

# Hedge Fund Returns: A Study of Convertible Arbitrage

by

Chris Yurek

An honors thesis submitted in partial fulfillment

of the requirements for the degree of

Bachelor of Science

Undergraduate College

Leonard N. Stern School of Business

New York University

May 2005

Professor Marti G. Subrahmanyam

Faculty Adviser

Professor Lasse Pedersen

Thesis Advisor

# Table of Contents

<b>I Introductions.....</b>	<b>3</b>
Related Research.....	4
Convertible Arbitrage Returns.....	4
<b>II. Background: Hedge Funds.....</b>	<b>5</b>
Backfill Bias.....	7
End-of-Life Reporting Bias.....	8
Survivorship Bias.....	9
Smoothing.....	9
<b>III Background: Convertible Arbitrage.....</b>	<b>9</b>
Past Performance.....	9
Strategy Overview.....	10
<b>IV Implementing a Convertible Arbitrage Strategy.....</b>	<b>12</b>
Creating the Hedge.....	12
Implementation with No Trading Rule.....	13
Implementation with a Trading Rule.....	14
Creating a Realistic Trade.....	15
Constructing a Portfolio.....	16
Data.....	16
Bond and Stock Data.....	16
Hedge Fund Databases.....	17
<b>V Convertible Arbitrage: Risk and Return.....</b>	<b>17</b>
Effectiveness of the Hedge.....	17
Success of the Trading Rule.....	20
Portfolio Risk and Return.....	22
Hedge Fund Database Returns.....	23
<b>VI Conclusion.....</b>	<b>25</b>

## **Abstract**

The hedge fund world has recently experienced an explosion in growth. However, while new investors rush to pour money into a seemingly attractive industry, the risk and returns of popular strategies are not fully known. This study simulates a Convertible Arbitrage strategy in order to determine its risk and return characteristic and then compares these returns to returns found in Hedge Fund Databases. We find that before fees, the strategy has excess returns of 2.57% per year from September 2000 to December 2004. These returns compare nicely to those reported in databases. However, after adjusting for fees, the excess returns turn negative and the correlation of our returns to those reported in databases declines significantly suggesting that reported returns may be upwardly biased.

## **Introduction**

The hedge fund industry makes it into the headlines more often seemingly every year. Not only has the industry grown significantly, but it is also having greater effects on financial markets throughout the world. The reason for its success is the apparent superior returns coupled with low volatility that hedge funds seem to offer. Hedge Fund databases and Indexes report that hedge funds have been significantly outperforming benchmarks since at least the mid 1990's. Because of this success, hedge funds have expanded to mainstream investors. For example, last year two huge financial institutions, JP Morgan and Lehman Brothers, were in talks to acquire multi-billion dollar stakes in two large hedge funds.

However, the risks and returns of many of the strategies have not been explored to the fullest, and the returns reported by databases may not be the best measure. While there have been a number of studies looking at possible biases in reported hedge fund returns, including back-fill bias, survivorship bias, end-of-life reporting bias, and smoothing, there are only two major papers that have attempted to quantify the risks involved with some major hedge fund trading strategies.

## **Related Research**

Liu and Longstaff (2004) and Mitchell and Pulvino (2001) tested the return characteristics of two specific hedge fund trading strategies in order to determine if the strategies were as attractive as they appear on paper. Liu and Longstaff (2004) tested the risks and returns of fixed income arbitrage and found that the strategy does in fact provide excess returns on the order of one to six percent per year, which is on par with what is reported in hedge fund databases. However, they find these returns actually represent a compensation for market risks not captured by standard risk measurements. Mitchell and Pulvino (2001) also find that a Merger Arbitrage strategy has excess returns on the order of four percent per year.

These results also correspond highly to those found in hedge fund databases. However, these two papers overlook the effect of the significant fees that hedge fund managers take for their efforts. Therefore, while the papers give a better understanding of the risks involved in each strategy, they fail to look at the effects that fees have on the returns and the implications for reported hedge fund returns.

## **Convertible Arbitrage Returns**

This paper takes a similar approach to Liu and Longstaff (2004) and Mitchell and Pulvino (2001) for a Convertible Arbitrage strategy. And indeed, we find that Convertible Arbitrage offers similar results to the previous papers: excess returns of 2.57% per year and low volatility in a period from September 2000 through December 2004. The alpha of the strategy is significant and 3.27% with a beta of just 0.05. These returns are also

very similar to those found in hedge fund databases. Van Hedge Fund Advisors report that their Convertible Arbitrage Index had excess returns of 4.09%, an alpha of 4.11% and a beta of 0.01 over the same period. Similarly, CSFB/Tremont's Convertible Arbitrage Index had excess returns of 3.23%, an alpha of 3.27%, and a beta of -0.003.

However, once we take the standard hedge fund fees of 2% management and 20% performance into account, the attractiveness of the strategy declines significantly. The excess returns slip to -1.03%, which corresponds to an alpha of -0.67% and a beta of 0.05.

This suggests that while the strategy does appear attractive, hedge fund fees absorb all of the excess returns. Additionally, this suggests an upward bias in returns reported by hedge funds, a finding suggested in many other papers.

## **Background: Hedge Funds**

The hedge fund industry has undergone significant growth in the past couple of years. Investment in hedge funds has increased from an estimated \$400 billion in 2001 to over \$1 trillion in 2004. The number of hedge funds has also grown from an estimated 3,000 funds in 2000 to an estimated 8,000 funds in 2005. Hedge funds also typically use large amounts of leverage, meaning that these investment vehicles have an even greater impact on the global financial markets than the size of their assets suggest.

The term 'hedge fund' is a general term that applies to a broad range of different strategies. Hedge funds enjoy less regulation as mutual funds, their older and larger

counter parts, and therefore often hold both long and short positions in addition to derivative positions. Basic strategies include long/short, market neutral, arbitrage, and directional trading strategies.

