August and by 52 per cent thus far during 1998. Rumours and alarm now spread like wildfire in the market. LTCM's gigantic positions, comparatively extreme risk-taking (see box on page 24) and potential impact on prices if it withdrew from the market helped to fuel uncertainty and volatility as well as a herd mentality in financial markets. According to a rough estimate in the magazine *Risk*, LTCM had positions tied to the interest rate swap market equivalent to 1,250 billion dollars, or about 5 per cent of the global market.

The mere *rumour* that LTCM had a position in a given market created instability and caused market players to unwind their positions, with a further widening of interest rate differentials in most fixed-interest markets among the consequences. In a generally unstable financial market climate, with growing risk aversion and mounting risks, most market players probably chose certainty before uncertainty and elected not to wait for reliable information. This may be one reason why swap spreads increased sharply in most fixed-interest markets in the autumn of 1998 (see chart on page 26). This instability was reinforced by fears about how the banks would react to LTCM's problems.

The value of mortgage and corporate bonds (and other more risky securities) fell and was expected to continue falling sharply. As indicated, banks make margin calls when the value of a bond no longer covers lending and a credit risk thus arises. These requirements became increasingly difficult for LTCM to meet. The fund therefore found itself in an acute liquidity crisis that presumably would quickly force the fund to use its equity to meet obligations. If banks thus receive no extra collateral for their repo transactions, they may (depending on the structure of the contract) be entitled to sell the existing collateral, albeit perhaps with a loan loss if the mortgage or corporate bonds etc have fallen in value. Prescribed counterparty risk mandates may also force the bank's repo department to sell the collateral. In addition, in the case at hand there was a risk that general turmoil might cause the bonds to fall even further in value. Many banks probably reasoned that it was important not to sell too late, in order to limit their losses. Meanwhile liquidity diminished in the markets and the general reduction in risk exposure was expected to continue. All this helped create expectations of increased flight to quality and liquidity, reinforcing the herd mentality, while increasing the probability that LTCM would go bankrupt.

Late in September 1998, LTCM was indeed on the brink of bankruptcy. By then, its equity had fallen from about 4.8 billion dollars to 600 million dollars, that is, by nearly 90 per cent in just nine months.¹⁹ At the initiative of the US Federal Reserve Bank, on September

Upon the initiative of the US Federal Reserve Bank 14 banks with claims against LTCM agreed to jointly advance 3.65 billion dollars in order to prevent a systemic crisis.

23, 14 banks with claims against LTCM agreed to jointly advance 3.65 billion dollars in order to continue operating LTCM in the form of a consortium and to unwind the fund's positions in a controlled way. There was a danger that the impact of bankruptcy and an uncontrolled unwinding of LTCM's positions might threaten the functioning of the financial markets and thereby create a systemic crisis.

¹⁹ IMF (1998), *World Economic Outlook*, December 1998.

Why a systemic risk?

SYSTEMIC RISK – A DEFINITION

Systemic risks within the financial system arise when the credit or liquidity problems of a market player create substantial credit or liquidity problems for other players.

Systemic risks within the financial system arise when the credit or liquidity problems of a market player create substantial credit or liquidity problems for other players. The latter may thus go bankrupt, although they actually have no problems besides the fact

that the first-mentioned player cannot meet its payments. This may eventually lead to severe disruptions in the entire financial system. Systemic risks arise mainly in connection with very large payments between financial market players. For example, a major financial institution may be threatened if a large payment from a counterparty does not materialise or is delayed.

In the case of LTCM, the risk of severe disruptions in the financial system – that certain markets would largely stop functioning – was the central problem that caused the Federal Reserve to consider itself compelled to act.

In this context, it is mainly the banks' *counterparty risks* that are important from a systemic risk perspective. Counterparty risks are credit risks that arise via a bank's exposure to other players in the financial market. What distinguishes counterparty risk from the "ordinary" credit risk that occurs when lending to households and companies is that individual exposures are very large, while the probability of losses is comparatively low. Large exposures coupled with low diversification may nevertheless mean that the consequences of a single payment cancellation are often far-reaching. In the work of bank supervision authorities, for example, counterparty risk has attracted little attention for a long time, but the frequently recurring financial turmoil of recent years has caused central banks in particular to pay more attention to counterparty risk. In the case of LTCM, the consequences for the banks of highly concentrated exposure to a single market player were clear.

Counterparty risk can be divided into *full credit risk* and *replacement cost risk*. Full credit risk exists when credit is granted without collateral. This means that the entire loan amount may be lost. Replacement cost risk exists in the case of lending against collateral. The risk is then that the value of the collateral may decline, so that it does not fully cover the loan amount. Whether a loss occurs thus depends on market movements.

