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Measuring Risk in the Hedge Fund Sector

Tobias Adrian

Recent high correlations among hedge fund returns could suggest concentrations of risk comparable to those preceding the hedge fund crisis of 1998. A comparison of the current rise in correlations with the elevation before the 1998 event, however, reveals a key difference. The current increase stems mainly from a decline in the volatility of returns, while the earlier rise was driven by high covariances—an alternative measure of comovement in dollar terms. Because volatility and covariances are lower today, the current hedge fund environment differs from the 1998 environment.

Hedge funds—private investment partnerships that are not directly regulated—have grown in importance in recent years. Total assets under the management of hedge funds are currently estimated at $1.5 trillion, and the funds contribute more than half of average trading volume in equity and corporate bond markets.[1]

While the funds are major liquidity providers in normal times, their use of leveraged trading strategies has raised concerns about their liquidity effects in times of market stress. Indeed, the collapse of the hedge fund Long-Term Capital Management (LTCM) in 1998 seemed to confirm fears that heavy losses by hedge funds have the potential to drain significant liquidity from key financial markets (Table 1). These ongoing concerns about hedge fund vulnerability, coupled with the rapid growth of the funds, underscore the importance of understanding risk in this sector.

A key determinant of hedge fund risk is the degree of similarity between the trading strategies of different funds. Similar trading strategies can heighten risk when funds have to close out comparable positions in response to a common shock. For example, many funds had to close out positions during the LTCM crisis to meet margin calls and satisfy risk management constraints.

There are many ways to assess the similarity of hedge fund strategies. The approach taken in this edition of *Current Issues* is to examine how closely together the funds' returns move. If the returns of many funds are either high or low at the same time, the funds could record losses simultaneously, with possible adverse consequences for market liquidity and stability.

One standard measure of the comovement of hedge fund returns is covariance. The covariance across a group of funds essentially captures the extent to which their returns move together (or apart, in the case of negative covariance) in dollar terms. A high covariance between two funds means that when one earns a larger-than-normal amount of money, the other is likely to do the same. However, it matters little if two funds tend to gain or lose at the same time if such joint gains and losses are only a small fraction of the funds' total returns. Therefore, analysts "normalize" this measure by dividing the covariance of fund returns by the returns' total variability. This calculation tells us how closely hedge fund returns move together relative to their overall volatility—a different

Table 1
1998 Timeline of the Long-Term Capital Management (LTCM) Crisis

Date	Event
August 17	Ruble devaluation and moratorium on Russian bonds
September 2	LTCM warning to shareholders
September 22	Meeting of LTCM with banks at Federal Reserve Bank of New York
September 23	LTCM recapitalized by consortium of banks with $3.625 billion
September 29	Fed funds rate cut by 25 basis points, to 5.25 percent
October 15	Fed funds rate cut by 25 basis points, to 5 percent
November 17	Fed funds rate cut by 25 basis points, to 4.75 percent

measure of comovement known as correlation. While this measure is frequently used, it has a notable drawback: correlation may change because its numerator (the returns' covariance) or its denominator (the returns' volatility) changes. For instance, the correlation of different funds' returns may rise either because the returns have moved more closely together (their covariance has increased) or because their volatility has fallen.

As this article shows, the distinction is more than a mere technicality: the correlation of hedge fund returns rose both in the period prior to the LTCM crisis and in recent times—but for different reasons. An increase in the comovement of dollar returns was the leading cause of rising correlation in the 1990s, but a decline in overall volatility explains the recent rise.

Complementing this result is our finding that high correlations of returns generally do not precede increases in volatility in the hedge fund sector, but high covariances among hedge funds do. While the LTCM collapse was preceded by high correlations and high covariances in an environment of increased hedge fund return volatility, the current environment is characterized by only average levels of covariances and low volatility. Therefore, with respect to both volatility and covariance, the current environment differs markedly from the one in the months preceding the LTCM crisis.

