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A Golden Anniversary of a Dynamic Asset Class:

Optimizing Asset Allocation with Convertible Securities

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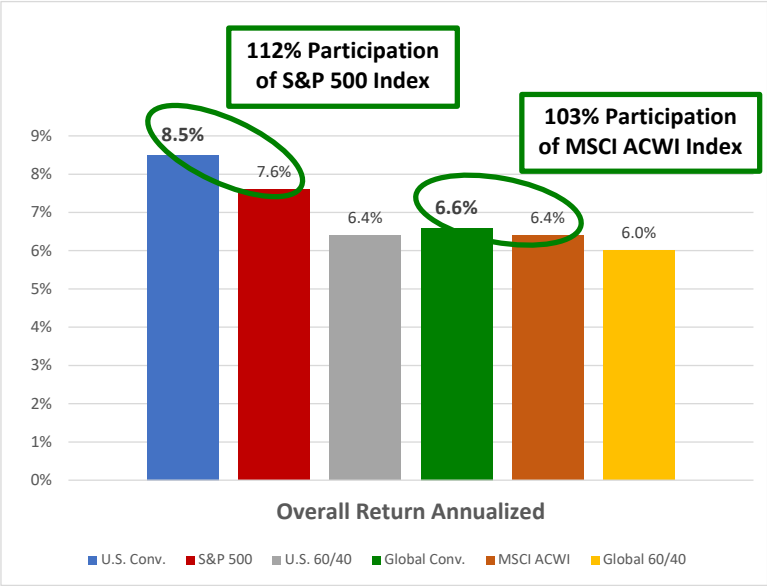
Executive Summary

Convertible securities have been used to finance innovation since the early 1600s, when they were first used by the East India Company to expand global trade. They became a common form of financing in the mid-1800s to fund the rise of the railroad industry, and they have been used to fund growth ever since – as of April 2023, 20 of the 25 largest companies in the U.S. have all had convertibles in their capital structure.

Annual returns for U.S. convertibles are available since the beginning of 1973, giving us a fifty-year track record for the asset class and making 2023 the Golden Anniversary – **a full half century in which convertibles had comparable returns to the S&P 500 Index (10.2% vs. 10.3% per year), but with significantly less volatility**[1].

Asset allocators and investment consultants use a wide array of models and procedures to determine how to diversify their funds across asset classes and investment managers. This paper examines the performance and optimal allocation to convertibles in the context of both U.S. and global portfolios.

Figure 1. Convertibles Outperform Equity Indices and 60/40 Blends in the Long-Run (1998-2022)



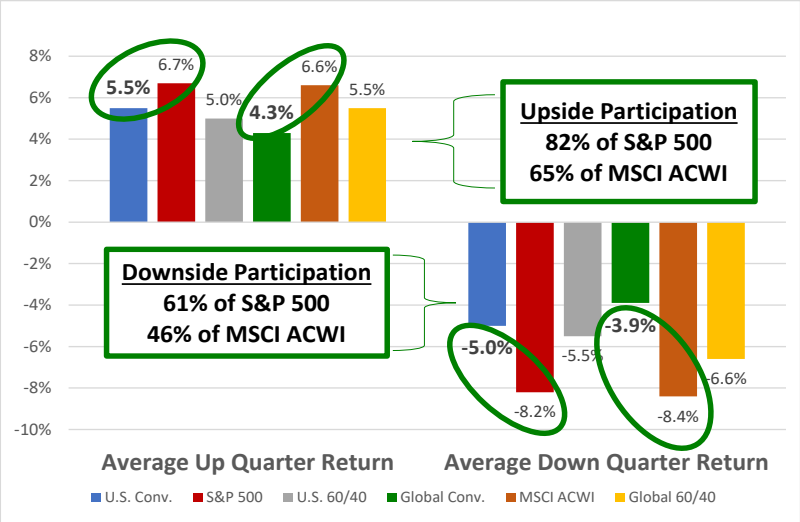
Source: Advent Capital, Bloomberg, and ICE Data Services.

- **Strong Risk-Adjusted Performance vs. S&P 500 Index**. Over the last 25 years, U.S. convertibles **generated 278 basis points of Jensen's Alpha per year with a Sharpe ratio 36% higher than the S&P 500 Index**[2].
- **Structural Alpha vs. Underlying Equities**. Convertibles consistently outperform their own underlying equities due to multiple factors: yield advantage (+1.28%), and positive asymmetry (+2.04%) combine to drive 3.32% of structural alpha per annum. Additionally, participating in only 35% of the underlying convertible equity downside

and 75% of the underlying convertible equity upside, on average, also drives alpha[3].