Historically, hedge funds have been primarily used by institutional investors looking to diversify large portfolios. In recent years, however, hedge funds have also become popular for wealthy individual investors. Part of the reason for the increased interest in this asset class is the potential for large returns coupled with low volatility that is uncorrelated to the overall market. And indeed, this potential appears to be present. According to the Van Hedge Fund index, the average hedge fund has returned 14.14% annually with a standard deviation of 7.75% between 1995 and 2004. This is compared to the S&P 500, which had a yearly return of 11.53% and standard deviation of 15.60% in the same period.

Hedge funds are not only attractive to investors, but also to portfolio managers. The average hedge fund takes a 2% management fee and 20% performance fee, leaving the potential for a huge payday for portfolio managers. The benefits hedge funds offer both to investors and managers seem to create the perfect asset class: investors like high returns and low volatility, and managers like the high fees. The result has been an explosion in the number of hedge funds in recent years.

However, this 'perfect' asset class does not come for free. While SEC hedge fund scrutiny has increased recently with the requirement of hedge fund managers with more than \$25 million under management to register as financial advisors, this is still a highly

unregulated industry. For one, only about 45% of hedge funds are larger than \$25 million, meaning many hedge fund managers still do not have to register. In addition, hedge funds are not required to report their returns to an index or database.

Both of the above anomalies present an additional source of risk for investors. Judging by the pure number of hedge funds, there is the potential for unsavory characters to get into the business. It is not unheard of for incompetent managers to either lose all their investor's money, or worse, take the money and run. Additionally, because hedge funds are not required to report returns, hedge funds with somewhat rocky histories will tend not to report. This leaves only the best funds left to report, skewing databases and making hedge funds appear more attractive than they actually are. Below are some of the biases found in hedge fund databases.

### **Backfill Bias**

Often, a hedge fund will not report returns to indices until they have developed a strong track record. This period is often referred to as an 'incubation period' where the manager is usually only managing his own or friends money. If results are favorable, managers will often decide to report to indices or databases in hope of raising further capital. The past results are then 'backfilled' into the database, giving the reported returns and upward bias. Park (1995) found that the average incubation period is between 15 and 27 months. If the strategy has proved successful in this time period, the manager will then start reporting.

Malkiel and Saha (2004) found that in the early years of hedge fund databases, the majority of returns had been backfilled. They estimated the effect of this backfill to increase average hedge fund returns by 500 basis points per annum. Fung and Hsieh (2000) estimated the backfill bias in their sample at 140 basis points per annum.

### **End-of-Life Reporting bias**

Malkiel and Saha (2004) found that hedge funds stop reporting in the few months before they dissolve. Generally, before a fund fails, it suffers significant losses. For example, Long Term Capital Management stopped reporting its returns near the end of its life as it lost almost all of its capital. Therefore, the manager's decision to stop reporting puts an upward bias on average hedge fund returns.

However, there are other reasons for hedge funds to stop reporting returns to databases. One such reason is that funds with superior performance close to new money and therefore stop reporting. Fung and Hsieh (1997) discuss this counteracting effect, noting that the highly successful Quantum fund managed by George Soros does not report returns because it has been closed to new investors since 1992. This fact gives a downward bias to hedge fund databases. Unfortunately, it is impossible to tell which funds stop reporting due to failure as opposed to success. However, Fung and Hsieh (2000) found that the funds that stop reporting had a much lower average return than those that continued to report. Additionally, of the funds that stopped reporting in their sample, 60% were liquidated. While they found that all funds that stopped reporting had a lower average return, they found that the 60% that were liquidated performed significantly worse, with returns of -0.4% per annum between 1994-1998.



## **Survivorship Bias**

Unsuccessful hedge funds tend not to survive, leaving only the successful hedge funds left to report to the indices. This effect also causes an upward bias on average hedge fund returns. Malkiel and Saha (2004) estimated that 10% of hedge funds fail every year. In addition, in their study, of the 604 hedge funds that reported results in 1996, only 124 funds were still around to report in 2004 (less than 24%). They also found that there was a 750 basis point difference between surviving funds and failing funds. Liang (2000) estimates that survivorship bias overstates hedge fund returns by as much as 2% per year.

## **Smoothing**

Because the industry is not highly regulated, and funds are not required to report audited returns, funds that do report have the tendency to smooth their reported returns. This reduces volatility, thus improving the risk and reward characteristics of the returns.

These issues show that there is potential for a significant upward bias on hedge fund returns. While the reported numbers boast high, uncorrelated returns, there is a danger that this information is unrepresentative of the overall industry.

## **Background: Convertible Arbitrage**

### **Past Performance**

The Convertible Arbitrage Strategy has been one of the most popular hedge fund strategies in recent years. Up to 2001, about one third of all investments in hedge funds

went into a convertible arbitrage strategy and it is considered by many to be one of the cornerstones of the industry through the 1980's and '90's.

Hedge funds have been active in the convertible bond world since the 1980's. As much as 70% of new issue convertible bonds are taken up by hedge funds and estimates have hedge funds controlling as much as 80% of the overall convertible bond market.

However, in recent years the huge influx of capital into this strategy has made it less attractive by pushing up convertible bond prices up and making opportunities less profitable.

None the less, according to the Van Hedge Fund Advisors Convertible Arbitrage Index, the strategy has returned an average 13.17% per year with an annual standard deviation of 3.40% since 1995. This compares to the S&P, which returned an average 11.27% per year with an annual standard deviation of 15.14%. Based on these numbers the Convertible Arbitrage strategy had a beta of .04 and a yearly alpha of 6.81%. The numbers reported by the Van Hedge Fund Advisors are net of fees.

