

Homework #2

Due on Wednesday, July 1, at 6pm CT.

Long-Term Capital Management, L.P. (A) [HBS 9-200-007]

1 Conceptual issues for LTCM

Section 1 is not graded, and you do not need to submit your answers. But you are encouraged to think about them, and we will discuss them.

1. Describe LTCM's investment strategy in less than 100 words.
2. What are LTCM's biggest advantages over its competitors?
3. LTCM is largely in the business of selling liquidity and volatility. Describe how LTCM accounts for liquidity risk in their quantitative measurements.
4. Is leverage risk currently a concern for LTCM?
5. Many strategies of LTCM rely on converging spreads. LTCM feels that these are almost win/win situations because of the fact that if the spread converges, they make money. If it diverges, the trade becomes even more attractive, as convergence is still expected at a future date.

What is the risk in these convergence trades?

2 LTCM Risk

On Canvas, find the data file, “**hedge_fund_data.xls**”.

- The first tab gives LTCM excess returns—both gross and net of fees.
 - Use this provided LTCM return data provided, rather than the subsample provided in the case exhibit.
 - The third tab has factor data on the equity market index.
 - In this section, you will only need the subsample corresponding to the dates matching the LTCM data.
1. Summary stats.
 - (a) For both the gross and net series of LTCM excess returns, report the mean and volatility. Since this is monthly data, scale the mean by 12, and scale the volatility by $\sqrt{12}$.
 - (b) Report the annualized Sharpe ratio, (the SR based on the annualized mean and volatility.)

- (c) Comment on whether the mean, volatility, and Sharpe ratio seem especially high or low relative to other assets we have seen.
2. Using the series of **net** LTCM excess returns, denoted \tilde{r}^{LTCM} , estimate the following regression:

$$\tilde{r}_t^{\text{LTCM}} = \alpha + \beta^m \tilde{r}_t^m + \epsilon_t$$

- (a) Report α and β^m . Report the R^2 stat.
- (b) From this regression, does LTCM appear to have much exposure to the equity-market factor, \tilde{r}^m ?
3. Regression-based metrics.
- (a) Calculate the Treynor ratio.
- (b) Calculate the Information ratio.
4. Tail risk.
- (a) Calculate the 5th worst return of the sample.
- (b) Calculate the mean of the worst 4 returns from the sample.
- (c) Report the skewness of the return distribution. Compare to a normal distribution with skewness of 0.
- (d) Report the kurtosis of the return distribution. Compare to a normal distribution with kurtosis of three.¹

3 Other Hedge Fund Indexes

Analyze the Total Index fund (of the second tab in the data file,) by calculating the same statistics you estimated for LTCM. So if you wrote the code above well, it can mostly be re-used for this.²

1. Report the summary statistics for each series:
- Annualized mean
 - Annualized volatility
 - Skewness (no annualizing)
 - Kurtosis (no annualizing)
 - 5th percentile of returns.
2. For each series, run a regression of the series on the market-equity factor:
- Report the following for each regression:

¹Careful that some computational packages calculate *excess* kurtosis, which is kurtosis minus three, such that an excess kurtosis above zero is already a kurtosis larger than that of a normal distribution.

²Note that the data for these funds covers a longer time period than the data for LTCM, so the stats are not directly comparable.

- beta
- alpha
- R-squared
- Treynor Ratio
- Information Ratio

3. Optional.

Re-run this for every hedge-fund index, not just the “Total Index”.

- (a) Which is the most attractive in terms of Sharpe ratio?
- (b) And in terms of regression-based metrics?
- (c) And in terms of tail-risk?
- (d) What is the correlation matrix of the hedge-fund return strategies?