- **Convertibles Add Value to Blended Portfolios**. Including convertibles in optimized asset allocation models leads to returns up to 45% higher than when they are excluded[4]. Relative to a 60/40 portfolio of the S&P 500 and the Bloomberg U.S. Aggregate indices, U.S. convertibles generated 33% better performance over the last 25 years (See Figure 1)[5].
- **Global Convertibles**. **Over 25 years, global convertibles have outperformed the MSCI ACWI Global Equity Index (6.6% vs. 6.4% per year) with 35% less volatility[6]**. This combination helped global convertibles generate 2.08% of alpha per year, and a 60% higher Sharpe ratio than global equities.
- **Overlooked Asset Class**. **Convertibles represent an overlooked and under-appreciated asset class for most institutional investors**. Many do not even consider convertibles, and this lack of attention helps to create the compelling risk-adjusted return profile that convertibles provide. Of 12 recent long-term capital market forecasts published by leading investment consultants and advisors, only two contained forecasts for U.S. Convertibles, and only one for global convertibles. Those that do forecast convertible returns project strong expected returns and Sharpe ratios for convertibles relative to other asset classes[7].

Figure 2. Convertibles Have High Upside Capture and Low Downside Capture vs. Equities (1998-2022)



Source: Advent Capital, Bloomberg, and ICE Data Services.

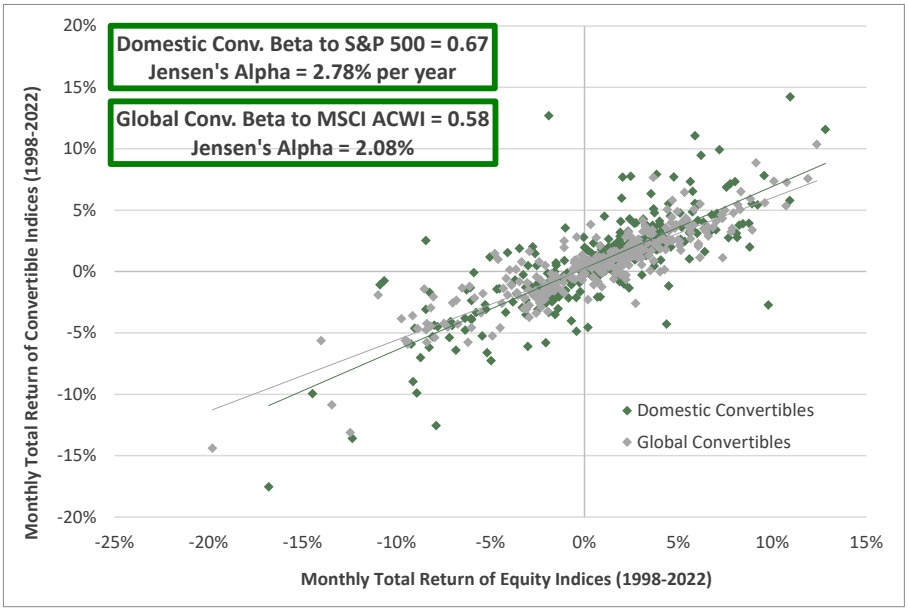
1. Convertibles Generate Strong Risk-Adjusted Returns

While past performance is no guarantee of future success, convertibles have historically generated long-term alpha. As shown in Figure 3, the beta of convertibles to the S&P 500 Index has been 0.67, and Jensen's alpha is 2.78% per year. Global convertibles have a lower beta, 0.58, to the MSCI ACWI with an alpha of 2.08% per year. In section 2 of this paper, we demonstrate that the alpha is persistent and a result of the structure of convertibles, not the variable or temporary outperformance of their underlying equities.

Equity-Like Upside, Bond-Like Protection on the Downside

Convertible beta to equities is higher in up years and lower in down years. This positive asymmetry means that in all up years since 1972, **U.S. convertibles participated in 86% of the upside of the S&P 500 Index**. Yet, in all but one down year (2008), convertible "bond floors" held up well and the asset class demonstrated low downside participation. Including 2008, U.S. convertibles participated in 60% of the downside of the S&P 500 Index, while excluding that year, the downside participation was only 45%. By excluding both 2008, and the ensuing credit rally of 2009, and the outlier COVID and post-COVID years of 2020-2022, we get a better feel for the "normal" relationship between convertibles and the S&P 500 Index over the past 50 years. During this period, we see that convertibles delivered a lower beta of 0.63, and a higher intercept of 3.34% per year versus the S&P 500 Index.