### **Strategy Overview**

A Convertible Arbitrage strategy is primarily based on buying a convertible security, usually a convertible bond, and shorting the underlying common stock. The goal of this strategy is to create a market neutral position and capitalize on underpricings between the bond and the stock. In general, the price of the convertible bond will fall less rapidly than the underlying stock in a falling equity market yet mirror more closely the stock in a rising equity market (Nicholas, 58).

Convertible bonds are made up of two primary components: straight debt and an option to convert into common stock. The straight debt, referred to as the ‘investment value’, represents a floor to the value of the convertible bond. The option to convert depends on the conversion price, stock price, time to maturity, volatility of the stock, and risk free rate.

In a standard Convertible Arbitrage trade, the manager attempts to create a market neutral position by buying a convertible bond and shorting an appropriate amount of the underlying common stock. The sources of returns from this strategy include:

- Interest income from the bond
- Interest earned on the cash proceeds of the short sale of stock
- Changes in the value to convert
- Profits from rebalancing due to a fall in the underlying stock or rise in the convertible bond (Nicholas, 68)

The worst case scenario for a Convertible Arbitrage strategy is a flat stock market and rising interest rates. In this case, the investment value of the bond will fall, the option to convert will fall (as time to maturity and volatility decrease), and the trade will lose money. This was the situation that occurred in 1994 and 1998, in which the strategy lost 8.02% and 4.09% respectively. However, in most other cases, the trade will make money on at least two of the above sources of returns.

## Implementing a Convertible Arbitrage Strategy

### Creating the Hedge

The basic and most common Convertible Arbitrage strategy consists of being long a convertible bond and selling short an appropriate amount of the underlying stock. In shorting the stock, the arbitrageur is attempting to remove effects of price changes in the bond due to its sensitivity to the underlying stock. This sensitivity is the delta of the convertible bond.

To calculate the delta, we used the Black-Scholes formula:

$$\text{Delta} = N\left(\frac{\ln(S/K) + (r + s^2/2)*t}{\sigma \sqrt{t}}\right) \quad (1)$$

Where: N = cumulative standard normal distribution

S = Current Stock Price

K = Conversion Price

r = Risk free interest rate

$\sigma$  = Yearly standard deviation of the underlying stock

t = Time to maturity (in years)

To calculate the delta, we used the 10 yr. t-bill to estimate the risk free rate and used the past 25 day standard deviation, annualized, for the standard deviation of stock returns.

Each bond has a conversion price and corresponding number of common shares to which

the bond can convert per \$1,000 face value (the conversion ratio). We determine the appropriate hedge for each bond by multiplying the delta by the conversion ratio.

### **Implementation With No Trading Rule**

The simplest way to implement a convertible arbitrage strategy is to buy a convertible bond and short the underlying stock according to the delta without giving a thought to the relative price between the stock and bond. To do this, we buy the convertible bond at time  $t=1$  and simultaneously short the stock. Throughout the life of the trade, the quantity of bonds is held constant, while the hedge is adjusted daily based on changes in the delta.

Daily returns come from four main sources in this scenario: changes in the bond price, changes in the stock price, interest from the proceeds of the short sale, and interest from owning the bond. Interest earned on the proceeds of the short sale is reduced, however, because 50% of the short sale proceeds must be posted for margin.

We looked at the returns for this simple trade under two conditions: with transaction costs and without transaction costs. Transaction costs consist of bid/ask spread on both the bond and the stock as well as broker commissions paid to buy/sell the bonds and stocks. We assumed the following transaction costs: 2.0% and 0.50% bid/ask spread for the bonds and stocks, respectively, and 0.50% and \$0.01 brokerage commissions for the bond and stock, respectively. These numbers are inline with prices paid by hedge funds.

## Implementation With a Trading Rule

The most commonly used Convertible Arbitrage strategy is a positive carry strategy. In this strategy, the trader buys the bond and shorts the stock if the expected income is greater than the financing/opportunity costs. We created a formula that determines when the above scenario is present:

$$\text{Carry}_t = (B_t * \text{YTM}_t) + (S * (d_t * C_b) * (\frac{1}{2}sy - dy)) - (B_t * D) \quad (2)$$

Where:  $B_t$  = Cost of Bond at time t

$\text{YTM}_t$  = Yield to Maturity at Time t

$S$  = Current Stock Price

$d_t$  = Delta at time t

$C_b$  = Conversion Ratio

$sy$  = Interest earned on short sale

$dy$  = dividend yield of the stock (cost of shorting)

$D$  = Financing/opportunity cost of capital

This formula consists of four parts:

1.  $(B_t * \text{YTM}_t)$ , the income earned on the bond position
2.  $S * (d_t * C_b)$  the value of the short position;
3.  $(\frac{1}{2} sy - dy)$ , the interest earned on the proceeds of the short position minus the cost of the short position. The interest earned on the short sale is multiplied by  $\frac{1}{2}$  because only half of the proceeds have to be posted for margin
4.  $(B_t * D)$ , the cost to the trader for putting a position on.

Based on this formula, the trade is implemented if:

$$\text{Carry}_t > 0 \quad (3)$$

Once the carry turns negative, the bond position is sold and the short position covered.

### **Creating a Realistic Trade**

In order to simulate a realistic trade, we assume that each trade starts out with a set amount of cash, a fraction of which is used to buy the buy the bond. The remaining capital is used to post margin for the short position. Any capital left over earns interest at the opportunity cost of capital. We Assumed this opportunity cost to be 6% based on the low end of what a Convertible Arbitrage manager could earn on an average trade according to the hedge fund databases. If the current carry of the bond is negative, the entire amount is earning at the opportunity cost of capital.

