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EQUITY MARKET IMPACT ON CORPORATE BOND EXCESS RETURNS

Corporate bond portfolio managers must constantly decide whether to overweight or underweight the credit sector, to overweight or underweight certain industry sectors, or to hold specific securities in the portfolio. For these decisions, portfolio managers rely on their knowledge of company fundamentals, industry trends, and the general macroeconomic environment. Equity investors and analysts also closely follow the same variables, and their assessment leads to decisions to buy or sell equity. It seems reasonable to suggest that there might be a relationship between corporate bond excess returns and equity returns. This article examines the data to see if there is a statistical relationship between equity returns and corporate bond excess returns. More important, if there is a relationship, might it be helpful to fixed-income corporate bond portfolio managers?

Before letting the data speak, does finance theory offer any insights into the relationship between equity and debt returns? One of the early models for valuing default-risky debt is based on the principles of option pricing.[1] This model notes that the payment to the bondholder at maturity is the smaller of two quantities: the face value of the debt or the market value of the firm. If the firm's market value is greater than the face value of the bond, then shareholders have the incentive to pay bondholders. If, on the other hand, the value of the firm is less than the face value of the bond, then shareholders will default and let bondholders take control of the firm. The payoff to the bondholder at maturity is summarized in Figure 1.

The payoff to the corporate bondholder resembles that of holding a risk-free bond (with the same face value as the corporate bond) and being short a put option on the firm's value with an exercise price equal to the face value of the bond. If we subtract the credit risk-free curve component (*i.e.,* the same-duration Treasury return) from a corporate bond's total return, we are left with the bond's excess return. This excess return captures the return due to the bond's credit (or default) premium. According to the option-based model for valuing default-risky debt, corporate bond excess returns will fluctuate with the value of the short put option on the firm's value.

Using the Black-Scholes option pricing model, we would expect the return on the short put option position (and corporate debt excess returns) to be positively related to increases in the firm's value, positively related to changes in the risk-free rate, and negatively related to the volatility of the firm's value. Let's see what the data say.

Model Specification

We examine the relationship between equity and debt returns at both the aggregate and industry sector levels.[2] At the aggregate level, we examine how excess returns of the entire Credit Index are related to S&P 500 equity returns.[3] At the industry sector

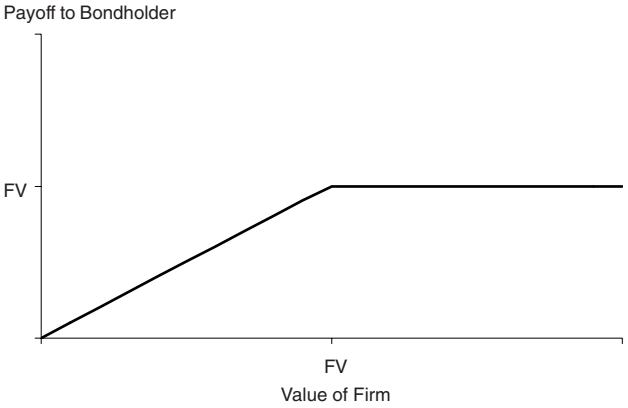
[1] See "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates," by Robert C. Merton, *Journal of Finance*, May 1974.

[2] We may examine this relationship at the issuer level in a follow-up piece.

[3] A limitation of this analysis is that the Credit Index includes many issuers that are not in the S&P 500, and, in turn, the S&P 500 includes many issuers (184) that are not represented in the Credit Index.

Figure 1. **Payoff to Bondholders at Maturity**

	Value of Firm (V) Less than Face Value of Bonds (FV) V <= FV	Value of Firm (V) Greater than Face Value of Bonds (FV) V > FV
Payoff to Bondholders	V	FV
Payoff to Equityholders	0	V - FV



level, we examine the relationship between excess returns on various industry sectors of the Credit Index (*e.g.,* financials) and the equity returns for the comparable sector of the S&P 500. Although the Credit Index and the S&P 500 may define a given industry sector differently, there is a broad correspondence between them.

We use least-squares regression to estimate the following relationship at both the aggregate and industry sector levels:

$$CorpER_t = constant + ß_1 * EquityRet_t + ß_2 * EquityRet_{t-1}$$

$$+ ß_3 * EquityRet_{t-2} + ß_4 * ChgYield_t + ß_5 * ChgVol_t + ε_t$$

The regression variables are defined as follows:

$CorpER_t$ = Monthly corporate excess returns (*i.e.,* corporate total returns less duration-equivalent Treasury returns) for the U.S. Credit Index.

For the sector regressions, this variable represents monthly excess returns for the various industry sectors of the Credit Index.