The final part of our analysis compares hedge fund correlations and volatilities *during* the LTCM crisis with equity return correlations and volatilities. By the time the LTCM crisis broke in August 1998, hedge fund return correlations had dropped from their peak levels in 1996 and 1997 to a level that was not particularly high. Some hedge fund strategies registered losses while others gained. By contrast, equity return correlations and volatilities increased sharply, a phenomenon known as financial market contagion.[2] Thus, this episode provides evidence that while returns on equities and similar financial assets tend to move together during crises, returns on hedge funds tend to react independently, reflecting the differences in hedge fund exposures to various shocks.

[1]Credit Suisse First Boston, "Equity Research Sector Review: Hedge Funds and Investment Banks," March 9, 2005.

[2]This type of financial market contagion among asset returns is well documented. See, for example, Claessens and Forbes (2001).

Table 2
Summary Statistics for Hedge Fund Index Returns
January 1994 to September 2006

Strategy	Mean	Standard Deviation	Minimum	Maximum	Months
Hedge Fund Index	0.87	2.23	-7.55	8.53	153
Convertible Arbitrage	0.73	1.35	-4.68	3.57	153
Dedicated Short Bias	-0.03	4.92	-8.69	22.71	153
Emerging Markets	0.81	4.65	-23.03	16.42	153
Equity Market Neutral	0.80	0.84	-1.15	3.26	153
Event Driven	0.92	1.61	-11.77	3.68	153
Fixed Income Arbitrage	0.52	1.07	-6.96	2.05	153
Global Macro	1.11	3.13	-11.55	10.60	153
Long/Short Equity	0.97	2.92	-11.44	13.01	153
Managed Futures	0.54	3.44	-9.35	9.95	153
Multi-Strategy	0.77	1.24	-4.76	3.61	150

Source: Author's calculations, based on data from Credit Suisse/Tremont.

Notes: The table reports summary statistics for returns on Credit Suisse/Tremont hedge fund strategies. The Multi-Strategy data begin in April 1994.

Hedge Fund Strategies, Returns, and Correlations

Our study uses Credit Suisse/Tremont data on hedge fund returns by trading strategy. This database has the advantage of including the returns of large hedge funds that do not report to the usual hedge fund databases. Trading strategies are classified into ten groups according to asset class and investment style.[3] The indexes are available monthly since January 1994—except for Multi-Strategy, which is available since April 1994.

The data reveal that average returns and standard deviations varied widely across hedge fund strategies during the 1994-2006 period (Table 2). The Global Macro strategy had a monthly average return of 1.11 percent while the return on Dedicated Short Bias was -0.03 percent. Standard deviations—a measure of the risk of a particular trading strategy—ranged from 0.84 percent, suggesting relatively low risk, to 4.92 percent, pointing to greater risk. The distribution of extreme returns also varied widely across strategies. Emerging Markets experienced the largest monthly decline, -23.03 percent, while Dedicated Short Bias had the biggest monthly gain, 22.71 percent.

Significantly, the data also show that correlations among hedge funds were high over the 1994-2006 period (Table 3). The average correlation of the ten strategies with the Credit Suisse/Tremont Hedge Fund Index was 40 percent. Only the Dedicated Short Bias strategy was negatively correlated with the index.

Hedge Fund Risk

Risk is a critical component of hedge fund strategies, so the way in which it is measured is extremely important. By analyzing measures of risk across hedge funds, we seek to shed light

[3]The strategies are identified in Tables 2 and 3. For more details, visit <http://www.hedgeindex.com/>.