For clarification, take an example. Assume the current carry on a position is positive and we start with \$1MM. We use 50% of that to buy bonds, simultaneously short the underlying stock and have to post an additional \$250M of margin for our short sale. This leaves the remaining \$250M earning at the opportunity cost. Each day, our profit consists of the price change in the bond offset by the price change in the stock, interest earned on the proceeds of the short sale, interest earned on the bond, and interest on the excess capital. We adjust the value of the hedged position daily based on the delta while the number of bonds remains constant.

When the carry turns negative, We liquidate our bonds and cover our short position. Our entire capital is now earning at the opportunity cost of capital. When the carry turns positive again, we again invest 50% of our capital into bonds, short the stock, and post margin.

### **Constructing a Portfolio**

To get an idea of an average portfolio of a Convertible Arbitrage strategy, we aggregate the daily P/L of each trade and calculate the monthly return. We calculate returns based on three scenarios:

1. Gross of transaction costs and fees
2. Net of transaction costs, gross of fees
3. Net of transaction costs and fees

Fees are based on the industry standard 2% management/20% performance fees.

We have left the effects of leverage out of this analysis. While the majority of hedge funds to use large amounts of leverage, the general effects of leverage are well known: increase in returns and standard deviation. This is the same approach and reasoning used by Liu and Longstaff (2004).

### **Data**

#### **Bond and Stock**

Bond and stock data was obtained from Datastream, a proprietary data vender. We gathered data ten bonds and their corresponding stock.



The bond prices quoted are ‘clean prices,’ meaning they do not include accrued interest. In reality, bonds are bought and sold including accrued interest. Therefore, accrued interest was added to each bond and removed on days of interest payments. Stock prices were quoted after making adjustments for stock splits, etc.

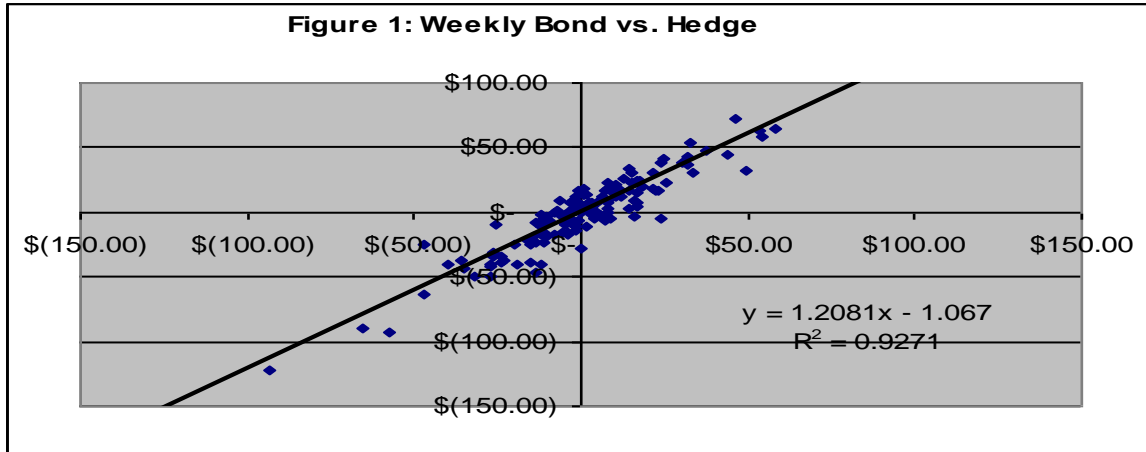
### **Hedge Fund Database**

Convertible Arbitrage has been one of the most popular hedge fund strategies since hedge funds started gaining popularity in the 1990’s and therefore large hedge fund databases have a sub-index for Convertible Arbitrage. These numbers are reported on a monthly basis. The primary databases used in this study were the Van Hedge Fund Advisor’s Convertible Arbitrage Index and the CSFB/Tremont Convertible Arbitrage index. These indexes give monthly data starting in 1995 to present. The average reported return and standard deviation from 1995-2004 was 13.17% and 3.40%, respectively.

### **Convertible Arbitrage: Risk and Return**

#### **Effectiveness of the Hedge**

The hedge had a varying level of effectiveness across trades. Ideally, the hedge matches a dollar change in the bond with a dollar change in the stock. Figure 1 represents the hedge for Barnes & Noble, a particularly effective hedge. For every \$1.20 change in the price of the bond, there is a corresponding \$1.00 change in the price of the stock. This is accompanied by a very high  $R^2$  of .92.

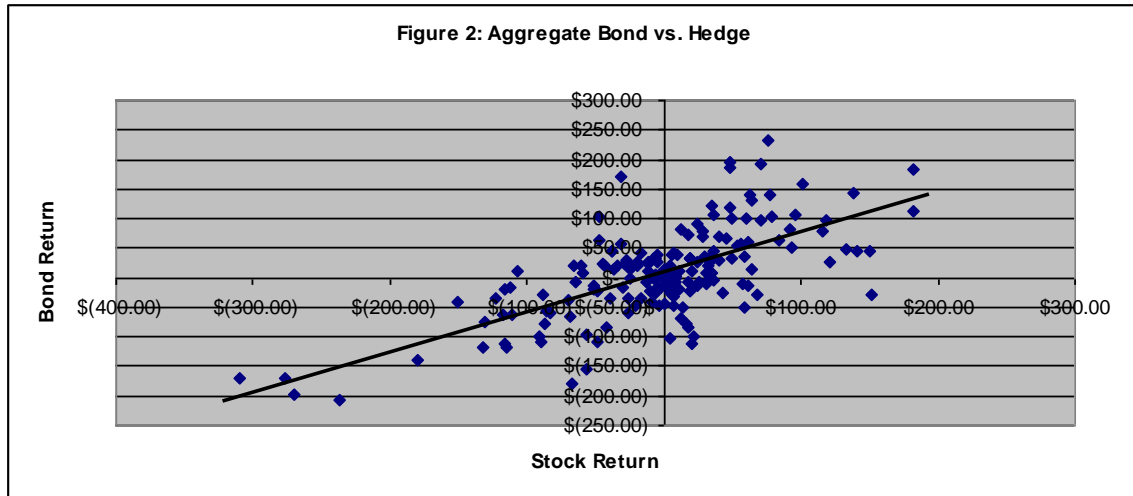


Because this hedge is so successful at removing the price changes in the bond due to changes in the stock, this trade essentially only made money on the interest income from the bond in addition to the interest on the proceeds of the short sale of stock.

