

AN EXAMINATION OF THE THEORETICAL
AND EMPIRICAL ARGUMENTS FOR

Introducing Convertible Arbitrage into a Portfolio

OF STOCKS AND BONDS

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An analysis of the mechanics governing convertible arbitrage intuitively indicates that there is a potential to achieve substantial diversification benefits when this strategy is included in a traditional portfolio of stocks and bonds. Empirical evidence confirms that convertible arbitrage as an asset class has one of the lowest correlations to stock and bond prices out of a group of popular hedge fund strategies, thus making a strong case for its inclusion into a U.S.-based or global portfolio with the objective of increasing risk-adjusted returns, as measured by the Sharpe ratio.

What is a Convertible Security?

When most investors think of investing in a company, they naturally think in terms of buying either the equity or debt of that company. If investors feel strongly that the company will do well, they might purchase the stock to participate in the upside. If investors feel the stock is too risky, they might purchase the debt of the company so that they have some protection to the downside. There is, however, often a third option that many investors do not consider: a convertible security.

Convertible securities occupy an investment space that is between debt and equity. They are generally structured as a debt obligation of a company, giving investors the downside protection of a debt instrument. However, they are also convertible, at the option of the holder, into a fixed number of shares of common stock, giving investors some of the upside participation of equity. Therefore, investors receive a payoff that is part debt and part equity.

It is often useful to think of a convertible security as a hybrid instrument consisting of a corporate debt security and an embedded call option. If investors choose to exercise the call option, they can exchange their bond for a certain number of shares of stock. The value of a convertible can therefore be thought of as the value of its bond component plus the value of its stock component, with the latter being determined by the value of the embedded equity call option. In Exhibit 1, we illustrate how the value of a hypothetical \$1,000 convertible bond might be distributed: a non-convertible bond worth \$700 and a call option worth \$300. There are many types of convertible securities, but they all share this basic tenet in common.

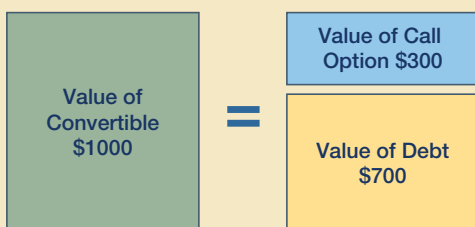
The Rise of Convertible Arbitrage

Traditionally, companies have issued convertible securities as either a lower-coupon alternative to straight debt or a less-dilutive alternative to equity. Since bond investors receive the added benefit of a call option on the equity, they are willing to

accept a lower coupon. Similarly, since equity investors receive some of the protections of a bond, they are willing to accept less upside equity participation. Furthermore, companies issuing convertibles can adjust the savings mix to their specific purposes. If a company wishes to emphasize the savings over straight debt, they can increase the equity component of the convertible and lower the coupon. Alternatively, if they wish to emphasize the savings on equity dilution, they can increase the bond component of the convertible and reduce the number of shares to be issued upon conversion. The flexibility to shift from debt benefit to equity benefit increases the chance that a convertible security meets the specific capital needs of a company, which in turn increases the probability that the company will issue a convertible security instead of a traditional debt or equity security.

For example, in December of 2007, Transocean Inc, a global oil services company, issued a \$7.1 billion public financing to help fund the acquisition of one of their competitors, Global SantaFe Corp. The convertible securities portion of the financing consisted of \$6.6 billion in convertible bonds with an average coupon of 1.55% and an average expected life of 4 years. The equity call component allowed these convertible bonds to convert into approximately 39 million shares of common stock, which would be about \$5 billion worth of stock at the then current stock price of \$127.50 per share (\$127.50 per share x 39 million shares). At the same time, they issued \$500 million of non-convertible debt with roughly the same duration and a coupon of 5.25%. As we can see, the company was able to save 3.70% (5.25%–1.55%) in coupon by allowing the holders the option to convert into common stock. The fact that the company heavily weighted the financing towards convertibles as opposed to straight debt is a likely sign that they felt this was a significant savings.

EXHIBIT 1: DEBT + CALL OPTION STRUCTURE



Shown for illustrative purposes only.