Table 3
Correlations of Returns by Hedge Fund Strategy
January 1994 to September 2006

Strategy	Hedge Fund Index	CA	DSB	EM	EMN	ED	FIA	GM	LSE	MF	MS
Hedge Fund Index	100										
Convertible Arbitrage (CA)	40	100									
Dedicated Short Bias (DSB)	-48	-24	100								
Emerging Markets (EM)	66	31	-55	100							
Equity Market Neutral (EMN)	32	33	-32	24	100						
Event Driven (ED)	68	57	-63	66	38	100					
Fixed Income Arbitrage (FIA)	41	53	-5	26	11	38	100				
Global Macro (GM)	85	28	-12	42	20	38	42	100			
Long/Short Equity (LSE)	79	27	-71	60	34	67	18	41	100		
Managed Futures (MF)	17	-13	11	-7	13	-13	-5	27	3	100	
Multi-Strategy (MS)	22	39	-10	2	24	22	30	14	21	4	100

Source: Author's calculations, based on data from Credit Suisse/Tremont.

Notes: The table reports correlations across returns on Credit Suisse/Tremont hedge fund strategies. The Multi-Strategy data begin in April 1994. Figures are in percent.

on the evolution of risk in the hedge fund sector as a whole. This approach is preferable to examining the riskiness of individual funds or strategies because it yields more representative results.

Cross-Sectional Dispersion of Returns

Our preferred measure of risk is the cross-sectional dispersion of returns, which is the volatility of returns across funds at each point in time (see box).[4] One advantage of cross-sectional volatility as an indicator of hedge fund risk is that it captures the exact timing of spikes in risk. It can do so because it implicitly accounts for the variation of exposures over time to different sources of systematic risk—the risk arising from common movements in asset prices. This is an important advantage, because hedge funds use dynamic trading strategies and hold derivatives, practices that lead to time-varying exposures to systematic risk.[5] By comparison, a common alternative approach—gauging risk by calculating volatilities over twelve- or twenty-four-month periods and then averaging across funds—has the potential disadvantage of averaging periods of high and low volatility, making it difficult to determine the precise timing of shocks to risk.

A second advantage of the cross-sectional measure is that it captures idiosyncratic risk—the risk unique to an individual asset—as well as systematic risk. This feature is important because shocks that are idiosyncratic in normal times can cause much broader disruptions when intermediaries become financially constrained. For example, an idiosyncratic shock in 1998—the Russian default—became a threat to overall financial stability because of the failure of LTCM.

According to our measure, cross-sectional volatility of hedge fund returns peaked in August 1998, the month in which the Russian default precipitated the LTCM crisis (Chart 1). Volatility stood at 12.10 percent that month, nearly 7 standard deviations above its mean of 2.66 percent (Table 4). September and October 1998 also saw high volatility. However, over the next twelve months, a rapid decline occurred.

Since 2001, hedge fund return volatility has declined substantially. As Chart 1 shows, average volatility was 3.17 percent before

Measuring Risk in the Hedge Fund Sector

Our preferred measure of risk is the cross-sectional dispersion of returns, defined as the volatility of returns across funds at each point in time.

To construct this measure, we let $i = 1,\ldots, N$ index the hedge fund strategies, and we denote the monthly return of strategy i in month t by R_t^i. We calculate the cross-sectional volatility across strategies as the square root of the cross-sectional second moment:

(1) cross-sectional volatility at time $t = \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(R_t^i\right)^2}$.

Cross-sectional covariance is defined as the average of cross-sectional moments:

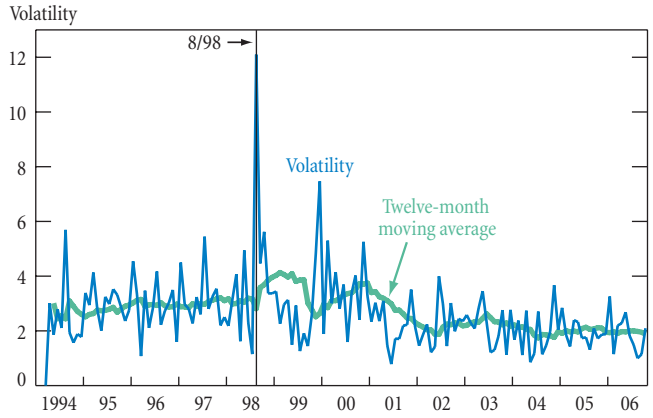
(2) cross-sectional covariance at time $t = \frac{1}{N^2-N}\sum_{i=1}^{N}\sum_{\substack{j=1\\ j\neq i}}^{N} R_t^i R_t^j$.

