COMPANY AND ASSET SPECIFIC RISK FACTORS: SHORT OVERVIEW ON HIGH YIELD BONDS

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Abstract

This paper discusses the theory that risk factors divide to the company specific and asset specific risk factors. The first group affects to the expected value of an equity of a company whereas the second only to the positive cash outflows for a specific asset. I find that equity market, value, and quality factors are indeed possible company specific risk factors with influence on an expected equity of a company and dividend and volatility factors are possible stock specific risk factors affecting positively to dividends and other cash payments from a company to shareholders. These results are statistically significant and important for our understanding of risk factors and their characteristics.

Keywords: Risk Factors, Risk Factor Theory, Factor Investing, High Yield Bonds, Market, Volatility, Quality, Value, Momentum, Dividend, Size

1. INTRODUCTION

Even though risk factors and risk factor theory are familiar concepts from equity market studies, they are not forgotten in other asset markets, especially in corporate bond markets. Ilmanen, Byrne, Gunasekera and Minikin (2004) with Frazzini and Pedersen (2013) find that corporate bonds with higher credit rating or shorter maturity (lower risk) have higher risk-adjusted returns than bonds with lower credit rating or higher maturity when both investment grade and high yield bonds are concerned. Additionally, Houweling and Zunbert (2015) show that low-risk, value, momentum, and size factors in investment grade and high yield bond markets generate positive returns that are not compensation for higher risk. They calculate these factors by using bond market ratios, such as credit ratings, maturities, and credit spreads, which is the main difference between the studies above and this paper. As Ilmanen, et al. (2004), Frazzini and Pedersen (2013) and Houweling and Zunbert (2015) use risk factors changed to correspond the bond markets, I use unchanged risk factors from the equity markets.

The purpose of this paper is to start a discussion about a theory that there is at least two kind of risk factors that have influence on asset returns. The first group includes risk factors that affect directly to the expected level of a company's equity. They are the company specific factors with an influence on the fundamental value of the company. The second group consists of risk factors that affect only to the cash outflows from the company to a specific asset holder without any high effect on the expected equity level. In other words, these latter factors have main influence on the dividend and coupon outflows of the company and, thus, are favorable for certain assets. They are the asset specific risk factors. Together, company and asset specific risk factors form cross asset market risk factors.

The idea of this theory comes from a simple mathematical reasoning. The dollar outflow \$OF the shareholder gets from the company in a discrete investment horizon from t to T is equal to the difference between the dollar value of the company's equity (Equity in this model means all the cash and tangible assets that are left over after liabilities and other payments have been subtracted.) E_T at the time T and the current dollar value of the company's equity E_t plus all the dividends and other payments D_{T-t} the shareholder receives from the company during his investment period. This is presented in the equation (1):

$$\$OF = E_T - E_t + D_{T-t} = \frac{E_T}{S_T}S_T - \frac{E_t}{S_t}S_t + D_{T-t} = S_T - S_t + D_{T-t} \quad (1)$$

where, S represents the price of a share. Current equity value E_T represents the price the shareholder pays for the company and equals to the dollar inflow \$IF to the company. If markets are efficient, the share represents fully the value of the equity and, thus, the earnings-to-price ratio equals to one. Hence, the dollar outflow depends only on the change in share price and all the dividends the company pays to shareholders. When we divide equation (1) by the current share price (or dollar inflow), we get the return R for the shareholder.

$$\frac{\$OF}{\$IF} = R = \frac{S_T}{S_t} - \frac{S_t}{S_t} + \frac{D_{T-t}}{S_t} = \frac{S_T}{S_t} + \frac{D_{T-t}}{S_t} - 1 \quad (2)$$

And the expected return is:

$$E(R) = \frac{E(S_T)}{S_t} + \frac{E(D_{T-t})}{S_t} - 1 \quad (3)$$

Because the current share price and 1 are constant, their expected values are themselves.

In summary, the expected return to shareholders only depends on the expected value of the share (equity) and the expected value of the dividends.

Now, let's consider the dollar outflow to a bondholder from his investment. If we assume that the company cannot repay an existent debt with a new debt, the only place to get the money to repay the bond is the company's equity. Therefore, bondholder's return does not depend on the par value of the bond but rather on the equity level of the company at the bond's maturity:

$$\$OF = E_T - B_t + C_{T-t} = \frac{E_T}{B_T} B_T - B_t + C_{T-t}, \quad so\ that\ \ \$OF = [-B_t, B_T - B_t + C_{T-t}] \tag{4}$$

where, B_T is the par value and B_t is the current value of the bond and C_{T-t} is the interest and all the payments the bondholder gets from the company over the principal (yield). Equity-to-bond ratio E_T/B_T - at the maturity determines the dollar portion of the par value the bondholder receives from the company. Because the par value and the coupon are preset to a certain level, the maximum return bondholder receives equals to the amount of the coupon, if the bond is bought at a par, plus the change in the bond price, if the bond is bought at a discount or premium. Naturally, the maximum lost is the whole investment value. When we divide the equation (4) by the current bond value (dollar inflow), we get the return for bondholders:

$$\frac{\$OF}{\$IF} = R = \frac{E_T}{B_t} + \frac{C_{T-t}}{B_t} - 1 \tag{5}$$

$$E(R) = \frac{E(E_T)}{B_t} + \frac{E(C_{T-t})}{B_t} - 1 \tag{6}$$

The expected return on bonds is same as the equivalent return on stocks with only one difference, coupon, which is one of the two important notions. Because the return of an asset depends on the risk factors to which the asset has an exposure, these factors also determine the equity level and the amount of all cash outflows of the company. In other words, expected equity level and outflows from the company are determined by specific risk factors. So, if there is a risk factor that affects only to the expected equity level, the same factor has an influence on both stock and bond returns. If this kind of factor exists, it can be found by investigating the factors affecting to both of these asset types.

The second important notion concerns the expected dividend or coupon and especially the direction of their cash flows. Because both dividend and coupon are paid from the equity of the company (if we assume again that a company cannot issue new bonds to pay principal and coupon of the old ones to bondholders or to pay dividends to shareholders), they decrease the level of the equity. This decrease, however, does not show to the ones who receive the cash flow at the time but only to ones without the cash outflow. In other words, dividends do not change the level of the equity for shareholders when they are paid but they decrease the level of the equity for bondholders. Coupons (yield) have the same characteristics but the direction of cash flows is opposite. Thus, the possible risk factors that have positive influence on dividends (coupons or yield), have also positive influence on stock (bond) returns but negative influence on bond (stock) returns.

This paper shows that equity market and equity value factors explain the short- and mid-term returns of high yield bonds with positive coefficients, which indicates that they are possible company specific risk factors. They affect directly to the expected value of a company's equity possibly via gross domestic product (GDP) and distress risk or profitability of a company. Additionally, quality of a company (quality factor) affects positively to the mid-term bond returns and would hence be a company specific risk factor as well. However, the correlation of the quality factor relative to high yield bonds indicates that the factor would also be a stock specific risk factor along with dividend and volatility factors.

Dividend ratio has a short-term effect on high yield bond returns, whereas the volatility of a share (equity) value has influence on medium-term returns. Because both dividend and volatility factors have negative coefficients on bond returns, they are possible stock specific risk factors with an influence on cash outflows to shareholders. Hence, they are unfavorable factors to bondholders. For equity momentum factor, I find no notable influence on high yield bond returns, and the results for equity size factor are not clear.

This paper is constructed as follows: After Forewords, I present the data and the methods I used in this study in chapter Data and Methods. This is followed by chapter Results which shows us the results of the study. Lastly I discuss these results in chapter Comments and provide the list of references in References.

2. DATA AND METHODS

My data includes daily prices of one high yield bond market index and seven MSCI equity risk factor indices from USA markets. These indices are J0A0 Index of Bank of America Merrill Lynch, MSCI USA Total Return Index, MSCI USA Minimum Volatility Gross Index, MSCI USA Quality Total Return Index, MSCI USA Value Weighted Total Return Index, MSCI USA Momentum Gross Index, MSCI USA High Dividend Yield Total Return Index, and MSCI USA Small Cap Total Return Index. High yield bond index is a price index from Bloomberg because total return index was not found. All the MSCI indices are total return indices and from DataStream. The timeframe is 1.1.2002–30.9.2015.

I calculate daily, monthly, quarterly, semiannual and annual logarithmic returns for high yield bond index and equity risk factor indices. Because these risk factor indices of MSCI are highly affected by market factor (see Lappalainen, 2016)[3], I remove the market effect by calculating the difference of returns of every equity risk factor (excluding market factor itself) relative to the market factor. In other words, I take a short position on markets. Thus, I get market-adjusted risk factor returns.[4]

[3] My Master Thesis is currently only in Finnish. However, I can provide English translations of some parts of it if requested.

[4] Market–adjusted returns of risk factors are calculated in order to avoid an accumulative effect of market factor in regressions.

I use multi-factor regression model to determine the explanation power of the risk factor returns on the high yield bond market returns. In the model, the high yield bond market index is the dependent variable and all the risk factor indices are explanatory variables. The regression is as follows:

$$R_{J0A0} = a + \sum_{i=1}^{7} b_i R_{Fi} + e \quad (7)$$

After I calculate regression for every return period, I take three to four explanatory variables with the highest t-values in each period and use again a multi-factor regression to determine how much these three to four factors themselves explain the high yield bond market returns. Results of both of these regressions are found in tables 1 and 2. I also calculate correlations for monthly, quarterly, semiannual, and annual returns of high yield bond index relative to corresponding returns of risk factors in Table 2. Correlations are presented in Table 3.

3. RESULTS

Equity market factor and market-adjusted equity risk factors do not have influence on daily returns of high yield bond index. This is shown by the low R-square ratio for multi-factor regression in 1d column of table 1. However, when the return period is extended to cover one month, the explanation power of risk factors increases notably. Also, the coefficients of risk factors are statistically significant at 0.1 % level (excluding momentum factor). Most of this explanation power, 53 % out of 55 %, is driven by market, dividend, and value factors, as shown in table 2. Thus, these three factors from all the factors included in this study are the main drivers of the performance of the high yield bond market on monthly basis.