EXHIBIT 2: ESTIMATED TRANSOCEAN CONVERTIBLE SAVINGS

	Straight Debt	Straight Equity	Convertible	Savings
Coupon Cost	5.25%		1.55%	3.70%
Share		52 million	39 million	13 million

Source: Lazard Asset Management, Bloomberg

Transocean did not do a simultaneous common offering, but it is not difficult to estimate the savings from an equity standpoint by using the then current market price of the common as a basis for analysis. On the night of the convertible pricing, the price of the common was \$127.50. The company was able to raise \$6.6 billion in a convertible security by giving investors

the option to convert into roughly 39 million shares of common stock. Had the company instead sought to raise \$6.6 billion in an equity issuance, they would have had to issue approximately 52 million shares of common stock (\$6.6 billion/\$127.50 per share). This indicates that the company was able to save 13 million shares of common stock over a comparable equity issuance, as shown in Exhibit 2. In fact, this savings estimate may be conservative if you consider that many companies issue common stock at some discount to the then current market price when doing a secondary offering.

In the last two decades, we have seen three further developments favoring the issuance of convertible securities over traditional debt or equity. First, innovative new structures have been developed that provide for specific tax savings and/or increased earnings per share. Second, companies are increasingly developing a preference towards having a diversified investor base. Third, the time-to-market for a convertible issuance has shortened from one week to overnight, with one conference call being the only real direct marketing task required of senior management. Given the flexibility of convertible securities and the sophistication of the convertible investor base, we believe there will continue to be developments in the future that will make convertible securities even more attractive capital raising tool for corporations.

The investor base for convertible securities has also developed over the last two decades. Before 1990, the investor base was dominated by insurance companies, some retail companies, and a few select mutual funds. This resulted in illiquid trading and relatively inefficient markets. However, after 1990, hedge funds started to become a larger part of the investor base, and by 2001 hedge funds were the dominant investors in the space. With the entry of hedge funds into the convertible space, the market has become substantially more liquid and efficient.

As a result of the rise in convertible issuance and the improvement of liquidity afforded by the entry of hedge funds, we have seen a significant increase in the size of the convertible asset class. The amount of convertible securities outstanding in Europe and the United States has increased from an approximate average of \$154 billion in 1994 to \$444 billion at the end of 2007¹, as shown in Exhibit 3. The universe has pulled back with the sell-off of global assets in 2008, but the underlying trend is still intact. In addition to an overall increase in the size and liquidity of the universe, price discovery has also improved greatly with the advent of the Trade Reporting And Compliance Engine (TRACE) system in 2002 and the development of the Bloomberg messaging system as an informal electronic exchange. The net result of all these effects has

been a significant increase in the average capacity for convertible hedge fund managers, which we estimate has risen from approximately \$500 million before 1990 to \$3-5 billion today.²

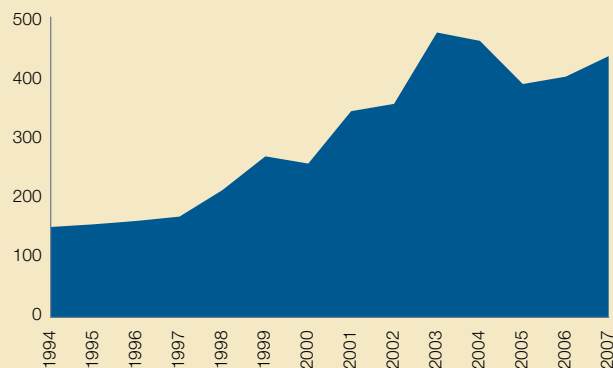
The Reasons behind the Attractiveness of Convertible Arbitrage

The rise in the popularity of convertible arbitrage as an asset class is generally attributable to three factors: low correlation to other asset classes, low volatility of returns, and respectable excess returns. In order to understand why these three factors exist in convertible arbitrage, it is first important to understand the basics of convertible arbitrage trading. In this section, we will briefly describe the mechanics of convertible arbitrage trading and examine how these mechanics help shape the pay-off profile of convertible arbitrage as an asset class. Once we understand the theory of how this return profile is generated, we will attempt to quantify the three attractive factors of convertible arbitrage using statistical analysis.

EXHIBIT 3: VALUE OF THE U.S. AND EUROPEAN CONVERTIBLE UNIVERSE

From 1994 to 2007

U.S. \$Billion



As of 31 December 2007

Source: Merrill Lynch Convertibles Research

Since convertible arbitrage is considered a market-neutral strategy, managers will typically look to buy a convertible bond and then hedge out the various economic sensitivities of the convertible security to the broader marketplace. If we think of a convertible security as a piece of corporate debt married with an equity call option, we can reason that a convertible has all the economic sensitivities of corporate debt plus all the economic sensitivities of an equity call option. Regarding the debt component, a convertible has a negative sensitivity to interest rates and a negative sensitivity to credit spread. Regarding the equity component, a convertible has positive sensitivities to

stock price, interest rates, and volatility. Students of the modified Black-Scholes formula and other pricing models may point out that equity call options also have a negative sensitivity to equity dividends, but this risk has been effectively eliminated by new protections built into convertible securities that automatically compensate the holders of such securities in the event of a common dividend increase. Therefore, we can surmise that convertible securities in general carry the following primary sensitivities: equity, interest rates, credit spread, and volatility.