Cross-sectional correlation is the ratio of cross-sectional covariance to the square of cross-sectional volatility.

[4] From a statistical point of view, this measure of risk is technically not a volatility, but (the square root of) a second moment. However, it captures both the volatility of return innovations and the volatility of expected returns.

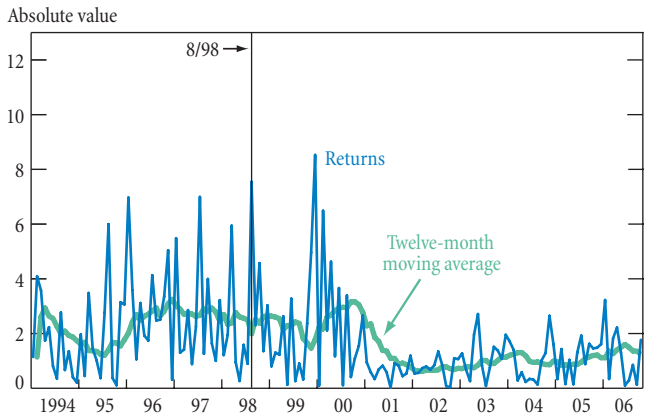
[5] For example, consider a fund that holds put options on an equity index. When the put is "out of the money," the sensitivity of the option with respect to the underlying index is small. If the index declines and the value of the put increases, the exposure of the put position to the index rises. The increase in exposure heightens the volatility of the option, even though the decline in the equity index may not be associated with a change in equity market volatility.

Chart 1
Cross-Sectional Volatility of Credit Suisse/Tremont Hedge Fund Returns
April 1994 to October 2006



Source: Author's calculations, based on data from Credit Suisse/Tremont.
Note: Volatility is measured in percentages of monthly returns.

Chart 2
Absolute Value of Credit Suisse/Tremont Hedge Fund Index Returns
April 1994 to October 2006



Source: Author's calculations, based on data from Credit Suisse/Tremont.
Note: Absolute value is measured in percentages of monthly returns.

that year, but only 2.09 percent afterward. The downward trend since 2001 mirrors the pattern of other volatility measures in the financial markets over the same period.

Absolute Value of Returns

To see why the cross-sectional dispersion of returns is a superior gauge of hedge fund risk, consider an alternative measure: the absolute value of returns on the Credit Suisse/Tremont Hedge Fund Index (Chart 2). The absolute value of returns is a measure of hedge fund volatility that increases with positive as well as with negative returns.

As the chart shows, absolute values of returns were high in the months preceding the LTCM crisis, but many other months in the sample show similarly high or even higher levels of volatility. For instance, the absolute value of the hedge fund index was particularly high in December 1999, the month before the millennium change. Thus, it appears that this measure is not as precise as our cross-sectional measure in distinguishing levels of risk.

Table 4
Summary Statistics for Cross-Sectional Moments
April 1994 to September 2006

Summary Statistic	Volatility	Correlation	Covariance
Mean	2.66	0.11	0.81
Standard deviation	1.35	0.21	2.40
Minimum	0.78	-0.11	-9.74
Maximum	12.10	0.69	13.19

Correlation (Percent)	Volatility	Correlation	Covariance
Volatility	100		
Correlation	-4	100	
Covariance	12	67	100

Source: Author's calculations, based on data from Credit Suisse/Tremont.
Note: The table reports summary statistics and correlations for the cross-sectional volatility, correlation, and covariance of returns on Credit Suisse/Tremont hedge fund strategies.