Figure 3. Both U.S. & Global Convertibles Deliver Strong Alpha and a Modest Equity Beta



Source: Advent Capital, Bloomberg, and ICE Data Services.

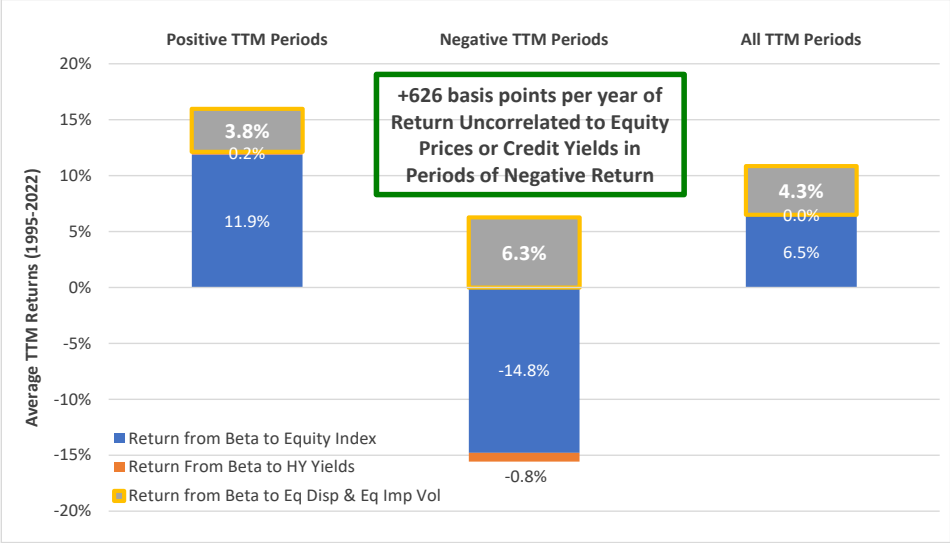
Convertibles are comprised of a bond and an embedded equity option which can be converted into shares of equity at the choice of the investor. This means that as stock prices increase, convertible valuations reflect much of the appreciation. However, in an individual convertible, if the stock does not appreciate beyond the conversion price by maturity, it is more advantageous not to convert, and instead receive the par value of the bond. This means that **convertible valuations provide a "bond floor" that significantly limits the downside when stock prices are falling**.

Idiosyncratic Convertible Return Drives Portfolio Value When Most Needed

The idiosyncratic return of convertibles (not beta to equity or credit) on both the upside and downside is the result of positive asymmetry and the interaction of that asymmetry with underlying convertible equity dispersion. Sensitivity to equity volatility also cushions the downside by increasing the value of the option when volatility increases in down markets.

In all trailing 12-month periods with negative S&P 500 Index returns since convertible underlying convertible equity returns were first tracked, U.S. convertibles generated idiosyncratic returns of 626 basis points per year unrelated to their underlying convertible equity or credit beta, as shown in Figure 4. A significant part of this idiosyncratic return comes from the combination of convertible positive asymmetry and dispersion of underlying convertible equity returns discussed in greater detail in section 2. The combination of strong long-term returns with excess return in down markets makes convertibles a good fit in blended portfolios.

Figure 4. Convertible Idiosyncratic Return Increases When Credit and Equity Markets are Down



Source: Advent Capital, Bloomberg, and ICE Data Services.

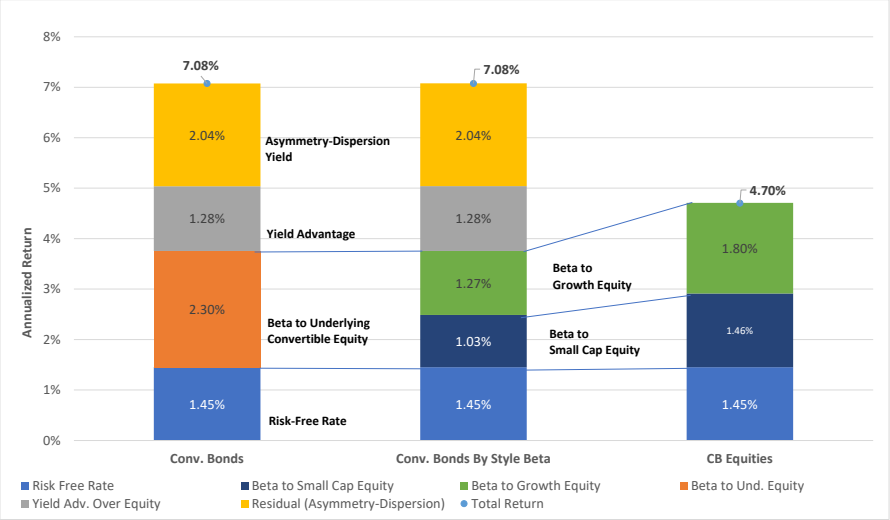
2. Convertibles Generate Structural Alpha