Equity Risk

In a normalized environment, equity price fluctuation is typically the primary exposure that needs to be hedged.

Fortunately, this risk can usually be hedged by simply taking a short position in the underlying equity. Convertible managers often use a computer model to calculate their equity exposure, or “delta,” and hedge the equity risk in real time. In fact, in the case where one hedge fund sells a convertible security to another hedge fund, they will often also transfer the stock hedge at the same time, delivering a “hedged” package to the new manager. To the extent that a manager is unable to short a particular equity security, the manager may still be able to short a correlated basket of equities or a well-correlated index, but this may introduce tracking risk into the portfolio, which managers typically seek to avoid.

Interest Rate Risk

In addition, as we have already discussed, convertible securities are negatively affected by increasing interest rates.

Although we do note that equity call options have a positive sensitivity to interest rates, this positive sensitivity is more than offset by the strong negative sensitivity of bonds to interest rates. Interest rate risk, or “rho,” is often aggregated across the portfolio and then hedged at the portfolio level using various interest rate derivatives. We have not mentioned currency risk because it does not exist in all portfolios, but to the extent it does exist, it is aggregated and hedged at the portfolio level in the same manner.

Credit Spread and Volatility Risks

After equity and interest rate hedging, two primary risks remain: credit spread and volatility. Convertibles are negatively affected by increasing credit spreads due to their corporate debt component and they are positively affected by increasing volatility due to their equity call option component. Fortunately, credit spreads and volatility are positively correlated such that when credit spreads increase, equity volatility also tends to increase and vice versa. To show that this is the case, we ran a correlation study of the Chicago Board Option

Exchange Volatility Index (VIX) versus the option-adjusted spread (OAS) of the Lehman U.S. Aggregate Bond Index using daily data from November 25, 1998, to September 30, 2008, the results of which indicate an 81% correlation.³ Since convertible securities are positively effected by a rise in volatility and negatively effected by a rise in credit spreads, the effect of one rising will typically be offset by the other rising as well, creating a natural hedge.

Although these two risks do offset each other, situations often arise where one risk will dominate the other, leaving a residual risk. To the extent that a manager believes that the credit spread component will dominate over the short/medium term, that manager may seek to neutralize that dominance by shorting corresponding straight debt, buying credit default swaps, or simply shorting an incremental amount of common equity. In the cases where the manager believes the volatility component will dominate, the manager may seek to neutralize that dominance by selling other volatility instruments, although many managers prefer to leave their volatility sensitivity intact, at least partially. Identifying which situations favor the credit spread risk and which situations favor the volatility risk is considered a basic skill required for convertible arbitrage, and a whole suite of computer models and fundamental indicators have been developed to assist the convertible manager in this determination. Exhibit 4 summarizes the risk factor exposures of convertible securities.

EXHIBIT 4: RISK FACTOR EXPOSURES OF CONVERTIBLE SECURITIES					
Risk Factor	Long Bond	Long Call	Stock Hedge	Interest Rate Hedge	Residual Risk
Stock Price	+		-		Neutral
Interest Rates	- Large	+ Small		+ Small	Neutral
Volatility		+			Natural Hedge
Credit Spread	-				Natural Hedge
Source: Lazard Asset Management					

Examination: Low Correlation to Other Asset Classes

As we can see from the mechanics of convertible arbitrage, many of the factor risks that affect other asset classes are either hedged out or mitigated. Intuitively, this would suggest that convertible arbitrage would have low correlations to other asset classes. In order to quantify this, we looked at the performance of the HFRI Convertible Arbitrage Index (HCAI) as a proxy