A third type of counterparty risk is *liquidity risk*, which arises when financing for a market player is suddenly withdrawn, thereby exposing this player to a li-

quidity shortage. This may arise when a payment – a loan or loan repayment – from a counterparty does not materialise, but also when a portfolio security cannot be transformed into liquid assets by being sold in the market. In the case of LTCM, it was mainly the latter situation that became a reality for many players, since the market for various types of securities in principal ceased to exist or was at least risked doing so.

The fact that LTCM was rescued after a number of investment banks supplied capital to the fund on the advice of the New York Federal Reserve demonstrates that if they have problems, hedge funds of LTCM's size can cause de facto systemic risks. In this case, the systemic risk was attributable to the banks' risk exposure to these funds.

Many players experienced an immediate liquidity shortage when the market for various types of securities in principal ceased to exist.

The banks' exposure to hedge funds

The banks' exposure to hedge funds can be divided into two categories: direct and indirect exposure.

Direct exposure. Direct exposure include those exposure arising when banks act as counterparties to hedge funds, especially in the repo and derivative markets. Direct exposure also arise by means of investments in and direct lending to these funds. In this case it is important to distinguish between lending against collateral and lending without collateral.

The risk associated with lending against collateral is the same as replacement cost risk, that is, the risk that the value of the collateral will decline so that it does not fully cover the loan amount. This risk is thus especially associated with the repo market, where all lending occurs against collateral. In order for a risk to occur, it is thus necessary both for the counterparty to fail and for the value of the collateral – the bonds – to decline. When it lends without collateral, on the other hand, the bank carries a full credit risk. In the case of LTCM, some sources maintain that a comparatively large proportion of lending was without collateral, although most lending was against collateral. To reduce their replacement cost risk, as indicated, many banks demand a "haircut" when lending against collateral. This means that from the outset, the value of the collateral exceeds the value of the loan.

The size of the banks' direct exposures are generally easy for them to calculate.

Indirect exposure. In cases where hedge funds have payment difficulties, their

counterparties – the investment banks – must often unwind their positions against a fund. This in itself may result in a loss.

Indirect exposure is mainly concerned with counterparties' exposure to certain markets where hedge funds are active.

Indirect exposure are thus concerned with counterparties' exposure to certain *markets*, i.e. the markets where the hedge fund in question is active. The risks of losses and how large these potential losses will be depend

mainly on two factors.

First, the funds in question may be active in markets that, from the start, are already characterised by shortages of liquidity. This creates an immediate risk for banks that are exposed to certain hedge funds. This was also reportedly the case with LTCM, which held large investments in markets/instruments characterised by high volatility and low liquidity (this applied, for example, to certain OTC derivatives). LTCM, and thus also its counterparty banks, were often also very large players in the markets they were exposed to.

Second, general market conditions may be unfavourable at the time of unwinding positions. This was clear in the case of LTCM, since the financial markets during the autumn of 1998 were characterised by instability due to the Asian and Russian crises. Among the consequences was a flight to safer investments and the resulting lower liquidity in many markets.

The size of the risk in indirect exposure is thus the same as the risk that the bank in question cannot unwind its market positions in a satisfactory way, or at worst that the market will stop functioning altogether. This risk grows with the size of the bank's positions in relation to the total size of the market.

Unlike direct exposure, it is characteristic of indirect exposure that they are very difficult for the banks to calculate.

FINANCIAL STABILITY/INSTABILITY

The failure or imminent failure of a major market player may in itself lead to instability in financial markets. This may cause any losses resulting from the above-described exposures to end up being larger. Even worse, from a central bank perspective, is that the entire financial market, or large parts of it, may cease to function. (Note the difference compared to the above-described indirect exposure, which only applied to banks with exposures to hedge funds.) In the long term, this may have a far-reaching negative impact on the economy in general.²⁰

²⁰ If a financial market ceases to function, the allocation function that is its primary task also ceases.



As described earlier, market instability caused by the problems of a hedge fund of LTCM's size occurs due to a general reduction in risk exposure and a "flight to quality". This leads to a rapid decrease in market liquidity and an increase in volatility. The failure of a hedge fund may force the fund's counterparties to unwind their positions in the market, leading to an oversupply of certain assets in the same market. This leads to even greater instability in the market. Mere *expectations* that large unwinding of positions are imminent may lead to greater instability. A drastic decline in liquidity often means that bid/offer spreads – the differences between buying and selling prices – increase sharply. This makes it very expensive and sometimes impossible for a bank to unwind a market position.

