INTEGRATED CONVERTIBLES - INVESTMENT STYLES AND CHARACTERISTICS INTEGRATION APPLIED TO CONVERTIBLE BONDS

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Abstract This article explores six investment styles like momentum, value, defensive and others in the niche asset class of US convertible bonds. While only carry and a characteristics integration approach yield promising results, it seems that both strategies can be explained by common equity and bond market factors. Thus, the case of characteristics investing in convertible bonds is not as strong as in other more traditional asset classes. However, convertible bond characteristics integration provides an interesting opportunity to get exposure to equity and bond markets as well as to multiple characteristics at once.

1 Introduction

Characteristics like momentum (e.g. past returns), defensive (e.g. return volatility), value (e.g. book-to-market ratio) and others have been widely discussed in the academic literature. While the literature provides strong evidence for these characteristics or effects to be priced in asset classes like equities, commodities and foreign exchange (see e.g. Asness et al. (2015) or Asness, Moskowitz, Pedersen (2013)), characteristics research in fixed income markets intensified not so long ago (see among others Brooks, Palhares, Richardson (2018), Israel, Palhares, Scott (2018) and Richardson, Palhares (2019)).

Based on different characteristics, profitable investment strategies (also called investment styles) can be constructed. Such a strategy involves the formation of two types of portfolios - a long and a short portfolio. The long portfolio usually goes long on assets with a very distinct characteristic, like low return volatility. The short portfolio on the other hand shorts assets with the least distinct characteristic, in that case high return volatility. The return differential between both is termed a hedge portfolio and describes the effectiveness or profitability of the respective characteristic - in this specific case defensive.

Investment styles can be applied to nearly any asset class, ranging from equities over bonds to commodities and even digital assets (see e.g. Li, Yi (2019) or Glas (2019) for first studies investigating investment styles in virtual currencies). Research of investment styles in fixed income however, despite its long history and importance for global capital markets, is still rather undeveloped when compared to equities. Fixed income additionally, can be distinguished into several sub asset classes. Next to corporate or government bonds, niche assets like credit default swaps or convertible bonds are part of the broader conception of fixed income as well. While research mostly focuses on corporate or government bonds at the moment, I aim to explore the same topic in the niche asset class of convertible bonds. Using a dataset of 1,507 US convertible bonds issued between the end of 1989 and the start of 2019, I find that only carry produces statistically significant mean monthly hedge portfolio returns out of

six characteristics under consideration.
Thus, I further borrow from the characteristics integration literature. Characteristics integration is the natural evolution taking into account multiple characteristics at a time as opposed to only a single characteristic. Using rather simple methods, nearly any number of characteristics can be considered for this portfolio construction process. By forming a hedge portfolio based on all six characteristics under consideration in this article, characteristics integration indeed yields positive and statistically significant mean monthly returns.
This article is structured in the following way: The next section describes the current state of the characteristics literature more closely. Thereby, I focus on fixed income and equities since convertible bonds are a hybrid version of both asset classes. Section 3 then briefly introduces convertible bonds in more detail. In section 4, I provide an overview of the used methodology and data applied in the empirical analysis and results are shown in section 5. Section 6 concludes.

2 Characteristics and convertible bonds

After the introduction of the capital asset pricing model (CAPM), researchers found many effects or characteristics which contradict the model. One of the effects already known before the CAPM might be the value effect. Graham, Dodd (1934) first describe different fundamental ratios and numbers as possible criteria for stock selection. Today, the book-to-market ratio might be the most widely used fundamental characteristic to construct the value style (see e.g. Fama, French (1998)). Value proclaims higher expected returns of value stocks (i.e. high book-to-market ratio) as opposed to growth stocks (i.e. low book-to-market ratio). Momentum on the other hand does not incorporate any fundamental data, but is solely based on the past performance of a financial asset. First introduced by Jegadeesh, Titman (1993), momentum assumes a future performance similar to the past performance. More precisely, assets which performed well during the last (up to) 12 months are expected to outperform within the next 12 months. The same applies to loser assets, which are set to underperform in the near future.
Defensive is also based on the time series of an asset and assumes higher returns for assets with a low market beta (or low return volatility) as opposed to assets with a high market beta (respectively high past return volatility). The defensive characteristic is almost as old as the CAPM. It was first documented by Black, Fischer, Scholes (1972) and has since been investigated more deeply. Blitz, Vidojevic (2017) find a more pronounced low volatility than low beta characteristic, which is mainly explained by rational investor behavior (see Blitz, Falkenstein, van Vliet (2014)).
Two other important characteristics mentioned by Asness et al. (2015) are size and illiquidity. Size proposes higher expected returns for small assets (in equities i.e. market capitalization) than for large assets (see Banz (1981)). For some time it has been deemed "dead"[1] however, recent articles find evidence in favor of the size effect (see for instance Asness et al. (2018)). (Low)