$EquityRet_t$ = Monthly returns (including dividends) for the S&P 500 Index. We assume that changes in firms' value is proxied by changes in equity returns.

For the sector regressions, this variable represents monthly equity returns for the corresponding industry sectors.

In addition to examining whether this month's equity returns are correlated with this month's corporate excess returns, we add one- and two-month lagged values of monthly equity returns to the regression. If these lagged values are significant, then there is some persistence in equity returns influencing corporate excess returns.

$ChgYield_t$ = Monthly changes in the 5-year par Treasury yield from the Lehman Treasury spline model.

$ChgVol_t$ = Monthly changes in the month-end VIX index value, which represents the implied volatility on "at-the-money" S&P 100 Index options. We use this volatility measure as a proxy for the volatility of firms' value.

Regression Results

We ran the regression for January 1989 through January 2001.[4] The full-period results are presented in Figure 2.

Overall, at the aggregate level, the regression results match our expectations. The coefficients on equity returns (including the two lagged terms) and changes in the 5-year Treasury yield are positive and generally statistically significant. The coefficient on the change in volatility is negative, as expected, and also statistically significant. In addition to the correct sign and significance of the regression coefficients, the magnitude of the R^2 value is also noteworthy. This regression model explains approximately 28% of the variability in monthly corporate bond excess returns. The correlation coefficient of 0.55 shows that the model's predicted value for corporate excess returns is highly correlated with the realized value.

The results of the regression at the aggregate level can be interpreted as follows. A one-percent increase in the current month for the S&P 500 Index returns adds 3 bp to this month's excess returns for the Credit Index. In addition, this one-percent S&P 500 increase will work itself through over the next two months, producing an aggregated dynamic impact of 9 bp (= 3 bp + 4 bp + 2 bp). Given the efficiency of financial markets, it's unusual for lagged variables to have a significant impact on future returns.

The coefficient for the change in the 5-year par Treasury yield indicates that a one basis point change in yield is associated with a 0.3 bp change in the same direction in corporate excess returns. The coefficient for the change in implied volatility indicates that a one percentage point change in volatility is associated with a 3 bp change, in the opposite direction, in corporate bond excess returns.

At the industry sector level, the regression results are similar to those for the Credit Index. The regression coefficients generally

[4] Data for basic materials and consumer cyclicals and non-cyclicals do not begin until July 1991.

have the expected sign and are statistically significant. In particular, for the financials sector, the model explains 40% of the variation in corporate bond excess returns (with a correlation coefficient of 0.65). In contrast, the model does less well for the utilities sector, explaining only 11% of corporate excess returns. In addition, none of the coefficients for equity returns are significant. Perhaps the model does poorly for the utilities sector because of its historical regulatory structure, which helps protect bondholders irrespective of the sector's equity performance.

We next subdivide the sample period to examine the stability of the results. Figure 3 presents results for the first subperiod, from January 1989 to June 1998. This period was characterized by generally declining or stable corporate spreads, declining interest rates, and rising equity values. Results for this first subperiod are somewhat stronger than those for the entire period. At the aggregate level, the coefficients for the contemporaneous, one-month lagged and two-month lagged equity returns are all positive and statistically significant. The coefficient for the change in Treasury yields is also positive and significant. The coefficient for the change in implied volatility is negative, as expected, and weakly significant. Most notably, the R^2 is 0.36, indicating that 36% of the variation in corporate excess returns is explained by this model.

Results at the industry sector level for this first subperiod are as expected: the coefficients have the expected sign and are generally statistically significant. In particular, the results for the financials sector are striking, as the model explains 49% of the variation in excess returns for the sector. As discussed earlier, the model does poorly in explaining excess returns for the utilities sector.

The second subperiod covers the period from July 1998, on the eve of the Russian and Brazilian crises, to January 2001. This period also includes the Treasury buyback announcements of early 2000. Figure 4 presents results for this subperiod.

At both the aggregate and industry sector levels, the regression results for this subperiod are not as compelling as those for the

Figure 2. **Regression Results, January 1989-January 2001**
t-statistics are presented in italics below the coefficient value*
Coefficients in bold are significantly different from zero at the 90% confidence level