EXHIBIT 5: CORRELATIONS* OF U.S. EQUITIES AND BONDS WITH SELECT HEDGE FUND STRATEGIES⁴

	S&P 500 Index	Lehman U.S. Aggregate Bond Index	HFRI Convertible Arbitrage Index	HFRI Equity Hedge Index	HFRI Distressed Securities Index	HFRI Macro Index	HFRI Merger Arbitrage Index
S&P 500 Index	1	0.13	0.34	0.68	0.45	0.36	0.52
Lehman U.S. Aggregate Bond Index	0.13	1	0.19	0.07	0.04	0.32	0.05
HFRI Convertible Arbitrage Index	0.34	0.19	1	0.53	0.58	0.33	0.51
HFRI Equity Hedge Index	0.68	0.07	0.53	1	0.64	0.59	0.57
HFRI Distressed Securities Index	0.45	0.04	0.58	0.64	1	0.47	0.6
HFRI Macro Index	0.36	0.32	0.33	0.59	0.47	1	0.33
HFRI Merger Arbitrage Index	0.52	0.05	0.51	0.57	0.6	0.33	1

Source: Lazard Asset Management, Bloomberg, Lehman Brothers, Hedge Fund Research

*Pearson Correlation Coefficients

for the convertible arbitrage asset class returns. Given that the HCAI is primarily U.S. based, we decided to limit the scope of our analysis to U.S. indices. However, given the mechanics of convertible arbitrage, we believe that our findings would also hold true in the non-U.S. investment space.

We compared the HCAI to two primary U.S. asset classes: equity, as measured by the S&P 500 Index (SP500), and bonds, as measured by the Lehman U.S. Aggregate Bond Index (LUABI). We found that the HCAI exhibits a correlation of 0.34 and 0.19 to the SP500 and LUABI, respectively, over the period from January 1990 through September 2008. Although the HCAI is positively correlated with equities and bonds, as we discuss in more detail later on, we find the correlation to be quite low. We feel that this confirms our thesis regarding the efficacy of the convertible hedging process and its effect on correlation. Given that low-correlated asset classes tend to produce higher diversification benefits than high-correlated asset classes, these findings suggest that convertible arbitrage may be a good diversifier for a core investment portfolio.

To help put the diversification benefit of convertible arbitrage into perspective, we compared the correlation coefficients of convertible arbitrage to the correlation coefficients of other popular hedge fund strategies. As Exhibit 5 shows, convertible arbitrage had the lowest correlation to equities out of our study group. On the other hand, many of the other strategies, except macro, exhibited a lower correlation to bonds than convertible arbitrage. However, these lower bond correlations were often more than offset by a substantially higher correlation to equities. Given that most portfolios are allocated to both equities and bonds, both correlations must be taken into consideration.

To help quantify the aggregate diversification benefit of each of these hedge fund strategies, we introduced a 10% weighting to each strategy into three popular stock/bond mixes, each time reducing the allocation to stocks and bonds by 5%, and observed the effect on the volatility of the resulting portfolio. We have outlined the results in Exhibit 6. As we would have anticipated, in each case convertible arbitrage is the best diversifier in our study group, creating the lowest resulting portfolio volatility. This makes sense given that, as an asset class, it has the lowest correlation to equities in the group. Even for a bond-centric portfolio, the diversification benefit of convertible arbitrage is the highest in the group, suggesting that the

EXHIBIT 6: RESULTING PORTFOLIO VOLATILITIES FROM ADDITION OF SELECT HEDGE FUND STRATEGIES TO A PORTFOLIO OF STOCKS AND BONDS⁴

	40/60 Stock/Bond	50/50 Stock/Bond	60/40 Stock/Bond
HFRI Convertible Arbitrage Index	5.71%	HFRI Convertible Arbitrage Index 6.88%	HFRI Convertible Arbitrage Index 8.11%
HFRI Merger Arbitrage Index	5.72%	HFRI Merger Arbitrage Index 6.89%	HFRI Merger Arbitrage Index 8.14%
HFRI Distressed Securities Index	5.79%	HFRI Distressed Securities Index 6.96%	HFRI Distressed Securities Index 8.21%
HFRI Macro Index	5.90%	HFRI Macro Index 7.05%	HFRI Macro Index 8.27%
HFRI Equity Hedge Index	6.10%	HFRI Equity Hedge Index 7.28%	HFRI Equity Hedge Index 8.53%

Source: Lazard Asset Management, Bloomberg

Shown for illustrative purposes only.

Not a portfolio managed by Lazard Asset Management.

lower correlation to equity more than offsets the occasionally higher correlation to bonds. This data confirms our thesis that the aggregate diversification benefit is indeed high for convertible arbitrage, particularly in equity-oriented portfolios.