[1] See for example van Dijk (2011).

size usually is associated with low turnover. By using turnover to measure the size effect, Ciliberti et al. (2019) indeed arrive at risk premium properties. Amihud (2002) as well finds an illiquidity premium in US stocks.

Most, if not all, of the above mentioned studies focus on the asset class equities. However, such characteristics do exist in the asset class fixed income as well. Fama, French (1993) also document term (i.e. maturity) and default risk (i.e. credit spread) premia in US bonds. For fixed income assets the expected return of an instrument can easily be obtained by looking at the z-spread or the yield to maturity[2], also known as carry. Koijen et al. (2018) apply the concept of carry to various asset classes and arrive at a significant carry premium. Brooks, Palhares, Richardson (2018), Israel, Palhares, Scott (2018) and Richardson, Palhares (2019) arrive at similar a conclusion for most of the above mentioned characteristics in bond markets as well.

Based on the findings from stock and bond markets, an investigation of the same effects is especially interesting for convertible bonds. Since convertibles are a mix between both of the former asset classes, similar effects should be observable. Therefore, I first investigate the six characteristics momentum, value, defensive, size, illiquidity and carry in a dataset of 1,507 US convertible bonds issued between the end of 1989 and the beginning of 2019. Due to relatively weak single style / characteristic results, I further apply the concept of characteristics integration and arrive at stronger findings. To better understand the nature of convertible bonds, I describe the instrument more detailed in the next section.

3 Convertible bonds in more detail

As mentioned earlier, convertible bonds are at the intersection of equity and bond markets and thus, share properties from both asset classes. More plainly speaking, the value of a convertible bond is similar to the sum of the bond value plus the value of a long call option on the issuer's underlying equity. Figure 1 shows the theoretical behavior of a convertible bond, dependent on the price of the underlying. In that illustrative example, the convertible matures exactly in one year and pays a coupon of 5% annually.

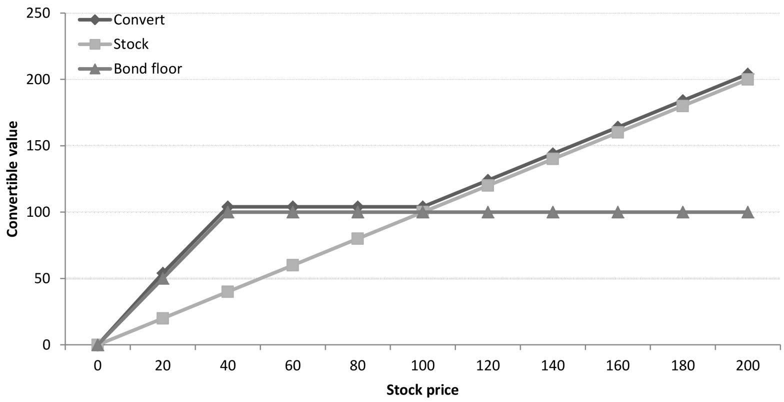

Fig. 1: Convertible value dependent on stock price.