Index/Sector		EquityRet$_t$						Correlation
CorpER$_t$	Constant	No Lag	1-Mo Lag	2-Mo Lag	ChgYield$_t$	ChgVol$_t$	AdjR^2	Coefficient
Credit Index	**-0.08**	**0.03**	**0.04**	0.02	**0.34**	-0.03	0.28	0.55
	-1.72	***1.84***	***3.39***	*1.34*	***3.10***	*-1.46*		
Basic Materials	-0.03	**0.03**	**0.02**	**0.03**	**0.31**	**-0.05**	0.32	0.59
	-0.75	***2.59***	***1.92***	***1.77***	***2.04***	***-2.31***		
Capital Goods	**-0.10**	**0.05**	**0.03**	0.02	**0.27**	**-0.04**	0.24	0.52
	-1.91	***3.10***	***2.02***	*1.25*	***2.34***	***-1.76***		
Consumer Cyclicals	**-0.13**	**0.09**	0.01	0.03	0.10	**-0.06**	0.37	0.63
	-2.01	***4.17***	*0.62*	*1.61*	*0.53*	***-2.65***		
Energy	0.02	0.03	0.03	-0.01	**0.47**	**-0.05**	0.20	0.48
	0.32	*1.61*	*1.44*	*-0.42*	***3.51***	***-1.83***		
Financials	-0.06	**0.05**	**0.01**	0.01	**0.34**	**-0.03**	0.40	0.65
	-1.53	***5.10***	***2.05***	*1.23*	***3.35***	***-2.40***		
Non-Cyclicals	**-0.10**	**0.05**	**0.04**	0.02	0.17	**-0.04**	0.27	0.55
	-1.86	***3.35***	***2.25***	*1.21*	*1.37*	***-2.30***		
Technology	**-0.31**	**0.06**	0.02	0.03	**0.36**	**-0.06**	0.23	0.50
	-2.34	***3.68***	*1.46*	*1.20*	***2.33***	***-3.62***		
Transportation	-0.03	**0.05**	0.01	**0.03**	**0.54**	-0.03	0.27	0.54
	-0.56	***3.71***	*0.95*	***2.58***	***3.79***	*-1.48*		
Utilities	0.03	-0.02	-0.01	0.00	**0.39**	**-0.04**	0.11	0.38
	0.86	*-1.13*	*-0.52*	*0.14*	***2.47***	***-1.81***		

* The t-statistics are corrected for heteroskedasticity, and are in most cases considerably more conservative than the conventional t-statistics.

Figure 3. **Regression Results, January 1989-June 1998**
t-statistics are presented in italics below the coefficient value*
Coefficients in bold are significantly different from zero at the 90% confidence level

Index/Sector		EquityRet$_t$						Correlation
CorpER$_t$	Constant	No Lag	1-Mo Lag	2-Mo Lag	ChgYield$_t$	ChgVol$_t$	AdjR^2	Coefficient
Credit Index	**-0.06**	**0.03**	**0.04**	**0.02**	**0.38**	-0.01	0.36	0.62
	-1.88	***3.05***	***5.14***	***2.55***	***5.43***	*-1.42*		
Basic Materials	0.01	**0.04**	0.01	0.00	**0.22**	**-0.03**	0.32	0.60
	0.36	***4.90***	*1.60*	*-0.14*	***2.35***	***-2.54***		
Capital Goods	-0.03	**0.05**	**0.02**	**0.02**	**0.30**	-0.01	0.40	0.65
	-1.09	***4.44***	***1.70***	***1.95***	***3.49***	*-1.17*		
Consumer Cyclicals	0.00	**0.05**	-0.01	0.00	0.13	**-0.03**	0.19	0.49
	-0.11	***4.47***	*-0.70*	*0.07*	*0.99*	***-1.77***		
Energy	0.05	**0.04**	0.01	**-0.02**	**0.46**	**-0.02**	0.26	0.54
	1.48	***2.62***	*1.01*	***-2.35***	***4.80***	***-2.24***		
Financials	-0.05	**0.04**	**0.01**	**0.01**	**0.29**	**-0.02**	0.49	0.72
	-1.57	***5.17***	***2.07***	***2.91***	***3.63***	***-2.25***		
Non-Cyclicals	-0.03	**0.03**	0.01	0.01	0.13	-0.02	0.06	0.34
	-0.61	***3.01***	*1.05*	*1.29*	*1.57*	*-1.06*		
Technology	-0.27	**0.04**	**0.04**	0.05	**0.37**	**-0.03**	0.18	0.46
	-1.61	***2.90***	***2.25***	*1.06*	***1.93***	***-1.93***		
Transportation	0.00	**0.05**	0.02	0.02	**0.47**	-0.01	0.31	0.58
	-0.05	***4.86***	*1.34*	*1.48*	***4.04***	*-0.75*		
Utilities	0.05	0.00	-0.01	0.00	**0.33**	**-0.02**	0.10	0.37
	1.45	*-0.26*	*-0.69*	*-0.07*	***2.69***	***-2.17***		