When calculating the beta of convertibles to their underlying equities (0.71 from August 2000 through March 2023), convertibles are influenced by equity prices and credit spreads. Those **underlying convertible equities in turn have multi-factor betas to more commonly followed equity indices such as Growth Equity and Small-Cap Equity, of 0.72 and 0.58, respectively**[8]. In addition to these betas and the risk-free rate of 1.45% per year during our period of study, convertibles generate significant structural alpha resulting in convertibles commonly outperforming their own underlying equities. Figure 5 illustrates that **convertible bonds have an Asymmetry-Dispersion yield of 2.04% per year and a Yield Advantage over their underlying equities of 1.28% per year, thus resulting in total structural alpha of 3.32% per year**.

While convertible dispersion is not regularly tracked, studies indicate it is correlated to S&P 500 Index dispersion. When backing out the beta of convertibles to their underlying equity and change in High Yield Yield-to-Maturity, the idiosyncratic

return of convertibles has a high correlation to S&P 500 Index dispersion of 0.45. Furthermore, while convertible implied volatility is only available in recent years, it is also correlated to S&P 500 Index implied volatility as expressed in the VIX Index. The idiosyncratic return of convertibles has a correlation to a change in the VIX Index of 0.38. **Since both dispersion and volatility increase in periods of market stress, the idiosyncratic return of convertibles also increases – providing extra cushion at the portfolio level when it is most needed** *(please see Appendix A: Structural Alpha Example for a simple numerical example)*.

Figure 5. Convertible Components of Return: Structural Alpha and Beta to Growth and Small-Cap Indices (August 2000-March 2023)



Source: Advent Capital, Bloomberg, and ICE Data Services.

3. Convertibles Fit Well in Blended Portfolios

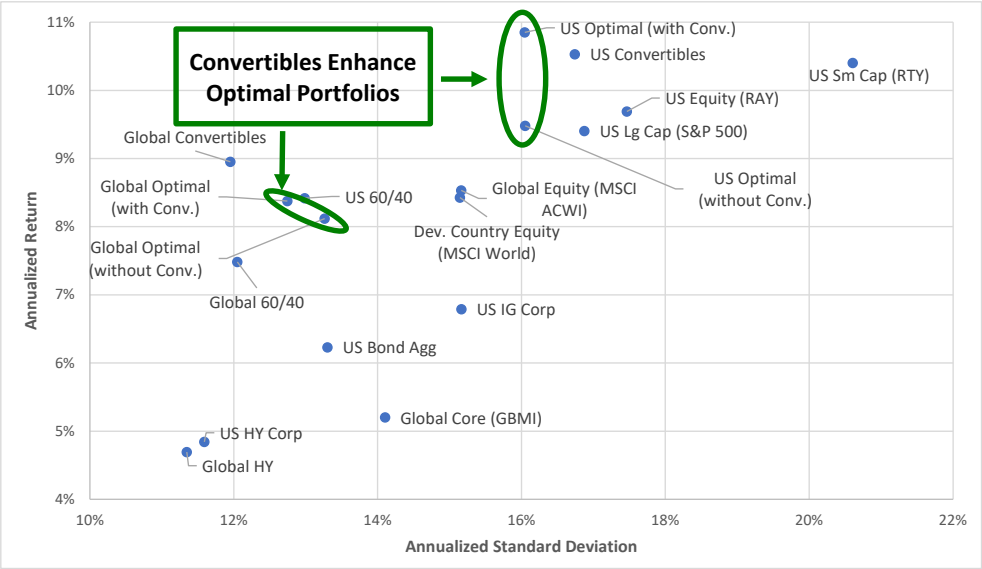
Convertibles Outperform the 60/40 Blend of Stocks and "Straight" Bonds

One common misperception about convertibles frequently heard is "Why do I need to allocate to convertibles if I can just own a blend of stocks and bonds?" The short answer is that a blend of stocks and bonds lacks the long-term optionality, positive asymmetry, long dispersion, and long volatility properties of convertibles, and therefore will likely underperform convertibles over time. Including listed equity options would not alter this outcome, since they are generally shorter-term and are more expensive than convertibles in terms of the implied volatility. As seen in Figure 6, **adding convertibles enhances U.S. and Global optimal portfolio risk-adjusted returns** in an ex-ante Monte Carlo analysis *(please see Appendix B: Optimal Portfolio Modeling for descriptions of the models and our implementations)*.