Hedge Fund Return Comovement

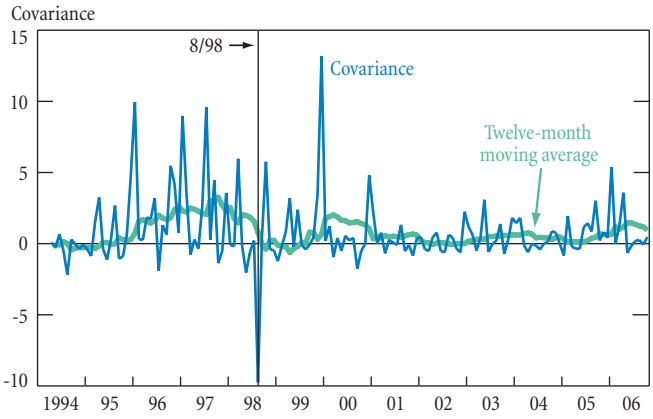
How does the recent behavior of hedge fund returns contrast with the behavior around the time of the LTCM crisis? To explore this question, we track the two measures of return comovement defined in the introduction—covariances and correlations. Recall that covariances are a measure of hedge fund comovement in dollar terms; correlations are covariances divided by volatilities (see box). An increase in correlations can stem either from an increase in covariances or from a decrease in volatilities.[6]

The spike in cross-sectional volatility in August 1998, depicted earlier in Chart 1, was accompanied by a large negative covariance of hedge fund returns (Chart 3). That is to say, some strategies lost money while others profited. The covariance then increased to a positive but not particularly high level in September 1998 before declining to levels close to zero in October and November. This pattern of covariances over time indicates that hedge fund returns diverged significantly as markets reacted to the Russian default. The response by hedge funds was a closing out of positions, leading to the September increase in cross-sectional covariance. Thereafter, covariances remained at fairly low levels, reflecting the reduced risk exposures of the funds.

Chart 4 presents the cross-sectional correlation of hedge fund returns together with the twelve-month moving average. The moving average was unusually high before the LTCM crisis, and it has been increasing recently. However, a comparison of Chart 4 with Charts 1 and 3 shows that the source of

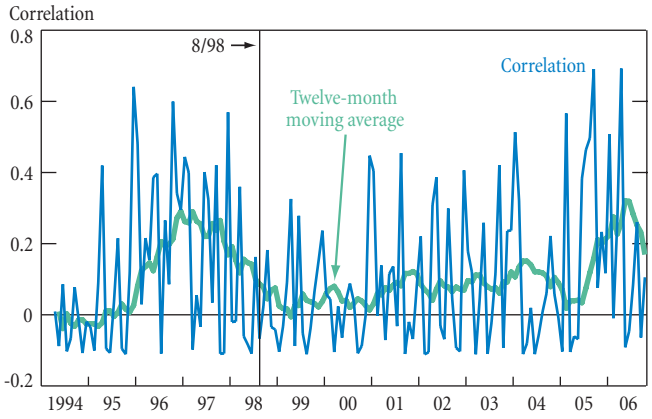
[6]Intuitively, when volatility decreases, the range of returns narrows, increasing the tendency for correlations to be high.

Chart 3
Cross-Sectional Covariance of Credit Suisse/Tremont Hedge Fund Returns
April 1994 to October 2006



Source: Author's calculations, based on data from Credit Suisse/Tremont.
Note: Covariance is measured in percentages of monthly returns.

Chart 4
Cross-Sectional Correlation of Credit Suisse/Tremont Hedge Fund Returns
April 1994 to October 2006



Source: Author's calculations, based on data from Credit Suisse/Tremont.