Examination: Low Volatility Return Stream

The mechanics of convertible bond arbitrage also suggest that the return stream has a relatively low volatility. This stands to reason since most systemic and idiosyncratic risk is either hedged out or mitigated. To determine if this is the case, we looked again at the return profile of the HCAI in comparison to the two main U.S. asset classes, the SP500 and the LUABI. As shown in Exhibit 7, the volatility of the HCAI is 4.83%, versus 13.95% and 3.71% for equities and bonds, respectively. This suggests that, in addition to a diversification benefit, convertible arbitrage may also serve to dampen volatility in portfolios containing equity because of its low volatility profile.

Examination: High Excess Return

Students of market theory may reason that, because convertible arbitrage hedges out or mitigates many of the risks associated with other asset classes, the expected return from the strategy should be roughly equal to the risk free rate. The Capital Asset Pricing Model (CAPM) states that as the

EXHIBIT 7: ANNUALIZED STANDARD DEVIATION OF EQUITIES, BONDS, AND CONVERTIBLE ARBITRAGE⁵

	SP500	LUABI	HCAI
Standard Deviation (Ann.)	13.95%	3.71%	4.83%
Variance	0.0194	0.0014	0.0024
Source: Lazard Asset Management, Bloomberg Shown for illustrative purposes only.			

systemic risk of an asset class diminishes, so too should the required rate of return (“kappa”), and should the systemic risk decline to zero, the expected return of the asset class should approach the risk free rate. However, as shown in Exhibit 8, when looking at the returns from the HCAI, we find that convertible arbitrage actually produces an excess return of 4.32%, even after fees and expenses.

When trying to understand why this happens, it is important to note that a critical assumption of the CAPM is that all markets are perfectly efficient and free of non-economic valuation factors. As it turns out, there are potentially two particular inefficiencies in the convertible market that allow it to earn an excess return beyond the predictions of CAPM. Notably, the demand base is dominated by sophisticated hedge funds, and the supply is dominated by corporations with some non-economic

motives. We believe this supply/demand dynamic tends to keep expected returns higher than the returns predicted by the CAPM.

On the demand side of the equation, market neutral hedge fund managers tend to be both sophisticated and disciplined when it comes to bidding for assets. They tend to have robust models that can estimate the return of an investment with more precision than an equity or bond manager. As such, they tend to purchase assets only when they feel the predicted return is in line with, if not in excess of, client expectations, with such expectations generally in excess of the CAPM-predicted return. Therefore, in a normalized environment, there is a strong tendency for convertible prices to exist in the secondary market at levels that can produce higher excess returns than would normally be expected from a less disciplined and sophisticated investor base.

On the supply side of the equation, convertibles are a popular capital raising tool for corporations. Corporations tend to be less disciplined sellers because they have a different set of objectives than the convertible investor base. First, they tend to compare cost of capital against opportunities to invest that capital in a more profitable alternative, with such an alternative typically not available to ordinary investors. This creates an automatic dislocation with CAPM because they are working off a different cost/benefit analysis. Secondly, there are several non-CAPM-based benefits that convertible issuance provides to a company, each allowing for a more aggressive sales price and higher excess return for the buyers. These non-CAPM-related factors include incremental tax benefits, incremental dilution benefits, shorter time to market, and diversification of the investor base. When a highly disciplined demand base meets a supply source with various economic and non-economic reasons for selling, we should probably not be surprised to see returns in excess of simple CAPM-predicted returns.

EXHIBIT 8: EXCESS RETURN AND SHARPE RATIOS OF EQUITIES, BONDS, AND CONVERTIBLE ARBITRAGE⁴

	SP500	LUABI	HCAI
Average Monthly Excess Return* (Annualized)	5.35%	3.05%	4.32%
Annualized Standard Deviation	13.95%	3.71%	4.83%
Sharpe Ratio	0.38	0.82	0.89

*Represents returns in excess of 1-month treasury bill
Source: Lazard Asset Management, Bloomberg
Shown for illustrative purposes only.

The Effect of Incorporating Convertible Arbitrage into an Asset Allocation Process

Based on our discussion regarding the mechanics and return profiles of convertible arbitrage, one might speculate that the addition of convertible arbitrage to a portfolio may increase risk-adjusted return for three reasons: low correlation to core asset classes; low volatility; and high expected return. The first two points speak to the diversification benefit that can be gained from convertible arbitrage, which may increase risk-adjusted returns by decreasing portfolio volatility. The last point speaks to the possibility of increasing the expected return of the portfolio by adding convertible arbitrage, thus increasing risk-adjusted returns from the numerator standpoint, particularly for debt-centric portfolios.