Additionally, U.S. convertibles have historically outperformed the 60/40 blend[9] by 10% (110% participation) in periods when the S&P 500 Index return is positive, and by 9% in periods when the S&P 500 Index is down (91% participation). This "winning by not losing" profile leads to convertible outperformance by 33% across all periods. Global convertibles have had slightly less equity sensitivity than U.S. convertibles, and, as a result, they underperform the global 60/40 blend[10] by 22% on the upside (78% participation) but outperform by 41% on the downside (59% participation). This translates

into global convertibles outperforming the global 60/40 by 10% across all periods (see Figure 1). As shown in Figure 6, convertible outperformance relative to the 60/40 is also expected in ex-ante Monte-Carlo modeling.

Figure 6. Convertibles Improve Optimal Portfolio Performance in Ex-Ante Monte-Carlo Analysis



Source: Advent Capital, Bloomberg, and ICE Data Services.

Significant Convertible Presence in Optimal Portfolios

Convertibles have historically generated strong long-term returns with moderate volatility and, as a result, convertibles receive a significant weighting in "optimal" portfolios. There are three general approaches to modeling optimal portfolio weightings: Mean-Variance, Black-Litterman, and Monte-Carlo methods *(please see Appendix B: Optimal Portfolio Modeling for descriptions of the models and our implementations)*. The common thread is that **all models, across all time frames, both domestic and global, include a significant weighting to convertibles**. The weights across all the domestic portfolio models that were analyzed were 19% (median) and 12% (minimum), and 30% (median) and 20% (minimum) in global portfolios. The inclusion of convertibles boosted Sharpe ratios significantly.

Table 1. All Optimal Asset Allocation Models Produce Significant Convertible Allocation and Higher Sharpe Ratios than 60/40 Blends

Significant Weighting to Convertibles

Optimal Portfolios with Convertibles Have Higher Sharpe Ratios than 60/40 Blend

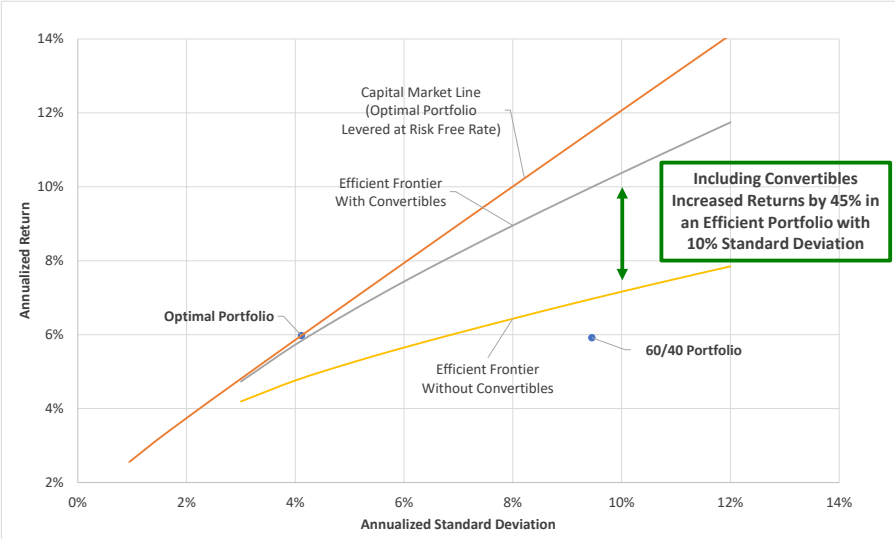
	Convertible Weight in Optimal Portfolio	Sharpe Ratios				% Sharpe Improvement from 60/40
		Convertible	Equity	60/40	Optimal Portfolio	
Domestic Historic Mean-Variance Model						
10 Year 2012-2022 M.V.	>30%	0.28	0.29	0.27	0.34	26%
25 Year 1998-2022 M.V.	15%	0.51	0.38	0.50	0.83	66%
50 Year 1972-2022 M.V.	17%	0.34	0.31	0.36	0.45	25%
Sub-Asset Class 24 Year 1999-2022 M.V.	20%	0.80	0.33	0.45	1.04	131%
Global Historic Mean-Variance Model						
10 Year 2012-2022 M.V.	>30%	0.68	0.56	0.46	0.70	52%
25 Year 1998-2022 M.V.	>30%	0.46	0.29	0.35	0.51	46%
Domestic Ex-Ante Models						
Median Cap. Mkt. Fcst.	N/A	0.28	0.19	N/A	N/A	N/A
Monte-Carlo Structural	>30%	0.40	0.33	0.35	0.40	14%
Monte-Carlo Greek	>30%	0.44	0.33	0.36	0.44	22%
Black-Litterman (Median C.M.F.)	17%	N/A	N/A	N/A	0.36	N/A
Black-Litterman (ACM S.A. Forecast)	12%	N/A	N/A	N/A	0.34	N/A
Global Ex.Ante Models						
Median Cap. Mkt. Fcst.	N/A	0.44	0.20	N/A	N/A	N/A
Monte-Carlo Structural	20%	0.43	0.31	0.30	0.43	43%
Monte-Carlo Greek	26%	0.39	0.30	0.30	0.39	30%
Black-Litterman (Median C.M.F.)	>30%	N/A	N/A	N/A	0.29	N/A