It was mainly the risk of a turbulent financial market, with all its negative consequences, and the risk that LTCM's counterparty investment banks would suffer major losses in a non-functioning market, that led the Federal Reserve to take the initiative to rescue the hedge fund. The fact that LTCM's bank counterparties risked losses on their loans to the fund was clearly of minor importance in this context. Among the American central bank's main concerns is to protect the stability of the financial market. Market instability and turmoil would certainly have been even greater and had more far-reaching effects if there had been an uncontrolled phase-out of LTCM.


Also worth noting is that even markets outside the initial source of instability often are affected by global turmoil and accompanying "flight to quality". Even market players with no exposure to the distressed hedge fund therefore run a risk of suffering major losses due to the changed market situation.

Worth noting is that even markets outside the initial source of instability often are affected by global turmoil.

How could this happen?

In our opinion, several factors in particular contributed to the collapse of LTCM and the resulting financial market turmoil: *lack of transparency, exaggerated confidence in well-reputed fund managers, inadequate risk management by banks, the inability of models to forecast unexpected events, and major positions held by international investment banks similar to those held by LTCM.*

Factors that contributed to the collapse of LTCM: lack of transparency, exaggerated confidence in well-reputed fund managers and inadequate risk management by banks, among others.



The lack of information about LTCM's portfolio and risk exposure is an obvious reason why lenders and others did not discover the danger in time. Exaggerated confidence in LTCM's star-quality financial team and the fund's high returns also persuaded banks to compromise on their risk monitoring. In the keen competition for status clients like LTCM, banks reportedly granted the fund very generous terms on the collateral it provided in repo transactions and trading in OTC derivatives. There were also very generous counterparty limits and instances of lending without collateral. Since they had no information about the fund's risk exposure, LTCM's banks were also unable to monitor the very large risk exposure that the fund had actually built up by using a large number of banks. As indicated, some observers believe that LTCM tried to give the impression that each bank was an exclusive counterpart, and that each had a satisfactory picture of the fund's overall risk exposure.

Yet the question remains: Why did no one suspect that LTCM's high historic returns were also associated with high risk, especially since Meriwether had been known even earlier for taking very large risks. Some observers believe, however, that the rapid growth in financial markets and the expansion of hedge funds in recent years have helped to reduce the number of "price anomalies" (price differentials on assets that should theoretically sell for the same price), thus creating more efficient markets. LTCM and other hedge funds were thereby forced to increase their risks in order to improve returns.

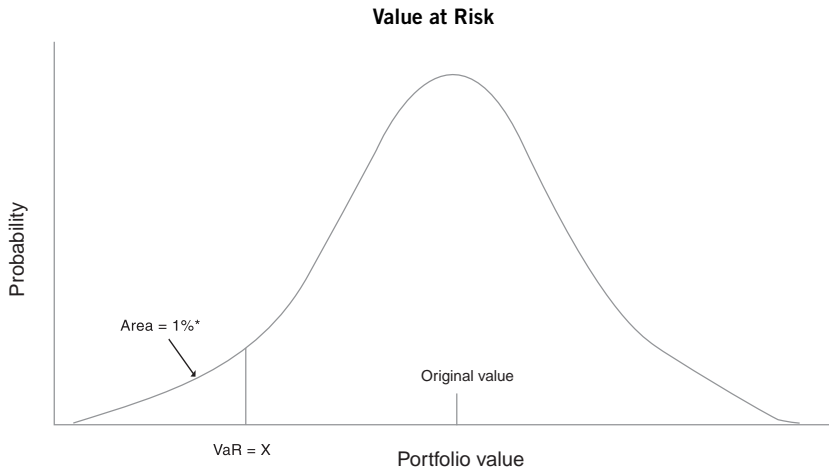
Statistical models that are based on historical data have a difficult time foreseeing extreme events. The probability of a Russian debt moratorium and the resulting panicked flight to quality and liquidity in financial markets was certainly very small, according to calculations based on historical data – but it still happened. Historical correlations ended. Suddenly, for example, prices of all risky assets were fully correlated in principle, since capital flight escalated and was concentrated in time. Some indications, among them the work of Scholes himself, are that faith in the forecasting ability of advanced statistical/mathematical models partly contributed to the collapse of LTCM, though investment decisions and risk exposure choices are ordinarily combined with other assessment criteria and not based exclusively on model results.²¹ Earlier in the summer of 1998, "abnormally" large deviations from the historical averages of various financial prices were noted. Market players that still relied on the forecasting ability of models – as LTCM reportedly did – thereby received a signal to increase their exposure, since Russian assets for example had become especially "cheap". For LTCM, which

²¹ See the Swedish business magazine *Affärsvärlden*, December 2, 1998.