Figure 4. **Regression Results, July 1998-January 2001**
t-statistics are presented in italics below the coefficient value*
Coefficients in bold are significantly different from zero at the 90% confidence level

Index/Sector		EquityRet$_t$						Correlation
CorpER$_t$	Constant	No Lag	1-Mo Lag	2-Mo Lag	ChgYield$_t$	ChgVol$_t$	AdjR^2	Coefficient
Credit Index	-0.18	0.03	0.06	0.04	-0.40	-0.06	0.18	0.56
	-1.45	*0.71*	*1.63*	*1.13*	*-0.53*	*-1.32*		
Basic Materials	-0.05	0.01	0.03	**0.05**	0.71	**-0.06**	0.31	0.65
	-0.37	*0.65*	*1.04*	***1.65***	*1.25*	***-2.14***		
Capital Goods	**-0.34**	0.05	0.05	0.01	-0.14	**-0.06**	0.08	0.49
	-1.85	*1.19*	*1.36*	*0.36*	*-0.19*	***-1.95***		
Consumer Cyclicals	-0.22	**0.12**	0.03	**0.06**	-0.51	**-0.09**	0.47	0.75
	-1.57	***3.63***	*1.22*	***2.10***	*-0.76*	***-3.21***		
Energy	-0.01	0.00	0.04	0.02	0.41	**-0.08**	0.14	0.53
	-0.06	*0.06*	*1.05*	*0.37*	*0.68*	***-1.64***		
Financials	-0.10	**0.06**	0.02	0.01	0.33	**-0.04**	0.26	0.62
	-0.82	***2.75***	*0.92*	*0.32*	*0.82*	***-1.83***		
Non-Cyclicals	-0.09	**0.07**	0.07	0.04	0.02	**-0.06**	0.38	0.70
	-0.92	***2.85***	*2.33*	*1.34*	*0.03*	***-2.72***		
Technology	-0.53	**0.08**	0.00	0.01	0.25	**-0.08**	0.35	0.68
	-2.23	***2.83***	*0.08*	*1.03*	*0.38*	***-2.78***		
Transportation	-0.08	**0.04**	0.01	**0.06**	0.68	-0.05	0.16	0.55
	-0.51	***1.66***	*0.18*	***2.21***	*1.33*	*-1.54*		
Utilities	-0.04	-0.04	0.00	0.01	0.82	**-0.05**	0.04	0.45
	-0.28	*-1.57*	*-0.12*	*0.40*	*1.48*	***-1.65***		

previous subperiod. However, many results continue to hold despite the market turmoil throughout the period. First, while the coefficients on the equity returns are generally positive, many of the coefficients on the lagged equity returns have lost their statistical significance. Second, the coefficients on changes in the 5-year par Treasury yield are sometimes negative and generally not statistically significant. This is a dramatic change from the first subperiod. Third, while the coefficients on changes in volatility are negative, as expected, in several regressions, the coefficient is no longer statistically significant. Finally, although the R^2s are still reasonably high (the model explains 18% of the variation in corporate excess returns for the Credit Index), the overall explanatory power of the regression has declined sharply at both the aggregate and industry sector levels.

What could account for the model's drop in performance during this second subperiod? Recall that the regression model is based on the idea that the corporate-Treasury spread represents a credit (or default) spread that is essentially a put option on the value of the firm written by the bondholder. However, during this second subperiod, the Treasury yield began to incorporate a liquidity premium.[5] As a result, the corporate-Treasury spread reflected not only a default spread, but also a liquidity spread. Consequently, our model lost some of its explanatory power, because it was not designed to account for changes in the liquidity premium. To the extent that the Treasury liquidity premium stabilizes, then we would expect our model to perform as well as it did in the first subperiod.

Correlation versus Causality

The regression results above indicate that positive equity returns are associated with positive excess corporate bond returns. Regression results show correlation, not causation. However, the fact that lagged equity returns are significantly correlated with corporate bond excess returns indicates that perhaps equity returns "cause" corporate excess returns. Economists use the term "causation" in a temporal sense, as in "for A to cause B, then A must occur before B." One econometric test for causation is to see if past values of A are correlated with B, but past values of B are not correlated with A. If so, then A is said to "cause" B. We can conduct this type of causality test to see if equity returns "cause" corporate bond excess returns.

We regress corporate excess returns on past corporate excess returns and past equity returns. We then regress equity returns on past equity returns and past corporate excess returns. For equity returns to "cause" corporate excess returns, we want to show that past equity returns are significant in explaining corporate excess returns but that past corporate excess returns do not play a significant role in explaining equity returns.