Figure 2 represents bond vs. hedge returns on an aggregate basis across all ten trades of the portfolio. Running a regression between bond returns and stock returns produces the equation:

$$y = 7.869 + .675x \quad (4)$$

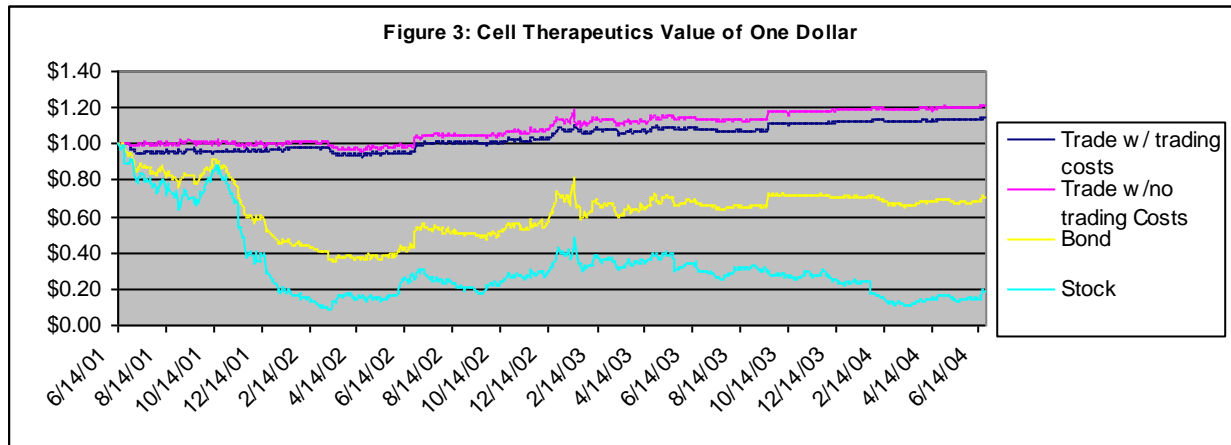
The regression has a relatively high  $R^2$  of 0.45. Over the entire portfolio of ten trades, every \$0.67 change in the value of the bond corresponds to a \$1.00 change in the stock. While this means that the hedge overcompensates for movements in the bond, this is still a relatively effective hedge because it is able to neutralize most of the sensitivity of the bond due to the stock throughout the portfolio as a whole.



The effectiveness of the hedge has implications for the risk and return of the portfolio. Ideally, in a standard Convertible Arbitrage trade, the returns come from the interest payments from the bond and the interest on the proceeds of the short sale. As long as the hedge is effective in neutralizing the bond's sensitivity to the stock, these will essentially be the only source of returns. Therefore, because our hedge was successful in neutralizing the bond's delta, trades were able to make money in essentially any environment: whether the bond and stock were falling, rising, or flat.

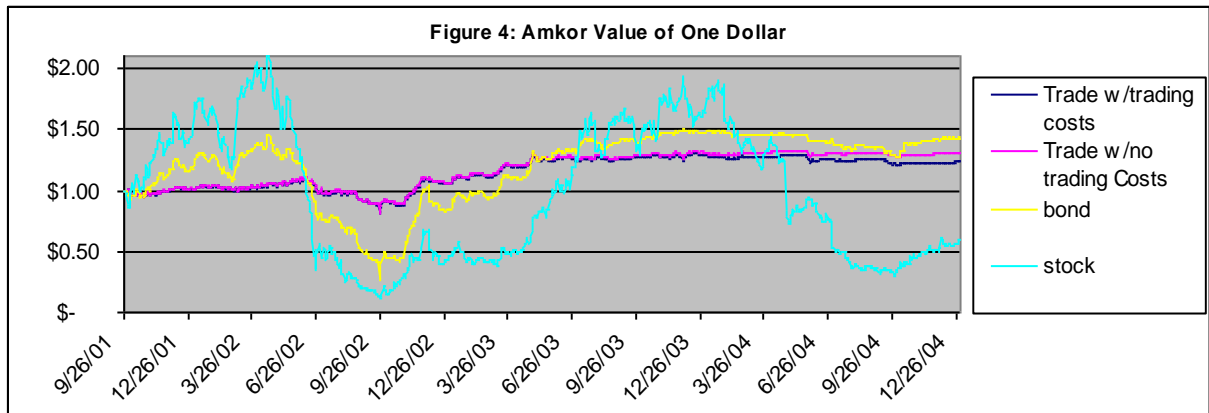
Figure 3 represents the value of one dollar invested in the bond, stock, or the Convertible Arbitrage trade (with and without transactions costs) from June of 2001 until December 2004 in Cell Therapeutics (CTIC). The bond returns are based off of the 'clean price,' meaning that they do not include accrued interest. The value of the dollar is calculated

based on excess returns.