Source: Advent Capital, Bloomberg, and ICE Data Services.

Sub-Asset Class Categories

Due to their hybrid nature, some convertibles behave more like stocks, and some behave more like a "straight" bond. Convertibles can also be either investment grade or speculative grade. Large-, mid-, and small-cap companies all issue convertibles, and **though there is a pronounced growth bias in most convertible issuers, there are value issuers as well**. This means that convertibles can serve as a substitute or diversifier for nearly any asset class or strategy. Many convertible sub-indices were created in 1999, and we can therefore perform mean-variance optimization at a more granular level since then *(please see Appendix B: Optimal Portfolio Modeling for descriptions of the models and our implementations)*. **Because of the strong performance of growth convertibles, the optimizer allocates a weight of 20.4% to convertibles – specifically growth convertibles**. In fact, the only other equity exposure in the optimal portfolio is a 4.6% allocation to Low Volatility Large Cap equity with the

Figure 7. Including Convertibles in an Efficient Portfolio Increases Risk-Adjusted Returns (1999-2022)



Source: Advent Capital, Bloomberg, and ICE Data Services.

rest allocated to ABS, MBS, and Treasuries[11]. The efficient frontier built with convertible sub-indices as well as other asset classes is substantially higher than an efficient frontier built without convertibles (see Figure 7). **With a target volatility of 10%, including convertibles adds 321 basis points to the efficient frontier, or a 45% increase.**

4. Convertibles Are an Overlooked Asset Class

Incorporating Convertibles into Long-Term Capital Market Assumptions

Investment consultants and advisors typically publish long-term capital market assumptions that include ten-year return and volatility forecasts that drive their strategic asset allocation recommendations. Not all publish every asset class category, and relatively few publish expectations for either U.S. or global convertibles. As of March 2023, we have seen 12 sets of recent capital market assumptions. Only two provide a forecast for U.S. convertibles, and only one provides a forecast for global convertibles. Both expect high return participation relative to stocks, and **the median expected volatility for U.S. convertibles is 26% less than broad U.S. equity, and for global convertibles it is 32% less than global equity. These estimates would lead to high relative Sharpe ratios for both U.S. and global convertibles, and hence would suggest substantial weighting in optimal portfolios.**

To incorporate convertibles into long-term capital market assumptions, we recommend a "CAPM" framework that uses the convertible beta to broad equity markets, the risk-free rate, and an adjustment for convertible structural alpha. The relevant metrics would be the 0.67 beta of U.S. convertibles to the S&P 500 Index, and long-term structural alpha of 3.3%.