In order to determine if this theory holds in practice, we looked at the effect of adding convertible arbitrage to a portfolio of U.S. stocks and bonds. Once again, we used the HCAI as our proxy for convertible arbitrage and we used the S&P 500 Index and the LUABI as our proxies for stock and bond allocations, respectively. We looked at the entire monthly dataset from 1990 through September 30, 2008. Unfortunately, we are not able to extend our analysis further back than 1990, as there is no reliable data for convertible arbitrage returns prior to that time.

Our first analysis involves adding convertible arbitrage to a simple stock and bond portfolio and observing how the expanded asset set changes the average return and volatility of the portfolio. We started with three popular stock/bond mixes: 60/40, 50/50 and 40/60. We then added a 10% allocation to the HCAI, lowering the stock and bond portions of the original portfolio by 5% each. Exhibit 9 shows our findings. In each instance volatility decreased by 55-56 basis points with a small

EXHIBIT 9: EFFECT OF ADDING THE CONVERTIBLE ARBITRAGE ASSET CLASS TO A U.S. STOCKS AND BONDS PORTFOLIO⁵

SP500 Weight	LUABI Weight	HCAI Weight	Annualized Expected Return	Annualized Volatility	Sharpe
60%	40%	0%	8.42%	8.67%	0.511
55%	35%	10%	8.43%	8.11%	0.548
50%	50%	0%	8.19%	7.43%	0.566
45%	45%	10%	8.20%	6.88%	0.613
40%	60%	0%	7.96%	6.26%	0.635
35%	55%	10%	7.97%	5.71%	0.697

Source: Lazard Asset Management, Bloomberg
Shown for illustrative purposes only.
Not a portfolio managed by Lazard Asset Management.

positive impact on the expected return of the portfolio, thus increasing the risk-adjusted return as measured by the Sharpe Ratio by 0.037-0.062, depending on initial portfolio composition. This confirms the intuitive case that adding convertible arbitrage to portfolio of stocks and bonds may increase risk-adjusted returns, particularly in a debt-oriented portfolio.

Although we are primarily examining the effect of adding the HCAI to U.S.-based portfolios, for completeness, we also ran our analysis against a global portfolio of stocks and bonds. In this study we used the MSCI World Index (MSCIW) as our equity proxy and the Lehman Global Aggregate Bond Index (LGABI) as our bond proxy. Exhibit 10 shows that the results make an even stronger case for adding convertible arbitrage to

EXHIBIT 10: EFFECT OF ADDING THE CONVERTIBLE ARBITRAGE ASSET CLASS TO A GLOBAL STOCK AND BOND PORTFOLIO⁶

MSCIW	LGABI	HCAI	Expected Return	Volatility	Sharpe
60%	40%	0%	6.77%	9.12%	0.306
55%	35%	10%	6.94%	8.51%	0.347
50%	50%	0%	6.83%	7.98%	0.357
45%	45%	10%	7.00%	7.36%	0.409
40%	60%	0%	6.90%	6.94%	0.420
35%	55%	10%	7.06%	6.33%	0.486

Source: Lazard Asset Management, Bloomberg
Shown for illustrative purposes only.
Not a portfolio managed by Lazard Asset Management.

a global portfolio of stocks and bonds. There is a larger decrease in volatility than in the U.S.-based case, a 61-62 basis points drop versus a 55-56 basis points drop, and the expected return actually increases by 16-17 basis points as opposed to one basis point in the U.S.-based case. This results in a Sharpe ratio gain of 0.041-0.066, which is in excess of the gain observed in the U.S.-based case.

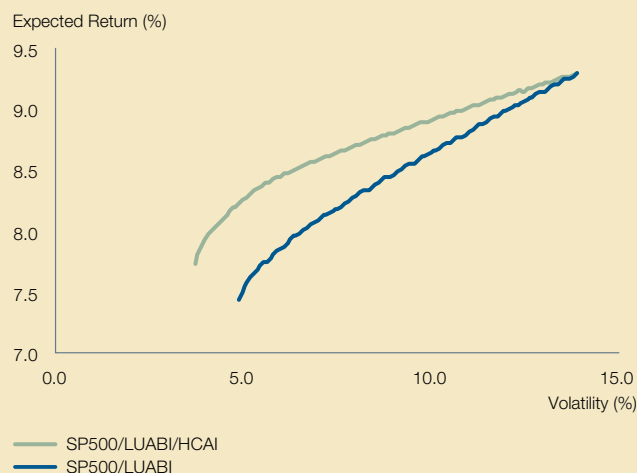
Next, we investigated the effect of taking the convertible arbitrage allocation solely from the equity allocation or solely from the bond allocation, as opposed to equally from each. We have observed that convertible arbitrage as an asset class has a significantly lower volatility than equity, albeit with a lower return. Therefore, we might anticipate that taking the convertible arbitrage allocation entirely from the equity portion of the portfolio may produce a lower volatility with a lower expected return. Similarly, we have observed that convertible arbitrage has a volatility somewhat comparable to bonds, but the expected return is much higher. Therefore, we might antici-

pate that taking the convertible arbitrage allocation entirely from the bond portion of the portfolio might produce a higher expected return with roughly comparable volatility.