As can be seen in figure 1, the value of the hypothetical con-

[2] Both as well depend on maturity and credit risk.

vertible rises with increasing stock price and decreases to zero in case the underlying stock becomes worthless or the company files for bankruptcy.[3] As such, the conversion ratio (*CR*) of the convertible bond is simply given by the face value *FV* and the conversion price *CP*. For the sake of simplicity, each convertible bond can be converted into stocks at a stock price of 100 in the above shown example:

$$CR = \frac{FV}{CP}$$

In the same example, the face value is 100 monetary units yielding a conversion ratio of 1 (100/100 = 1). Next to the face value of a convertible bond, its value can also be expressed in terms of parity or premium. Parity (in %) can be interpreted as moneyness of the convert and is dependent on stock price *S*:

$$Parity = \frac{S * CR}{FV} * 100$$

Thus, a parity greater than 100% can be read as "in the money", whereas a parity below 100% would be "out of the money" in that specific case. Another measure of importance is the premium. It is most relevant for out of the money convertibles and describes the necessary stock price increase for which the convertible value *P* equals its stock value:

$$Premium = \frac{P - (S * CR)}{S * CR} * 100$$

Consequently, the payoff of a convertible bond at maturity *T*, depending on the stock price at time *T* (i.e. S_T), can be described as follows (see de Spiegeleer, Schoutens, van Hulle (2011)):

$$P_T = FV + CR * max(0, S_T - CP)$$

For more sophisticated pricing approaches please refer to Baumol, Malkiel, Quandt (1966), Hüttner, Mai (2018) or references therein. Coming back to figure 1, there are some interesting properties to observe. In the stock price range of 40 to 100, the convertible bond line is situated above the bond floor as well as the equity / stock line. This is due to the structure of the convertible bond, which is basically comprised of a straight bond and a long call. Therefore, the convertible line is above the bond floor, due to the additional value of the call option. The convertible line is also trading above the stock line between a stock price range of 100 and 200. This spread is explained by the coupon paid by the convertible bond. Summarizing, a convertible bond provides an asymmetric payoff profile with equity upside and bond-like behavior in the case of decreasing stock prices.

4 Data and methodology

As such, convertible bonds should behave similar to equities or bonds. To check this proposition, I download information on N

[3] The value of the bond is unlikely to equal zero in case the issuing company defaults. Due to the higher seniority of debt (when compared to equity), the convertible bond should recover somewhere above zero after a bankruptcy.

= 1,507 convertible bonds issued in the US between December 1989 and April 2019 (t = 353 months) from Bloomberg.[4] To include only the most liquid ones, which are liquid enough for large individual investors[5], I use a set of different screening filters. Thus, I define a minimum issuance size of 100 million USD. Via the Bloomberg search (<SRCH> GO) command I limit the search to convertible bonds, which are incorporated in the US and denominated in USD (excluding mandatory, sinkable and putable bonds). Furthermore, I exclude private placements to ensure any investor is able to participate in a bond sale. Last but not least, I exclude convertible bonds trading below half of their face value, since the investor base shifts dramatically from this point. Bonds trading at such low values are commonly perceived to be "distressed", at which point specialized distressed debt investors start buying and looking at those (convertible) bonds. More traditional investors sell their stakes beforehand, leading to a significantly different investor base and therefore different investor interest and behavior.
For each convertible bond I retrieve monthly (clean) price information, turnover of the underlying stock (I could not obtain sufficient convertible bond turnover data), total common equity of the respective company[6] as well as the market value of each company (i.e. outstanding shares multiplied by stock price). Moreover, I download the delta of each convertible bond for every point in time based on the built-in Bloomberg convertible pricing tool. The same applies to the historical yield to maturity (YTM). Table 1 includes some descriptive statistics of the utilized data.

	Coupon (in %)	Issue amount	(Log) size	Delta (in %)
Min.	0	100	-9.21	0
25%-perc.	2.25	150	7.09	39.10
Mean	3.97	333.60	7.44	41.75
75%-perc.	5.5	373.75	7.88	45.48
Max.	18	3,180	16.41	100

Table 1: Descriptive statistics

The coupon is given in percentage points, issue amount is stated in millions, (log) size is the log of the market value measured as outstanding shares multiplied by stock price in million USD and delta describes the sensitivity to the underlying stock in percentage points. Minimum (min.) and maximum (max.) describe the two most extreme observed values of each variable. In between I report the values of the 25%- and 75%-percentiles (perc.) as well as the mean.

Due to a relatively small number of companies at the beginning of the sample, I additionally exclude the first 91 months of the sample period and start the calculation of investment styles from the 92nd months on (i.e. mid 1997). Figure 2 plots the num-

[4] I obtain the list at the end of May 2019.