Table 2. Few Investment Consultants and Advisors Include Convertibles In Capital Market Forecasts

Asset Class	2023 Investment Consultant and Advisor 10 Year Capital Market Return Forecasts												Median Return	Median Volatility
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12		
Broad US Equity	7.4%	7.8%	6.5%		7.9%	6.5%		4.9%		7.3%			7.3%	17.7%
Large Cap US Equity	7.3%			7.4%	7.7%		6.1%	4.8%	7.9%		5.4%	6.5%	6.9%	16.1%
Small Cap US Equity	7.5%	8.7%		8.7%	10.0%		6.5%	4.2%	8.1%		6.5%	5.4%	7.5%	21.5%
Global (All Country)		8.8%						4.8%	8.5%		6.3%	7.4%	7.4%	17.3%
Global ex-US Equity	7.5%		7.1%	8.7%	8.2%		7.5%					9.0%	7.9%	19.9%
Core US Fixed Income	4.3%	4.8%	4.9%	3.6%	4.4%	4.1%	4.9%	4.0%	4.6%		4.8%	4.3%	4.4%	4.6%
US IG Corporate		5.6%							5.5%	5.4%	5.9%		5.6%	7.0%
US High Yield Corporate	6.3%	8.0%	6.6%	6.6%	7.8%	6.2%		6.9%	6.8%	6.6%	7.1%	6.4%	6.6%	10.5%
Global ex-US Fixed Income	2.3%	3.8%	3.1%	3.4%	4.2%	3.0%		2.7%	3.6%		2.6%	2.2%	3.0%	7.9%
US Convertibles		**6.1%**							**9.0%**				**7.6%**	**13.1%**
Global Convertibles									**9.1%**				**9.1%**	**11.8%**

Source: Consultant data received by Advent Capital.

An Overlooked Asset Class, Forecasted Only by 2 out of 12 Consultants and Advisors

Adds Value

Conclusion

Asset Allocators and Investment Consultants should consider a strategic investment in convertibles.

- For the last 25 years, convertibles have generated strong risk-adjusted performance by generating Jensen's Alpha of 278 basis points per year and a Sharpe ratio 36% higher than the S&P 500 Index.
- Convertibles provide structural alpha vs. their underlying equities that comes primarily from two factors: yield advantage and positive asymmetry. These two factors combined generate 3.32% of structural alpha per annum.
- Convertibles fit well into blended, diversified portfolios. Whether looking at past performance over the last 10, 25, or 50 years, or considering the next 10 years, convertibles perform well in both ex-post and ex-ante portfolio optimization models.
- Global convertibles have outperformed the MSCI ACWI Global Equity Index with 35% less volatility over the last 25 years. This combination helped global convertibles generate 2.08% of alpha per year, and a 60% higher Sharpe ratio than global equities.
- Convertibles represent an overlooked and underappreciated asset class for most institutional investors. Many asset allocators and investment consultants do not even consider convertibles, and this lack of attention helps to create the compelling risk-adjusted return profile that convertibles provide.

Appendix A: Structural Alpha Example

For a simple numeric demonstration of structural alpha, consider a portfolio of 2 convertibles. Both have deltas of 0.50, which means that they participate in 50% of the movement of their respective underlying equities. Both also have gammas of 0.5, which means that for every 1% increase in the stock price, equity participation, or delta, increases 0.5%, and for every 1% decline in the stock price, equity participation, or delta, declines 0.5%. If the average underlying convertible equity return in a month is 0% and dispersion is 20%, this means one stock appreciates 20% and the other declines by 20%. The delta of the appreciating convertible increases from 0.50 to 0.60, while the delta of the declining convertible decreases from 0.50 to 0.40. This means that the appreciating convertible will participate in 55% of the increase of the appreciating stock, which is 11% (0.55 x 20%). Similarly, the depreciating convertible will participate in 45% of the decline of the declining stock, which is -9%. Given an equal portfolio weighting at the beginning of the month, the portfolio will increase in value by 1% (0.5 x 11% + 0.5 x -9% = +1%). The more positive asymmetry in the portfolio (called gamma) and the more dispersion of underlying convertible equity, the higher the return of the portfolio, all things equal. Therefore, we can say that convertibles are “long dispersion” because of the positive asymmetry of individual bonds.

Appendix B: Optimal Portfolio Modeling

Monte-Carlo processes are used to generate a large number of hypothetical economic and financial market outcomes 10 years forward. They incorporate stochastic modeling of economic factors including inflation and GDP, as well as short- and long-term interest rates, Investment Grade and High Yield yields, and equity prices, as well as the standard deviation of the idiosyncratic return of each asset class. The analysis in this paper resulted in hypothetical 10-year forward annual return “track records” for each asset class. The results are based on one thousand scenario sets, which do not result in complete convergence (due to the use of random variables), but subsequent result generation shows very little change in relative performance between asset classes. Convertible returns in the “Structural Alpha” Model are modeled as a function of the historical beta to their underlying equity return, historical beta to change in high yield yield-to-maturity, historical beta to S&P 500 Index average dispersion, and historical beta to change in the S&P 500 Index implied volatility VIX Index plus the historical intercept. Convertible returns in the “Greek” Model are modeled as a function of the long-term average delta, gamma, rho, and vega sensitivities of the convertible asset class to the return of their underlying equity, average dispersion, along with changes in yield to maturity and implied equity volatility. After generating the 10-year hypothetical track records for each asset class, the Excel Solver function is used to obtain optimal portfolio weights that lead to the highest average Sharpe ratio across all iterations.