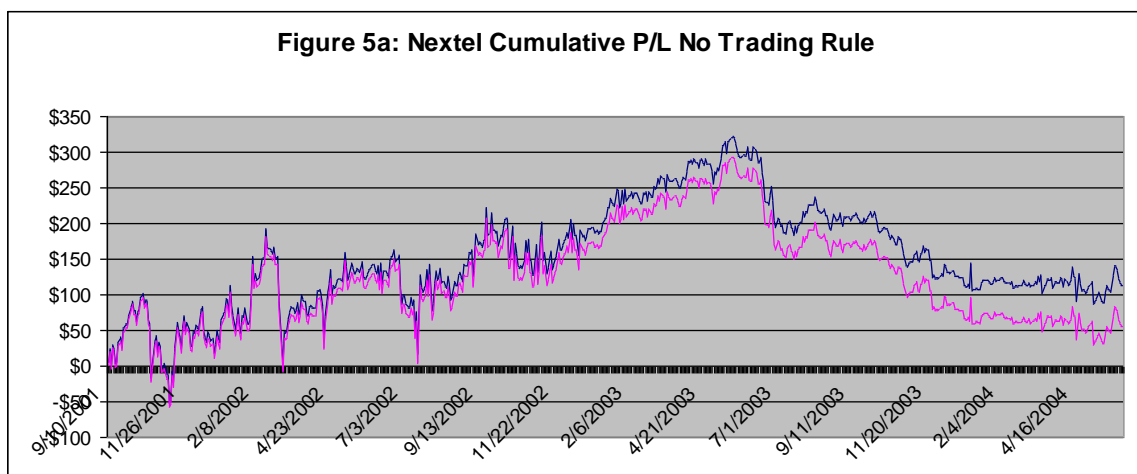
The stock, and subsequently the convertible bond, of CTIC fall dramatically at the end of 2001. However, because the hedge is successful in eliminating the risk of the stock reflected in the bond, the trade is still able to make money. From February 2003 until December 2004, while the bond is flat and the stock is falling, the trade is again still able to make money through interest payments because the hedge was successful.

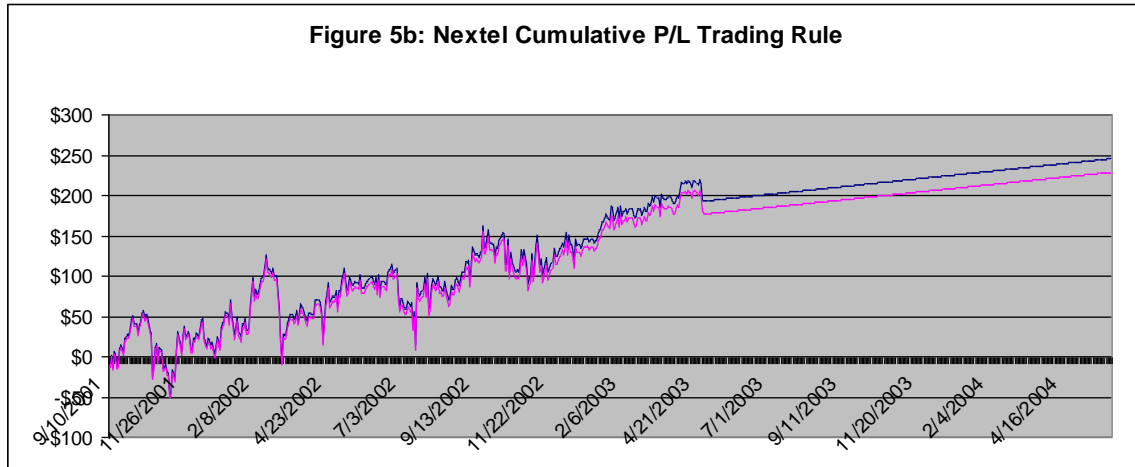
In addition to protecting against major losses, the hedge is also successful in reducing volatility. As can be seen in Figure 3, the CTIC trade had a significantly lower volatility than the stock or bond individually. The trade with transaction costs had a yearly return of 10.95% with a standard deviation of 11.70% compared with a yearly bond return and standard deviation of -7.43% and 41.84%, respectively, and a stock return and standard deviation of -33.19% and 91.67%, respectively. Figure 4 represents this same observation with a trade on a trade with Amkor's convertible bond and common stock. In Figure 4, the value of the dollar is calculated using excess returns. Again in this case, the hedge was effective enough to eliminate much of the volatility in the portfolio while keeping most of the upside.



### Success of the Trading Rule

The trading rule was successful in enhancing the risk and return characteristics of the portfolio. By using the trading rule, we were able to eliminate a lot of the volatility while also avoiding major down turns in certain trades. Figure 5a represents the cumulative returns on a Nextel Communications trade without the trading rule, while 5b represents the same trade with the trading Rule. The top line represents a world with no transaction costs, while the bottom line represents a world with transaction costs.





The trading rule is successful on two levels here: it reduces volatility and closes the trade right before it starts to lose money. Essentially, the trading rule is successful at identifying when the convertible bond is under priced relative to the stock and capitalizing on the underpricing. When the trade no longer becomes attractive, the trading rule closes the trade. In May of 2003, when the trade is closed in Figure 5b, the money is invested at our opportunity cost and continues to accrue through December 2004 since the carry remains negative.