Value at Risk – a model risk?

VaR indicates the loss that, with a given probability (ordinarily 5 per cent or 1 per cent), will be exceeded during a specified time period.²² Most variants of VaR are based on the assumption that portfolio return is approximately normally distributed and that historical volatility is a good predictor of future volatility. As for risk exposure under turbulent market conditions, however, it is not normal events but extreme ones that are of interest. It is thus unsuitable to use normal distribution assumptions and an excessively narrow confidence level, since the tail ends of a distribution are its relevant parts – that is, extreme cases with low probability but with potentially severe consequences from a risk standpoint (“tail risk”). Developments during the summer and autumn of 1998 were neither normal nor predictable. Among other things, the calculation of VaR for a trading portfolio is normally based on a given horizon (normally one to five days) in which it should be possible to unwind positions – in other words, it presupposes liquid markets. The problem in this context was probably not the model itself, but its application. Greater use of stress tests – where a portfolio is subjected to a large number of possible outcomes – may perhaps provide better guidance from a risk perspective.



** Interpretation: The probability is 1 per cent (assumed) for a larger loss than x (for a specific period of time) or, put simply, the maximum loss is x under normal market conditions (assumption).*

The use of the VaR model may also, to some extent, have contributed to strengthening market volatility and herd instincts in the autumn of 1998. Models are often used for establishing trading limits – risk limits that a trader is forced to follow. VaR places greater emphasis on movements that are close in time when calculating historical volatility. When major market movements occur, traders’ risk limits can quickly be exceeded, with the result that they must reduce risk – for example by selling assets. When players act this way simultaneously, there is a risk that volatility increases.

²² See *Value at Risk for Derivatives* by Jahel, Perraudin and Sellin, Sveriges Riksbank Working Papers Series, No. 45, December 1997.

speculated in narrower interest rate differentials, in some markets such tiny differentials were required in absolute terms that its positions had to be loan-financed in order to yield a decent return. Meanwhile, this meant heavier risk exposure.

The application of the popular Value at Risk (VaR) model to market developments probably contributed to some extent (see the box below).

It is wrong, however, to blame hedge funds in general for having caused the financial market turmoil of the autumn of 1998. Several hedge funds also performed better than various share indexes and traditional fund managers during the second half of 1998. LTCM was an extreme case. In normal cases, letting one hedge fund go bankrupt should not cause problems for the world-wide financial system. Nor was direct bank lending to LTCM the problem, since it was largely covered by collateral. On the other hand, indirect exposure to LTCM by major international investment banks helped magnify financial market instability.

The investment banks had reportedly taken large speculative positions similar to LTCM's, among other things in the belief that interest rate differentials related to credit and liquidity risks would narrow.

The investment banks had reportedly taken large speculative positions similar to LTCM's, among other things in the belief that interest rate differentials related to credit and liquidity risks would narrow. LTCM's historically very high return may have lured investment banks into believing there was

room for more players to make profits from convergence trading in bond yields. Some figures in the press claim that as part of their strategic positions, investment banks had tied around 3,000 billion dollars to the American bond market, while LTCM had positions equivalent to some 80 billion dollars.²³ One anonymous – but well known – hedge fund manager puts it this way: “The proprietary trading desks of the brokerage firms and banks are the biggest hedge funds of all. If one of them goes bust, we are all in the soup.”

Policy measures

However, it is important to point out that it was primarily the hedge funds' counterparties – i.e. the banks – that failed to pursue proper risk management.

The course of events during the autumn of 1998 related to the problems of LTCM has led to various discussions of what can/should be done to reduce the risk of a repetition. There have been calls for tighter regulation of both investment banks and hedge funds.

²³ *The Economist* (1998), “The Risk Business,” October 17, 1998.



Most observers agree that the lack of transparency in the investment portfolios of hedge funds is a problem and that greater transparency would be an advantage. However, it is important to point out that it was primarily the hedge funds' counterparties – the banks – that failed to follow proper procedures. Most measures and reforms should thus focus mainly on the banks – an opinion shared by most observers. Another reason is that when major financial market players (i.e. the banks) have problems, that is when systemic risks occur and market stability is threatened. (The systemic risk aspect is what financial supervisory authorities and central banks focus on.) A working group appointed by the Basle Committee on Banking Supervision also concluded that the potential range of measures mainly involve the banks.²⁴

These possible measures may be divided into *indirect* ones aimed at the counterparties of hedge funds, and *direct* ones aimed at hedge funds.