END NOTES

[1]Source: ICE Data Services and, prior to 12/31/1987, Ibbotson Associates. Date range is 12/31/1972-12/31/2022. Throughout this paper, unless otherwise indicated, U.S. convertibles are represented by the ICE BofA US Convertible Excluding Mandatory & Preferred Index (V0S0). The V0S0 Index is used as it is representative of convertible bonds excluding mandatories and preferreds. Convertible preferred are a much smaller portion of the market than they have been historically, making the V0S0 Index a more accurate representation of today's opportunity set. From 1973 to 1981, the convertible proxy for these years, referenced in an Ibbotson Associates study, is based on returns of convertible bond mutual funds. From 1982 to 1987, the Ibbotson proxy for convertible performance is the First Boston Convertible Bond Index. From 1988 to present, we reference returns from the V0S0 Index, as that benchmark's inception date was 12/31/1987. Return figures with start dates prior to 12/31/1987 are calculated using annual data for consistency with the available proxy data.

[2]Source: Bloomberg, ICE Data Services, Bloomberg, Advent Capital Management. Throughout the paper, unless otherwise indicated, "alpha" is defined as Jensen's Alpha. Data is monthly. Throughout the paper, a "25 year" date range is from 12/31/1997-12/31/2022. Throughout the paper, the Risk-Free Rate used is the average of the return of the ICE US 1-Month Treasury Bill Index (GBOM) from 12/31/1996 – 12/31/2022, the ICE BofA 0-3 Month US Treasury Bill Index (G0B1) from 6/30/1992-12/31/1996, and the US Generic Govt 3 Mth Index (USGG3M) from 12/31/1972-6/30/1992.

[3]Source: Bloomberg, ICE Data Services, Bloomberg, Advent Capital Management. Date range is 9/31/2000-12/31/2022, based on the availability of Yield Advantage data. Asymmetry Returns are defined as Total Return less Risk-Free Rate, less Beta to Underlying Convertible Equity Returns less Yield Advantage Return.

[4]Source: Bloomberg, ICE Data Services, Bloomberg, Advent Capital Management. The maximum improvement in returns from an allocation to convertibles in our analysis of asset allocation models was generated using a Mean-Variance approach, where the Excel Solver function was used to obtain optimal portfolio weights that led to the highest Sharpe ratio across all iterations based on historical returns of various sub-indices. In this exercise, the return of an efficient portfolio with convertibles was 45% higher than the optimal portfolio without convertibles at a volatility level of 10%.

[5]"60/40 portfolio" is comprised of 60% S&P 500 Index (SPXT) and 40% Bloomberg U.S. Aggregate Index (LBUSTRUU).

[6]Source: Bloomberg, ICE Data Services, Bloomberg, Advent Capital Management. Throughout this paper, unless otherwise indicated, global convertibles are represented by the ICE BofA Global 300 Convertible Index (VG00).

[7]Source: Consultant data received by Advent Capital.

[8]Growth Equity is represented by the Russell 3000 Total Return Index (RU30INTR Index) and Small-Cap Equity is represented by the Russell 2000 Total Return Index (RU20INTR Index).

[9]"60/40 blend" is comprised of 60% S&P 500 Index (SPXT) and 40% Bloomberg U.S. Aggregate Index (LBUSTRUU).

[10]"Global 60/40 blend" is comprised of 60% MSCI ACWI Index (M2WD) and 40% ICE BofA Global Broad Market Index (GBMI).

[11]Growth convertibles are represented by the ICE BofA US Growth Convertible Index (VGRO). Low Volatility Large Cap equity is represented by the S&P 500 Low Volatility Index (SP5LVI). ABS is represented by the ICE BofA US Fixed Rate Asset Backed Securities Index (R0A0). MBS is represented by the ICE BofA US Mortgage Backed Securities Index (M0A0). Treasuries are represented by the ICE BofA US Treasury & Agency Index (G0A0).

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