[5] Small issue sizes might become too illiquid for institutional investors since large parts of the issuance might be held until maturity by other market participants. Therefore, bond issuances larger than 100 million USD increase the likelihood of sufficient free float.

[6] Bloomberg defines total common equity as share capital and APIC (additional paid-in capital) plus retained earnings and other capital.

ber of companies in the sample over time to visualize that issue (including the first 91 months).

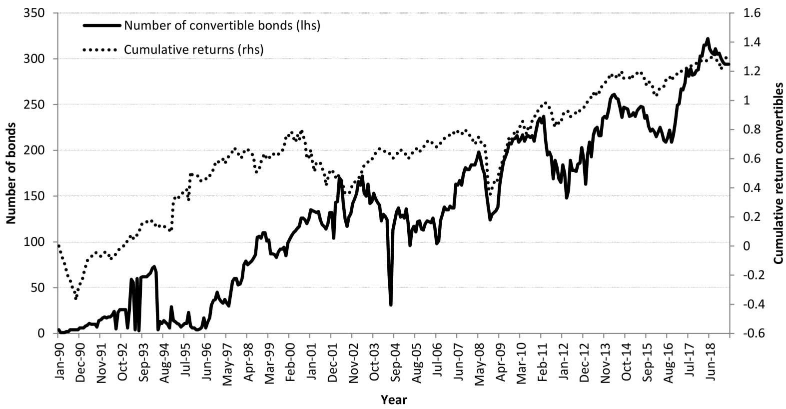

Fig. 2: Number of convertible bonds vs cumulative returns over time.

The construction of the investment styles is based on the six before mentioned characteristics. Table 2 depicts the construction methodology of each single style considered in this article, which is mostly in line with the current literature, and references the studies which first described the respective characteristic in the past. The construction of the investment styles follows some simple steps. First, I sort all available assets into quintiles at the end of month t, based on their respective characteristic. More plainly speaking, for example the momentum style is constructed by placing assets with the highest past return in quintile 5, whereas assets with the lowest past return are sorted into quintile 1. Assets in between will be separated into the remaining three quintiles. Quintile 5 thus, is comprised of high momentum assets and serves as long portfolio. Quintile 1 contains the worst performers and serves as short portfolio.

Second, based on these two portfolios, the investment style is the (log) return differential (based on a convertibles dirty price) between both portfolios at the end of month t+1. The convertible bonds within each portfolio are equally-weighted and rearranged monthly. Only value and size are rearranged yearly and lagged by six months to ensure data availability, in line with the literature (see e.g. Fama and French (1993)). Transaction costs are not taken into account.

Since this approach takes into account only one characteristic at a time, I further borrow from the characteristics integration literature (see among others Bender, Wang (2016) and Leippold, Rueegg (2018)). Based on the ranks (i.e. the quintile a convertible bond is sorted into) I build a simple average per asset over all six characteristics. The integrated rank ($Rank_{Integrated}$) thus, is given by:

$Rank_{Integrated} = \frac{\sum_{j=1}^{N} Q_j}{N}$

with *N* being the number of characteristics under consideration and *Q* as the rank of an asset with regard to the j_{th} characteristic. This integrated rank is then used to sort the convertible bonds into quintiles again and to construct the hedge portfolio.

	Original study	Calculation	Direction of sorts
Value	Graham, Dodd (1934)	$BM_t = \frac{CE_{t-6}}{MV_t}$	Up
Defensive	Black, Fischer, Scholes (1972)	$Std = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N} \lvert r_i - \bar{r}\rvert^2}$	Down
Momentum	Jegadeesh, Titman (1993)	$r_{Mom,t} = \frac{(P_{t-2} - P_{t-12})}{P_{t-12}}$	Up
Carry	Fama, French (1993)	$Bond = \sum_{t=1}^{T} \frac{C}{(1+YTM)^t} + \frac{FV}{(1+YTM)^T}$	Up
Illiquidity	Amihud, Mendelson (1986)	$Log(Turnover)$	Down
Size	Banz (1981)	$Log(MV_{t-6})$	Down