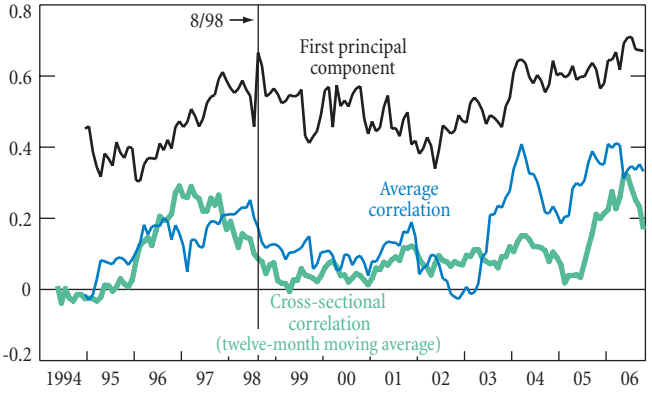
the elevated levels of hedge fund correlations before the LTCM crisis differs from the source in recent months. Whereas the current high level of correlations is associated with an unusually low level of return volatility, the high level of correlations prior to the LTCM crisis is associated with unusually high covariances. Significantly, although the covariance of hedge fund returns has increased in recent months, the most recent twelve-month average of 0.32 is well below the long-run average of 0.84—suggesting that current covariance levels may not be alarmingly high.

Alternative Correlation Measures

Our finding that hedge fund correlations dropped to relatively low levels during the LTCM crisis differs from results in the contagion literature indicating that asset return correlations increase during crises. Accordingly, one might wonder whether our cross-sectional measure differs substantially from other correlation measures. Most other measures of time-varying correlations are calculated as average pairwise correlations over moving twelve-month periods. Chart 5 plots one such measure, average correlation, together with the twelve-month average cross-sectional correlation (our measure).[7] An additional measure in the chart is the explanatory power of a common factor in hedge fund returns: the proportion of variance explained by the first principal component.[8]

The chart reveals that the overall pattern of the alternative correlation measures is similar to that of our measure: correlations were high prior to the LTCM crisis, and have been rising recently. However, there are some notable differences. The peak in average correlation prior to the LTCM crisis occurred in July 1998, while our moving average of cross-sectional correlations peaked in December 1996. More recently, average correlations have increased since 2003, but cross-sectional correlations have risen only since 2005. These differences suggest that the overall evolution of the correlation measures is similar, even though the precise timing varies somewhat.

Chart 5
Forecasting Volatility
April 1994 to October 2006



Source: Author's calculations, based on data from Credit Suisse/Tremont.
Note: The chart plots the twelve-month moving average of cross-sectional correlations across hedge fund returns together with the cross-sectional average of all pairwise twelve-month rolling correlations and the twelve-month rolling proportion of variance explained by the first principal component across hedge fund returns.

[7]Garbaravicius and Dierick (2005) survey the recent literature on hedge funds and financial stability; to our knowledge, they are the first to report rolling correlations across hedge fund strategies as an indicator of risk. Chan et al. (2005) explore a variety of indicators of systemic risk in the hedge fund sector. McGuire, Remolona, and Tsatsaronis (2005) construct measures of hedge fund leverage using rolling factor exposures of hedge fund returns.

[8]The first principal component is the linear combination of returns that best explains the common variation among the returns.

The Temporal Relationship between Hedge Fund Covariances and Risk

If the LTCM crisis was indeed preceded by elevated levels of hedge fund correlations, as our findings suggest, then it is reasonable to ask whether correlations predict volatilities—volatilities being our preferred measure of hedge fund risk. High correlations might indicate correlated exposures to underlying sources of risk, which in turn might raise the likelihood of a crisis when a shock hits the financial markets.

Table 5 reports the results of our regressions of quarterly hedge fund volatility on lags of itself as well as a combination of lagged values of correlations and covariances. Columns 1 and 3 show no statistical relationship between correlations and future volatilities. Significantly, columns 2 and 3 reveal that elevated covariances do tend to precede increases in volatilities.

One can conclude from these results that the increase in covariances—rather than the increase in correlations—was an early indicator of the high volatility that took place during the LTCM crisis. This conclusion is reasonable, because covariances measure hedge fund return comovement in dollar terms while correlations are covariances normalized by volatilities. System risk can occur when returns in the hedge fund sector move significantly in dollar terms; whether such movement is high or low relative to the level of volatilities appears to be less relevant. A further rise in covariances could thus be of some concern, but the current high level of correlations does not appear to be a strong predictor of future volatility.