The data show that at an 82% level of confidence, equity returns cause corporate excess returns, but, at the same confidence level, corporate excess returns do not cause equity returns. Overall, at this level of confidence, the direction of causality runs from equity returns to corporate bond excess returns.

Trading Strategy

How useful are these results for trading? To investigate this, we examine a simple trading strategy. Each month, we take a trading position as follows:

1) We examine sector equity returns for the two previous months. We use these equity returns to generate a signal for each industry sector that helps us determine which corporate bond sector to go long (or overweight) and which sector to go short (or underweight).

2) To generate a signal for each industry sector, we use the regression coefficients[6] for the sector equity returns for the prior two months from the regression model. For example, let $b_2^{financials}$ and $b_3^{financials}$ be the estimated regression coefficients for $EquityRet_{t-1}$ and $EquityRet_{t-2}$, respectively, for the financials sector. We then calculate the excess return signal for the financials sector using the equation below:

$$SignalER_t^{financials} = b_2^{financials} * EquityRet_{t-1}^{financials} + b_3^{financials} * EquityRet_{t-2}^{financials}.$$

[5] See *Identifying the Benchmark Security in a Multifactor Spread Environment*, by A. Kocić, C. Quintos, and F. Yared, September 26, 2000, Lehman Brothers.

[6] The regression was run each month, and the estimated regression coefficients for a given month were used to generate the sector signals for the following month. This way, the number of data points used in each regression increases by one from month to month, which guarantees that only information actually available to investors at that point in time is being used.

3) Next, we rank all sectors by their expected excess return signals.[7] The trading strategy will go long (or overweight) the sector with the best excess return signal and will short (or underweight) the sector with the worst excess return signal. Both the long and the short position will be duration-hedged with Treasuries so that the performance of the strategy depends on the net difference in realized excess returns. Consequently, the monthly performance realized by this strategy is given by

   monthly strategy realized performance =

   $CorpER_t^{\text{best equity signal}} - CorpER_t^{\text{worst equity signal}}$.

4. We begin this strategy in January 1990, and repeat the above steps each month. No allowance is made for transactions costs.

The results for this strategy are presented in Figure 5. On average, the strategy produces 7 bp of outperformance per month.

Figure 6 presents the cumulative performance of this strategy. For the entire period, the strategy produced cumulative outperformance of 988 bp, or approximately 89 bp per year. For much of the period, the strategy produced a relatively small, but positive, cumulative return. In only three of the past 133 months was the cumulative return negative, and the maximum negative cumulative return value was 30 bp. Figure 6 also shows that the strategy performed very well since early 2000. Much of this outperformance was due to underweighting technology after technology equity returns became negative. Overall, there appears to be some information in past equity returns that might be helpful for corporate bond portfolio managers.

[7] We exclude the utilities sector from the trading strategy because the model did not fit this sector very well.

Conclusion

Corporate portfolio managers have always had a hunch that equity returns might be important for subsequent corporate bond excess returns. This article examined the data and showed that equity returns are positively associated with corporate bond excess returns at the aggregate and sector levels. We then examined whether this relationship might be helpful in managing a corporate portfolio. We developed a very simple trading strategy based on past equity returns and showed that the cumulative performance of this strategy remained positive over a long period of time. Further analysis is warranted to determine if refinements to the trading strategy (*e.g.,* taking positions only if the signal achieves a certain critical value) might improve results further.

Figure 6. **Trading Strategy's Cumulative Performance**
January 1990-January 2001

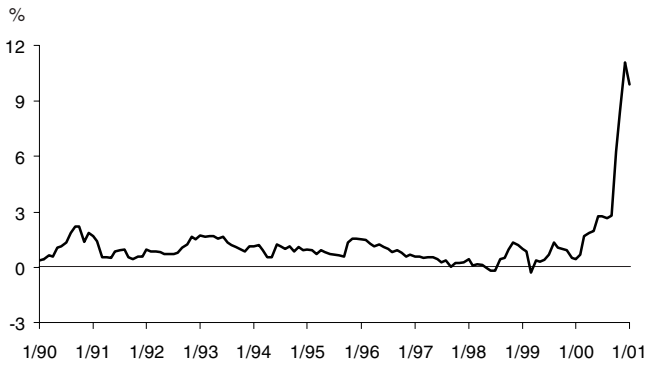


Figure 5. **Trading Strategy Results,** Monthly Performance, January 1990-January 2001, in bp

	$CorpER_t^{\text{best equity signal}}$	$CorpER_t^{\text{worst equity signal}}$	Strategy
Average	2.0	-5.4	7.4
Standard Deviation	47	76	52
Minimum	-217	-491	-118
Maximum	203	229	344