Table 2: Investment styles methodology

BM is the book-to-market ratio obtained from dividing the common equity (CE) of a company, lagged by six months to avoid a look-ahead bias, by the market value (MV) of the same company. I exclude negative CE values in line with Fama, French (1998). Defensive is measured by the rolling standard deviation (Std) with N as the number of observations and the return r of asset i. r_{Mom} is a convertible bonds past year return, when skipping the most recent months in line with Jegadeesh, Titman (1993) to avoid a short-term reversal effect. P describes the price of a security at time t. The yield-to-maturity (YTM) can be obtained from the above described bond price formula, where C is the coupon and FV describes the face value of a bond. Solving for YTM yields the carry characteristic used in this article. Since that data are downloaded from Bloomberg, I exclude the 1%- and 99%-percentile due to obvious data errors. Illiquidity is measured by the log of turnover data (traded shares multiplied by stock price) and size is the log of a company's market value (outstanding shares multiplied by stock price). The direction of sorts indicates the placement of assets in the respective long or short portfolio. "Up" in this context means assets exhibiting a very distinct characteristic (for example high past returns) are placed in the long portfolio. Low values (or small past returns) on the other hand are placed in the short portfolio. This relationship also works the other way round, indicated by "down".

5 Empirical analysis

Applying this concept to US American convertible bond data yields some interesting results. To my knowledge, I am the first to investigate investment styles in convertible bonds. Therefore, I utilize six well known characteristics as described in the asset pricing and investment styles literature to construct investment styles in this niche asset class. Table 3 contains the results of a long-only benchmark as well as every of the six investment styles in more detail.

	BM	Value	Defensive	Momentum	Carry	Illiquidity	Size
Mean (in %)	0.25	-0.33	0.06	0.36	0.69	-0.11	-0.02
t-statistics	1.26	-1.13	0.20	1.30	2.43	-0.45	-0.14
p-value	0.21	0.26	0.84	0.19	0.02	0.65	0.89
Std. dev. (in %)	3.24	4.66	4.13	4.40	4.58	3.84	4.30
Return/risk	0.08	-0.07	0.01	0.08	0.15	-0.03	-0.01
Skewness	-1.41	0.64	1.12	-0.17	0.68	0.22	0.47
Kurtosis	8.50	8.86	7.25	5.96	6.88	5.59	7.20

Table 3: Results single investment styles

This table reports the results of a long-only benchmark (BM), which invests equally-weighted in all available assets and six investment styles applied to convertible bonds. Mean is the average monthly log return of the long-short (hedge) portfolio stated in %. T-statistics and p-value are obtained from a two-sided t-test with the null hypothesis of zero mean returns. Std. dev. is the historical standard deviation of the mean returns in %. Return / risk is the mean divided by the standard deviation. Skewness and kurtosis are the third and fourth return moments of the monthly hedge portfolio returns.

As shown above, only carry produces statistically significant (at the 5%-level) mean monthly average returns. Defensive, illiquidity and size result in average returns close to zero, whereas momentum generates higher, but not statistically significant returns. Value on the other hand results in negative and statistically insignificant returns. Also, an equally-weighted benchmark of all available convertible bonds results in statistically insignificant mean monthly returns, which might be due to a relatively small sample size over time (see figure 2). The signs of the mean monthly returns of size, defensive and momentum are in line with their expectation. Only illiquidity and value fail to deliver positive mean returns. The low and insignificant returns also yield only small return/risk ratios. Skewness and kurtosis also show no meaningful outliers.

At this point, the results look rather weak and disappointing. One reason might be the comparably small sample size. Another reason could be the maturity of bonds in general. As opposed to equities, which are unlimited in time, bonds are repaid in full at some predefined point in the future. Convertible bonds sometimes contain call dates at which the bond can be redeemed prior to maturity by the issuing company. Therefore, as input for the characteristics integration, I use the monthly rank matrices of value and size as opposed to the yearly ones. By doing so, characteristics integration yields interesting outcomes (see table 4).