Among the *indirect measures* aimed at banks that have been discussed, the main one is an improvement in risk management. The banks must become better at assessing credit

Stress tests should be linked with VaR analyses and should be viewed as a necessary complement to VaR.

risks, most observers agree. Discussions often point to the need for regularly recurring *stress tests* of the banks' positions vis-à-vis funds. Stress tests result in estimates of how different types of market developments would hypothetically affect the market value of their positions. These tests thus provide a picture of the risk profile represented by the banks' positions. Stress tests should be linked with VaR analyses and should be viewed as a *necessary* complement to VaR. Banks would certainly develop greater risk awareness if stress tests were used more often. One conceivable consequence of better risk management by banks is that in a longer perspective, this will also lead to somewhat lower risk-taking by the funds, i.e. their leveraging may not exceed a certain limit.

As for proposals to change formal rule systems, for example BIS rules on capital adequacy, it is clearly difficult to introduce rules aimed specifically at hedge funds. On the other hand, a review of rule systems is undoubtedly needed. Today's rules should not work in ways that wrongly favour a given type of risk-taking, thereby (perhaps) creating incentives for "unsound" investments and lending.

Introducing new, differentiated rules for bank exposure to hedge funds without first evaluating today's rules might otherwise result in precisely such effects.

²⁴ "Banks interactions with highly leveraged institutions", Basle Committee on Banking Supervision, BIS (Basel 1999).

As for any demands that banks will be required to report their current exposures to hedge funds, the question also arises whether there should be special rules governing exposures to hedge funds in particular. After all, the problem is how this should relate to other rules on a bank's maximum exposure to the same counterparty. It is simply difficult to draw distinctions between hedge funds and a bank's other counterparties.

More stringent rules concerning the transparency of banks may be desirable in order to protect the stability of financial markets.

More general rules on the transparency of banks may be desirable, however, precisely in order to protect the stability of financial markets.

For example in the risk-weighting of bank exposures, there are also some questions that should be examined more closely. One is the comparatively low risk-weighting of many OTC derivatives for capital adequacy purposes. A bank's repo transactions with hedge funds, where it lends money against bonds as collateral, is another example. Today there are no formal requirements that a bank must demand extra collateral (*haircut*) for the risk that the value of the collateral will fall and thereby not fully cover the amount of the loan.

As for *direct measures* aimed at hedge funds, there are certain possibilities, but also difficulties, in implementing them. Examples of suitable measures might be better risk management requirements for the funds and perhaps also requirements that they supply information to the appropriate authorities. Here too, however, there is a problem in distinguishing between hedge funds among other market players. For example, there must be clear criteria as to which funds should be classified as hedge funds. Another problem is that hedge funds are often active, or rather registered, in countries that have more liberal rule systems. Imposing tougher requirements in the United States and in most of Europe would thus have no effect at all. However, better risk management by hedge funds would undoubtedly reduce their risks of major losses.

Some observers claim that hedge funds are, in fact, far from completely uncontrolled and unregulated.

Some observers, especially among those who are working in the industry themselves, believe that hedge funds are, in fact, far from completely uncontrolled and unregulated.

After all, they have made a commitment to their clients, their investors, to act according to a given strategy – a strategy that must be followed.



Conclusions

This article has discussed the operations of hedge funds and the instability caused by the failure of the LTCM hedge fund, the role these funds play in the market, the consequences of this and what changes in rule systems are possible and probable.

After this review, we can draw the following conclusions:

- Investments by hedge funds are generally less risky than is often claimed. There are many indications that in terms of risk-taking, LTCM was an extreme case.
- The risks generated by the failure of LTCM in the autumn of 1998 mainly involved the stability of financial markets, not the direct loan losses that banks would face if LTCM went bankrupt.
- The most important reason for the failure of LTCM was that its counterparties, i.e. its banks, had inadequate procedures, mainly in terms of risk management.
- Any changes in existing rule systems should therefore aim primarily at banks, not hedge funds. What makes large-scale regulation inadvisable is that it risks being ineffective both in terms of its purpose and a smooth allocation of credits.

Finally, it is worth pointing out that hedge funds normally help to improve the liquidity of markets, among other things by seeking to exploit “abnormally” large interest rate differentials, as LTCM did. In this way, hedge funds normally play an important role in financial markets.

What makes large-scale regulation inadvisable is that it risks being ineffective both in terms of its purpose and a smooth allocation of credits.

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