In Exhibit 11, we started with a simple 50/50 stock/bond portfolio and added a 10% allocation to convertible arbitrage, first taking the allocation from the stock portion of the portfolio, then from the bond portion. We also added the result of an equal carve-out from both stocks and bonds, for comparison purposes. As you can see, when we took the allocation from the stock part of the portfolio, volatility decreased by 115 basis points with only an 11 basis points decline in the expected return. When we took the allocation from the bond portion of the portfolio, the expected return increased by 12 basis points, with only a 6 basis points increase in volatility. As expected, these findings indicate that drawing from the equity part of the portfolio favors volatility reduction while drawing from the bond part of the portfolio favors enhanced expected return, with each case increasing the risk-adjusted return of the portfolio.

A more comprehensive way to analyze the effect of incorporating convertible arbitrage into a portfolio is to look at the efficient frontier. The efficient frontier describes the optimal asset mix for each given level of desired volatility. As Exhibit 12 illustrates, when we add the HCAI to a simple SP500/LUABI portfolio, we observe a significant shift up in the efficient frontier, particularly at lower volatility nodes. This means that adding convertible arbitrage to such a portfolio may increase risk-adjusted returns for virtually all desired risk lev-

EXHIBIT 12: THE EFFICIENT FRONTIER SHIFT OBSERVED FROM ADDING A 10% HCAI ALLOCATION TO A PORTFOLIO OF STOCKS AND BONDS⁵



Source: Lazard Asset Management, Bloomberg
Shown for illustrative purposes only.
Not a portfolio managed by Lazard Asset Management.

EXHIBIT 11: CARVING OUT STOCK VS BOND ALLOCATION⁵

SP500 Weight	LUABI Weight	HCAI Weight	Expected Return	Volatility	Sharpe
50%	50%	0%	8.19%	7.43%	0.566
40%	50%	10%	8.08%	6.28%	0.652
50%	40%	10%	8.31%	7.49%	0.578
45%	45%	10%	8.20%	6.88%	0.613

Source: Lazard Asset Management, Bloomberg
Shown for illustrative purposes only.
Not a portfolio managed by Lazard Asset Management.

els. This suggests that it is optimal to maintain some non-zero allocation to convertible arbitrage, particularly for lower-volatility investors.

Conclusion

We have shown that adding convertible arbitrage to a portfolio of stocks and bonds may increase risk-adjusted returns by lowering volatility and, in some instances, raise expected return. This confirms that convertible arbitrage is a good portfolio diversifier, as intuitively suggested by our review of the mechanics of convertible trading. Furthermore, we hypothesized that the observed excess returns are partially driven by a supply/demand dynamic that structurally favors convertible arbitrage investors. Because we see this as a structural advantage, we do not foresee the supply/demand dynamic dissipating over the long-term, and we therefore believe that these excess returns will continue. Our conclusion is that, although short-term periods of underperformance may arise as with any asset class, any portfolio that contains significant weightings of stocks and bonds may benefit from the addition of convertible arbitrage.

Furthermore, we feel that a good case can be made in favor of active manager selection. Thus far we have used the HFRI Convertible Arbitrage Index as a proxy for convertible arbitrage returns. However, since convertible arbitrage managers are largely active managers, it stands to reason that selecting the right manager may enhance risk-adjusted returns beyond what is predicted by the HCAI. Now that we have examined the mechanics of convertible arbitrage and looked at some of the sources of risk and return, we might be able to establish a list of criteria for manager outperformance that is at least intuitive, if not empirical.