	P01	P02	P03	P04	P05	PHedge
Mean (in %)	0.04	0.16	0.26	0.26	0.53	0.49
t-statistics	0.13	0.66	1.31	1.37	4.10	1.66
p-value	0.90	0.51	0.19	0.17	0.00	0.09
Std. dev. (in %)	4.97	3.58	2.99	2.84	1.94	4.42
Return/risk	0.01	0.04	0.09	0.09	0.27	0.11
Skewness	-1.53	-1.41	-1.55	-2.36	-0.28	1.55
Kurtosis	8.22	7.78	11.06	20.26	5.59	8.22
Mean characteristics	1.91	2.49	2.92	3.37	3.97	-

Table 4: Results characteristics integration

This table reports the detailed results of a characteristics integration approach based on six investment styles applied to convertible bonds. Mean is the average monthly log return of the long-short (hedge) portfolio stated in %. T-statistics and p-value are obtained from a two-sided t-test with the null hypothesis of zero mean returns. Std. dev. Is the historical standard deviation of the mean returns in %. Return / risk is the mean divided by the standard deviation. Skewness and kurtosis are the third and fourth return moments of the monthly hedge portfolio returns. Mean characteristic describes the average integrated rank for each of the portfolios.

Table 4 depicts the detailed results of the characteristics integration approach. Here, I simply calculate the average of all ranks of the six single investment styles. Assets with the highest average rank values are consequently placed in the top quintile portfolio (P05), whereas assets with the lowest average values are placed in the lowest quintile portfolio (P01). Portfolios in between are reported as well. The hedge portfolio (PHedge) is the return differential of P05 and P01. Interestingly, characteristics integration yields a statistically significant (at the 10%-level) mean monthly return of 0.49%. A mix of the six single investment styles would yield a mean monthly return of only 0.11% (i.e. the average of the single investment style mean returns). Also, the lower the average characteristic gets, the lower is the mean monthly return. P01 produces only slightly positive returns of 0.04% per month. All portfolios are negatively skewed except for the hedge portfolio. Standard deviation decreases with higher mean returns, which subsequently results in higher return/risk ratios.

In table 5, I include the pairwise Pearson correlation coefficients of all styles and the long-only benchmark. It emerges that all investment styles exhibit negative correlations with regard to the long-only benchmark. Also, the dependencies among the styles are relatively mixed with no obvious structural behavior.

Especially characteristics integration is positively related to almost all other investment styles. The same applies to defensive, however, lower in magnitude. Since the results shown in tables 4 and 5 are not yet conclusive, I additionally run a standard asset pricing test. Therefore, I utilize the same analysis as Bektic et

	BM	VA	DE	MO	CA	IL	SI	CI
BM	1	-0.45	-0.80	-0.06	-0.50	-0.42	-0.44	-0.68
VA		1	0.56	-0.21	0.72	0.66	0.59	0.71
DE			1	0.22	0.50	0.42	0.46	0.74
MO				1	-0.32	-0.15	0.01	0.17
CA					1	0.79	0.66	0.74
IL						1	0.75	0.72
SI							1	0.72
CI								1

Table 5: Pairwise correlation coefficients

This table reports the pairwise Pearson correlation coefficients for the long-only benchmark (BM) and all other investment styles of interest in this article. VA denotes value, DE is defensive, MO represents momentum, CA is carry, IL denotes illiquidity, SI represents size and CI is the short version of characteristics integration.

al. (2019), who explore Fama-French factors in corporate bond markets based on the works of Fama, French (1993) and Fama, French (2015). From this regression analysis it can be explored if the different convertible bond investment styles are (i) independent from the US stock and bond markets (which is more or less systematic risk) and (ii) are able to achieve an excess return over both markets. Therefore, Bektic et al. (2019) suggest the following regression framework:

$r_{it} = \alpha_{it} + \beta_{i1}MKT_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + \beta_{i4}RMW_t + \beta_{i5}CMA_t + \beta_{i6}TERM_t + \beta_{i7}DEF_t + \epsilon_{it}$

where r_{it} is the return of investment style i at time t, MKT is the market return, SMB mimics the size factor, HML proxies the value factor, RMW is a measure of the profitability factor, CMA mimics the investment factor and the two bond market risk factors default (DEF) and term structure ($TERM$). The error term is given by ϵ and the betas (β_i) measure the dependency of the single factors. For more information on the construction and intuition of the respective factors please see Fama, French (1993) and Fama, French (2015). Data for the factors MKT, SMB, HML, RMW and CMA are downloaded from Kenneth French's website.[7] $TERM$ and DEF are proxied by the yield spread of long-term (10 year) minus short-term (1 year) US government bonds and the yield spread of AAA rated long-term US corporate bonds over long-term US government bonds, respectively.[8] In table 6 I only include investment styles with statistically significant mean monthly return as well as the long-only benchmark.