### **Portfolio Risks and Return**

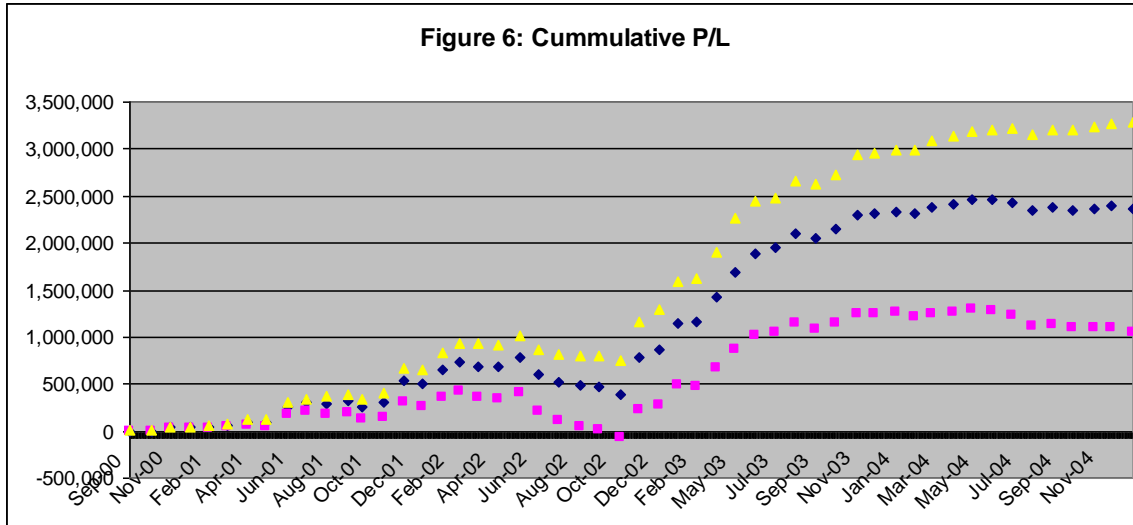
Table 1 represents the risk and return characteristics of a portfolio of ten trades from September 2000 to December 2004. The strategy performed very well both before transaction costs and before standard fees charged by hedge funds. Excess annual returns before transaction costs were 4.90% with a standard deviation of 4.18%, leading to a beta of .06 and an alpha of 5.30%. There was also just a .18 correlation to the S&P index, which had excess returns of -7.73% annually with a standard deviation of 15.34% over the same period.

**Table 1**

<b>Portfolio</b>	<b>Excess Annual Return</b>	<b>Standard deviation</b>	<b>Beta</b>	<b>Alpha</b>
<b>Gross</b>	4.90%	4.18%	.06	5.30%
<b>Net Trans. Costs</b>	2.57%	4.16%	.05	3.27%
<b>Net Fees &amp; Trans.</b>	-1.03%	3.64%	.05	-0.64%

In a more realistic state of the world, with transaction costs, the strategy still appears extremely attractive. The strategy returned positive excess returns and a large, significant, and positive alpha. However, once management fees were taken into account, the attractiveness of the strategy declined severely. The most significant trend to take note of is the decline in the alpha from over 5.30% before transaction costs and fees to a -0.64% after transaction costs and fees.

Figure 6 shows the cumulative profit and loss of the portfolio through December 2004 and reports a similar story to that of Table 1. The top line represents gross returns, the middle line represents returns net of transaction costs, and the bottom line represents returns net of transaction costs and fees. The most significant trend in this graph is the effect of management fees. While Transaction costs do have a significant effect on the cumulative P/L, the biggest drop in performance comes from the management and performance fees. Management and performance fees took the strategy from an attractive alpha of 3.27% after transaction costs to a negative alpha of -0.64%.



### Hedge Fund Database Returns

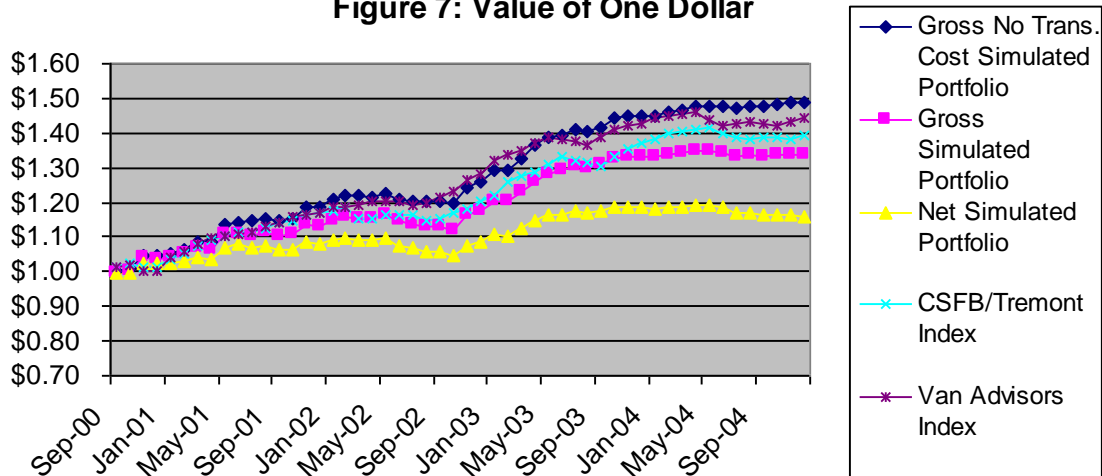
The returns found in hedge fund databases are similar to the simulated results in both the gross transaction costs and with transaction costs portfolios. However, once fees are added to the model, the similarity quickly fades. Table 2 represents returns for the Van Hedge Fund Advisors and CSFB/Tremont Convertible Arbitrage indexes compared to the returns for the simulated portfolio returns under a gross world, transaction costs world, and a transaction costs and fee world. Figure 7 represents the value of one dollar invested in each of these portfolios.

**Table 2**

Portfolio	Excess Annual Return	Standard deviation	Beta	Alpha
Van Hedge Fund Advisors	4.09%	3.62%	.01	4.11%
CSFB/Tremont	3.23%	3.82%	-.003	3.27%
Gross	4.90%	4.18%	.06	5.30%
Net Trans. Costs	2.57%	4.16%	.05	3.27%
Net Fees & Trans. Simulation	-1.03%	3.64%	.05	-0.64%



**Figure 7: Value of One Dollar**



The Gross returns, before transaction costs and fees, most closely mirrored returns found in the databases. The correlation between the gross portfolio and the Van Hedge Fund Advisors was .27. This same correlation was found between the gross portfolio and the CSFB/Tremont database. These correlations are very similar to the correlations found by Liu and Longstaff (2004) and Mitchell and Pulvino (2001) for their portfolios. They concluded that this was a very good correlation, suggesting that the trades they employed was very similar to what real managers were doing. Correlation between Net Transaction Costs portfolio and Van Hedge Fund Advisors as well as CSFB/Tremont is a similar .26. Figure 7 further shows that the portfolio we created corresponds extremely well to the hedge fund databases. This suggests that the trading rule we created is very similar to what managers are doing in the real world.