First, as noted before, there is a dynamic relationship between equity volatility and credit spread when it comes to convertible arbitrage. Typically, there is a tendency for these two risks

EXHIBIT 13: EXAMPLES OF FUNDAMENTAL OPPORTUNITIES IN CONVERTIBLE ARBITRAGE

Earnings Announcements	Convertible Buybacks
Capital Expenditures	Callable Paper
Operating Performance	Bank Covenants
Exchange Offers	Sweeteners
Levered Recapitalizations	Contract Wins/Losses
FDA Approvals	Strikes/Labor Issues
Increased Cash Flow	Mergers & Acquisitions

Virtually any event or development that effects the equity, credit or volatility of a company

Source: Lazard Asset Management

to hedge each other out, with credit spread increasing when volatility increases and vice-versa. However, situations often arise where the increase in credit spread is in excess of the increase in volatility, such as when a special dividend is paid, or when the volatility increase is in excess of the credit spread increase, for example when a company is the target of a potential acquisition. If a manager can correctly identify when these types of situations may occur, that manager may be able to outperform the index both in positive and negative scenarios. The list of issuer-specific events that can beneficially or adversely effect convertible arbitrage is rather lengthy, but for illustrative purposes, we show some examples in Exhibit 13.

Considering that most of these opportunities can only be identified through fundamental analysis, we can conclude that a manager with access to significant fundamental research is better positioned than a manager who has no such capabilities. It is interesting to note that most convertible managers do not have internal access to robust fundamental research. Anecdotally, most convertible arbitrage managers work at either boutiques or as carve-outs from a quantitatively-oriented hedge fund platform. Given the expense of hiring a robust equity research platform, we believe that it is unlikely that these managers have the financial inclination to build the necessary analytical functions internally. Companies that do have significant internal research assets, such as mutual fund complexes and equity management firms, tend not to engage in convertible arbitrage. Therefore, we believe there is an opportunity to increase risk-adjusted returns further by adding a fundamental research overlay to a convertible arbitrage portfolio, especially in light of the low fundamental competition in the convertible arbitrage market.

Second, convertible arbitrage benefits from an extensive suite of computer models and data feeds. The higher the level of technology, the better a manager is able to identify opportunities, hedge risks, and trade efficiently. Although computing power is ubiquitous these days, trading and analytical systems are not. Having a fairly deep, in-house technology team aids in the creation and support of these systems. Since technology is largely fungible across different products, this would tend to favor larger platforms, where the cost of maintaining such a team can be spread over several different types of funds.

Third, the skill set of convertible management teams needs to be evaluated. Given that both fundamental analysis and quantitative analysis are important determinants of performance, we believe that management teams with a deep background in both are better positioned to outperform the index. As we have described above, it is important to have these fundamental and quantitative resources available to the management team, but in order to really exploit them, the team needs the necessary fundamental and quantitative skills to interface with them properly. In addition, convertible securities are traded in a specific over-the-counter environment. As such, there are trading dynamics associated with convertible securities that, in our opinion, are best learned via direct experience. Therefore, we believe that the ideal manager should have both a fundamental and a quantitative analytical skill set combined with specific convertible trading expertise.

Our final conclusion is that the evidence we have presented regarding the benefits of adding convertible arbitrage to a portfolio may, in fact, be understated. Because we used index returns for our analysis, we believe that there is an opportunity to further increase the risk-adjusted return benefit of convertible arbitrage through manager selection. Furthermore, we feel there exists a fairly intuitive set of selection criteria that investors can use to identify managers that are likely to outperform. This would suggest that a portfolio allocation to convertible arbitrage with an active manager selection process might produce a greater improvement in the risk-adjusted return profile, if properly implemented.

NOTES

- 1 Source: Merrill Lynch Convertibles Research
- 2 Source: Lazard Asset Management
- 3 Credit spreads represented by the option-adjusted spread (OAS) on the Lehman U.S. Aggregate Bond Index. Source: Lehman Brothers.
- 4 Stock returns represented by the S&P 500 Index. Bond returns represented by the Lehman U.S. Aggregate Bond Index. Hedge fund returns represented by the corresponding HFR Hedge Fund Index. Calculated using monthly data from January 1990 through September 2008. Shown for illustrative purposes only. Not a portfolio managed by Lazard.
- 5 Stock returns represented by the S&P 500 Index. Bond returns represented by the Lehman U.S. Aggregate Bond Index. Convertible arbitrage returns represented by the HFR Convertible Arbitrage Index. Calculated using monthly data from January 1990 through September 2008. Shown for illustrative purposes only. Not a portfolio managed by Lazard.
- 6 Stock returns represented by the MSCI World Index. Bond returns represented by the Lehman Global Aggregate Bond Index. Convertible arbitrage returns represented by the HFR Convertible Arbitrage Index. Calculated using monthly data from January 1990 through September 2008. Shown for illustrative purposes only. Not a portfolio managed by Lazard.

IMPORTANT INFORMATION

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