As shown in table 6, all three strategies (a long-only benchmark, carry and characteristics integration) are relatively well explained by common equity and bond market factors. Furthermore, all three load significantly on MKT, carry and characteristics integration with a negative sign (which is in line with table 5). Moreover, both investment styles load positively on the equity market factors SMB, HML and RMW. Carry is also partly explained

[7] See `https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#Benchmarks`, "U.S. Research Returns Data (Downloadable Files)", accessed on June 17th 2019.

[8] Therefore, I download the respective data from Bloomberg, covering the same period of time as the US convertible bond sample.

	α (in %)	β_1	β_2	β_3	β_4	β_5	β_6	β_7	R^2 (in %)
BM	-0.44	0.58	0.14	-0.12	-0.14	-0.00	0.14	0.07	82.04
	(-0.79)	(18.79)***	(3.35)***	(-2.40)**	(-2.37)**	(-0.05)	(1.02)	(0.19)	
CA	-2.36	-0.55	0.16	0.58	0.44	-0.40	0.29	1.62	57.24
	(-1.89)*	(-8.15)***	(1.70)*	(5.14)***	(3.47)**	(-2.24)**	(1.00)	(1.96)*	
CI	-0.00	-0.55	0.17	0.44	0.62	0.19	0.59	-0.44	71.64
	(-0.00)	(-9.21)***	(1.82)*	(4.21)***	(4.86)***	(1.11)	(2.15)**	(-0.62)	

Table 6: Regression results convertible bond (styles) vs. equity and bond market factors

This table reports the regression results of three convertible bond investment strategies (BM = long-only benchmark, CA = carry investment style, CI = characteristics integration investment style) as dependent variables tested against five equity market and two bond market factors as independent variables (see the model above). α is the excess return stated in %. β is the regression beta for the respective independent factor. R^2 is given in %. Below the regression coefficients I report the corresponding t-statistics in parentheses. *** denotes a statistically significant t-statistics at the 1%-level, ** is statistical significance at the 5%-level and * denotes the 10%-level.

by the bond market factor DEF, whereas characteristics integration loads significantly on the $TERM$ factor. In terms of alpha, characteristics integration is the only strategy yielding neither an under- nor outperformance. The two other strategies achieve slightly negative alphas.

6 Conclusion

Although, evidence for well-known characteristics is not as strong in convertible bonds as in equities or other fixed income markets, characteristics integration yields promising results. While investment styles based on single characteristics mostly produce results with signs in line with their expectation, mean monthly hedge portfolio returns are not statistically significant except for carry. This might have several reasons like a too small data set or the implementation of the sorting criteria. In a first experimental analysis, some styles seem to produce clearer results when being sorted on the underlying equity but not convertible bond data.

Characteristics integration on the other hand assumes several characteristics at once and results in positive hedge portfolio returns significant at the 10%-level. Moreover, characteristics integration is negatively correlated to a long-only convertible bonds benchmark, which it outperforms clearly (0.49% mean monthly return of characteristics integration vs. 0.25% mean monthly return of a naive benchmark). Controlling for well-known equity and bond market factors neutralizes this outperformance, since these factors are able to explain the returns of characteristics integration to a large extent. However, characteristics integration outperforms a simple convertible bond benchmark and loads significantly on equity and fixed income factors without losing performance (alpha is zero). Therefore, such a strategy might be of interest for multi asset investors since it allows exposure to two different asset classes and different styles at once.

Due to a rather small academic interest in this asset class, basically all studies or approaches with regard to asset pricing and investment styles can be applied to convertible bonds. First, the same investigation with a broader, perhaps global, data set would be recommendable. Second, it needs to be seen if the diverse characteristics are sufficiently priced in the underlying data (in the sense of Fama, MacBeth (1973) or panel regressions). Also an alternative construction of the investment styles could be tested and discussed.

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