Table 5
Dependence of Volatility on Correlation and Covariance
April 1994 to September 2006

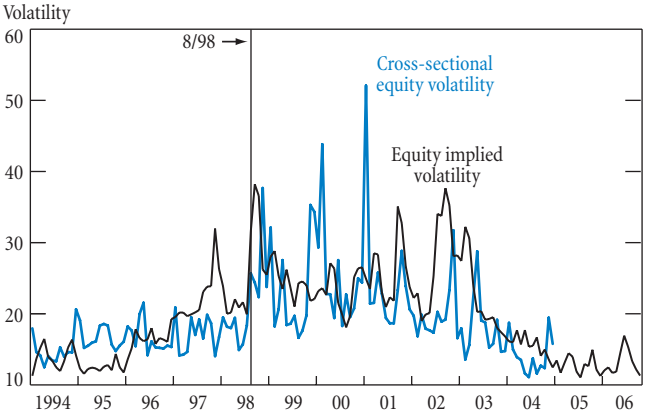
	(1)	(2)	(3)
Volatility			
Lag 1	0.28***	0.33***	0.25*
Lag 2	0.29**	0.24*	0.21*
Lag 3	-0.05	-0.03	-0.06
Correlation			
Lag 1	-2.08		-1.89
Lag 2	0.23		-1.22
Lag 3	0.79		-0.10
Covariance			
Lag 1		-0.12	-0.01
Lag 2		0.13*	0.19***
Lag 3		0.06	0.08
Constant	1.39**	1.18***	1.73**

Source: Author's calculations, based on data from Credit Suisse/Tremont.

Notes: The table reports regressions of the cross-sectional volatility on lags of cross-sectional volatility, correlation, and covariance at a quarterly frequency. Standard errors are adjusted for autocorrelation and heteroskedasticity.

*Statistically significant at the 10 percent level.
**Statistically significant at the 5 percent level.
***Statistically significant at the 1 percent level.

Chart 6
Cross-Sectional Equity Volatility and Equity Implied Volatility
January 1994 to October 2006



Source: Author's calculations, based on data from the Center for Research in Security Prices (CRSP) and the Chicago Board Options Exchange (CBOE).

Notes: The chart plots the cross-sectional volatility of all stocks in the CRSP data set from January 1994 to December 2004 and the CBOE equity implied volatility index from January 1994 to October 2006. Equity implied volatility is annualized.

A Comparison with Equity Market Comovement

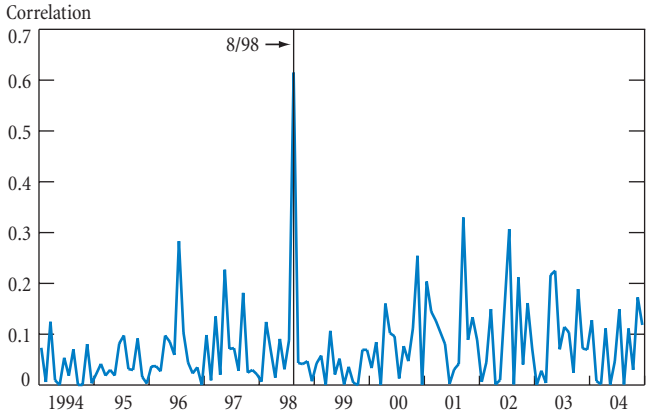
Our finding that the onset of the LTCM event was not associated with an increase in hedge fund correlations contrasts with other results showing how asset returns behave during financial crises. The literature on financial market contagion typically finds an unusual increase in asset return correlations during crises (see Claessens and Forbes [2001]). Contagion occurs when risk aversion increases because of trading losses, possibly owing to more binding financial constraints (see Kyle and Xiong [2001]). The spillover effect from the Russian default to the U.S. stock market in the summer of 1998 is a good example of this type of contagion.