Once management fees are taken into account, however, the similarity of the portfolio ceases. Even in a Transaction costs world, it is easy to see how managers are able to make excess returns. However, after fees are taken into account, the similarity decreases

dramatically. In fact, this is the only portfolio out of all five that produces negative excess returns and a negative alpha.

## **Conclusion**

Convertible Arbitrage does produce excess returns similar to those of Merger Arbitrage and Fixed Income Arbitrage, as found by Liu and Longstaff (2004) and Mitchell and Pulvino (2001). The strategy is able to reduce volatility associated with investing in just one security and earn steady returns. Even in a world with transaction cost, the strategy is able to earn excess returns of 2.57% per year. This corresponds very well with Liu and Longstaff's (2004) finding that Fixed Income Arbitrage has excess returns of one to six percent per year and Mitchell and Pulvino's (2001) finding that Merger Arbitrage has excess returns of four percent per year. However, these two studies did not take into account management fees.

Once fees are considered, the attractiveness of the strategy declines rapidly. The strategy flips from having positive excess returns and positive, significant alphas to having negative excess returns with negative, significant alphas. In a pre-fee world, our portfolio returns also corresponded very well with those found in hedge fund databases. However, in a post-fee world, the similarities decline rapidly.

This last finding suggests that hedge fund databases may be upwardly bias. It is possible, of course, that real hedge fund managers are very skilled at picking superior investments or that a portfolio of more trades would have yielded different results. However, this finding adds to those studies that find a number of biases in hedge fund databases. This

upward bias can have implications for an industry that is growing so rapidly. If indeed the returns that are reported in databases are upwardly bias, too much money could be allocated to this industry, which in turn can cause an inefficient use of capital.

## References

- Barrett, Jonathan, "SEC Stands by Hedge Fund Regulation", *Investor Daily News*, December 7, 2004.
- Boyd, Roderick, "Rough Year for Convertible Arbitrage", *The New York Sun*, August 9, 2004
- Bresiger, Gregory, "Hedge Fund Regulation Planned", *Traders Magazine*, June 1, 2004.
- Bresiger, Gregory, "Lawsuits for SEC Hedge Fund Regulation", *Traders Magazine*, January 1, 2005.
- Burns, Judith, "Controversy Still Raging over Hedge Fund Regulation", *Dow Jones News Wire*, September 10, 2004.
- Calamos, J. P., 1998, *Convertible Securities: The Latest Instruments, Portfolio Strategies, and Valuation Analysis*, McGraw-Hill.
- Codding, Jamey, "Regulation Afoot?", *Futures*, May 1, 2000.
- "Convertible Arbitrage Attracts Hedge Funds", *Global Finance*, vol. 24, January 1, 2003.
- Drummond, James, "Jury Out on Convertible Arbitrage: Can this Once-Dominant Strategy Survive its Latest Downturn?", *Financial Times*, December 20, 2004.
- Fung, W. and D. Hsieh, 1997, Empirical Characteristics of Dynamic Trading Strategies: The Case of Hedge Funds, *The Review of Financial Studies*, 10, 275-302.
- Fung, W. and D. Hsieh, 2000, Performance Characteristics of Hedge Funds and Commodity Funds: Natural vs. Spurious Biases, *The Journal of Finance and Quantitative Analysis* 35, 291-307.
- "Historical Hedge Fund Returns Fairly Represent Performance; Malkiel-Saha Hedge Fund Paper Flawed, According to Van Hedge Fund Advisors Int.", *Business Wire*, January 13, 2005.
- Jain, Anita, "Convertible Arbitrage Hedge Funds Have Midas Touch", *Dow Jones News Wire*, August 3, 2000.
- Kaban, Elif, "Convertible Arbitrage Hedge Funds see Outflows", *Reuters News*, March 14, 2002.
- Kurdas, Chidem, "Consistency in Hedge Fund Regulation across Countries a Major Issue", *Hedge World News*, November 10, 2004.
- "Lex-Convertible Arbitrage", *Financial Times*, April 28, 2002.
- Liu, J and F. A. Longstaff., 2004, Risk and Return in Fixed Income Arbitrage: Nickels in Front of a Steamroller?.
- Lian, B., 2000, Hedge Funds: The Living and the Dead, *The Journal of Finance and Quantitative Analysis* 35, 309-326.
- Lowenstein, R., 2000, *When Genius Failed: The Rise and Fall of Long Term Capital Management*, Random House.
- MacDonald, Alistair, "Asset Class: Convertible Arbitrage Gains Defy Reason", *Down Jones International News*, March 25, 2003.
- Malkiel, B.G. and A. Saha, 2004, Hedge Funds: Risk and Return.
- McDonald, Ian and Gregory Zuckerman, "The Wild West of Hedge Funds Becomes Tamer", *The Asian Wall Street Journal*, January 25, 2005
- Mitchel, M and T. Pulvino, 2001, Characteristics of Risk and Return in Risk Arbitrage, *The Journal of Finance* 56, 2135-2174.

- Nicholas, J. G., 2000, *Market Neutral Investing: Long/Short Hedge Fund Strategies*, Bloomberg Press.
- Park, J., 195, Managed Futures as an Investment Set. *Ph. D. Diss.*, Columbia University.
- Pernambuco, Andrew, “Consider Convertible Arbitrage to Balance Performance, Risk”, *Financial Executive*, May 1, 2003.
- “The Dangerous World of Bond Arbitrageurs”, *Financial Times*, July 29, 2003.