To put our findings in the proper perspective, we compare the behavior of risk and comovement among hedge funds with that of equity market returns. We create indicators of equity market risk by calculating cross-sectional equity volatility and plotting equity implied volatility derived from options prices.[9] Equity implied volatility peaked in September 1998, the month of the LTCM recapitalization (Chart 6). Cross-sectional equity volatility did not spike in either August or September 1998. Equity correlations, however, showed a sharp peak above 60 percent in August 1998 (Chart 7).

The behavior of equity correlations contrasts strongly with that of hedge fund correlations during the LTCM crisis. As we observed earlier, hedge fund correlations did not spike during either the Russian default or the LTCM event. Taken together, these results suggest that the investment strategies of hedge

[9]We use the equity implied volatility index of the Chicago Board Options Exchange as a measure of equity implied volatility. Cross-sectional equity volatility is measured for all traded stocks for each month.

Chart 7
Cross-Sectional Equity Correlation
January 1994 to December 2004



Source: Author's calculations, based on data from the Center for Research in Security Prices (CRSP).

Note: The chart plots the cross-sectional correlation of all stocks in the CRSP data set.

funds differ substantially from those of marginal equity investors. In particular, the spike in hedge fund cross-sectional volatility in August 1998 illustrates the heterogeneity of hedge fund investment strategies. In a related study, Boyson, Stahel, and Stulz (2006) find no evidence of contagion between hedge funds and market indicators—a result consistent with our finding that spikes in correlations and volatilities in the equity market do not coincide with those of hedge fund returns.

Conclusion

Our analysis of the relationship between hedge fund risk and comovement of returns generally produces no statistical evidence that increases in hedge fund correlations precede rises in hedge fund volatility. However, we do find that increases in hedge fund covariances tend to precede elevations in volatility. This result suggests that comovement measured in dollars—covariance—is a more relevant indicator of risk than comovement measured in correlation, that is, covariance normalized by volatility. Recently, hedge fund covariance has increased, but it is not at particularly high levels by historical standards. The unusually high correlation among hedge funds in the current environment is therefore attributable primarily to low hedge fund volatility—a reflection of the generally low volatility of financial assets.

We also find that the evolution of hedge fund risk and comovement during the Long-Term Capital Management crisis differed from the behavior of broad financial market returns. While the correlations of financial assets such as equities spiked at the same time as volatility shot up, hedge fund return correlations were not unusually high at the beginning of the crisis and they declined sharply as it unfolded. This finding reflects the diverse effects of the crisis on the outcomes of different hedge fund strategies: some hedge funds profited during the event while others registered losses.

References

Boyson, Nicole M., Christof W. Stahel, and René M. Stulz. 2006. "Is There Hedge Fund Contagion?" NBER Working Paper no. 12090, March.

Chan, Nicholas, Mila Getmansky, Shane M. Haas, and Andrew W. Lo. 2005. "Systemic Risk and Hedge Funds." NBER Working Paper no. 11200, March.

Claessens, Stijn, and Kristin J. Forbes, eds. 2001. *International Financial Contagion*. Boston: Kluwer Academic.

Garbaravicius, Tomas, and Frank Dierick. 2005. "Hedge Funds and Their Implications for Financial Stability." European Central Bank Occasional Paper no. 34, August.

Kyle, Albert S., and Wei Xiong. 2001. "Contagion as a Wealth Effect." *Journal of Finance* 56, no. 4 (August): 1401-40.

McGuire, Patrick, Eli Remolona, and Kostas Tsatsaronis. 2005. "Time-Varying Exposures and Leverage in Hedge Funds." Bank for International Settlements *Quarterly Review*, March: 59-72.

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About the Author

Tobias Adrian is an economist in the Capital Markets Function of the Research and Statistics Group.

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