Table 1. Coefficients and t-values from multi-factor regression model $R_{J0A0} = a + \Sigma b_i * R_{fi} + e$, where a = intercept, b_i = coefficient for risk factor i and R_{fi} = return of risk factor i.

	Returns				
Regressor	1d	1m	3m	6m	1y
Intercept	0.00***	0.00***	0.01***	0.02***	0.03***
	(6.01)	(12.79)	(17.77)	(22.16)	(17.31)
Market	0.03***	0.32***	0.41***	0.38***	0.44***
	(5.4)	(28.57)	(33.58)	(29.75)	(34.42)
Volatility	0.07**	0.33***	0.15***	-0.47***	-0.99***
	(2.74)	(9.01)	(3.53)	(-9.15)	(-18.00)
Quality	0.01	0.15***	0.30***	0.61***	0.74***
	(0.33)	(3.37)	(6.28)	(12.47)	(15.83)
Value	0.41***	1.06***	1.25***	1.54***	0.43***
	(9.23)	(14.19)	(15.00)	(17.89)	(4.87)
Momentum	0.02	0.04*	0.10***	0.11***	0.07*
	(1.64)	(2.11)	(5.01)	(4.65)	(2.49)
Dividend	-0.20***	-0.61***	-0.57***	-0.21***	0.65***
	(-9.07)	(-17.56)	(-14.27)	(-4.40)	(12.03)
Size	0.00	0.16***	0.13***	0.18***	0.50***
	(-0.22)	(8.11)	(6.13)	(8.40)	(23.00)
R²	0.10	0.55	0.66	0.73	0.74
F-statistics	55.6	634.4	979.4	1348	1364
N	3586	163	54	27	14

N = # of return observations per index, t-values are presented in parenthesis.
**** = 0.1 % significant level, ** = 1 % significant level, * = 5 % significant level*

For quarterly returns, market, dividend, and value factors still drive the most of the explanation power of multi-factor regression, even though the overall explanation power has increased from 55 % to 66 % (tables 1 and 2). This result shows that market, dividend, and value factors have a stronger influence on high yield bonds' three-month-returns than one-month-returns. When we move from quarterly returns to semiannual returns, table 2 shows that there are now changes in the main drivers of the explanation power. The R-square of multi-factor regression is again higher for semiannual than quarterly returns but now the dividend factor as a main driver is replaced with volatility and quality factors. For semiannual returns, market, value, volatility, and quality factors drive most of the explanation power, 72 % out of 73 %.

Interestingly, the explanation power of explanatory variables does not increase more than one percentage point when we move from semiannual to annual returns, as can be seen from table 1. The perceptible change, however, is related to the main drivers of the explanation power. Table 2 shows that, while market, volatility, and quality factors still hold their positions, value factor is replaced with size factor as one with the top four highest t-value. Size factor along with these other three factors explain 71 % out of 74 % of annual high yield bond returns (table 2). Regression results in semiannual and annual return periods generate a question whether equity risk factors explain at most 70 % of the bond returns despite the investment horizon. If this is the case, then the remaining 30 % would be explained by bond specific risk factors or the expected yield of the bond.

We see from Table 1 that all the explanatory variables except momentum retain the statistical significance of their coefficients at 0.1 % significant level from monthly to annual returns. This is the case also for the explanatory variables in table 2 which shows us that all the variables have statistically significant coefficients at 0.1 % level. The notable consideration, however, is related to the sign of these coefficients. As we can see from table 2, market, value, quality, and size factors have positive coefficient signs whereas dividend and volatility factors have negative ones. This result indicates that the first four factors are possible company specific risk factors with direct effect on expected equity, while the dividend and volatility factors are possible stock specific factors with effect on expected cash outflows from the company to shareholders.

Table 2. Results of multi-factor regression model with top 3-4 regressors measured in t-values from table 1

	Returns			
Regressor	1m	3m	6m	1y
Intercept	0.01***	0.01***	0.03***	0.03***
	(15.42)	(22.31)	(26.70)	(19.22)
Market	0.27***	0.38***	0.40***	0.48***
	(26.50)	(32.88)	(32.66)	(42.16)
Volatility	-	-	-0.62***	-0.44***
			(-19.22)	(-12.27)
Quality	-	-	0.42***	0.51***
			(9.56)	(12.89)
Value	1.00***	0.99***	1.27***	-
	(18.41)	(16.59)	(20.78)	
Momentum	-	-	-	-
Dividend	-0.51***	-0.50***	-	-
	(-20.07)	(-19.20)		
Size	-	-	-	0.54***
				(28.32)
R²	0.53	0.65	0.72	0.71
F-statistics	1317	2155	2207	1993
N	163	54	27	14

N = # of return observations per index, t-values are presented in parenthesis.
**** = 0.1 % significant level, ** = 5 % significant level, * = 10 % significant level*
Regressors for each return period is selected by the t-values from Table 1. For 1 to 3 months, there are top 3 regressors, and for 6 months to 1 year, there are top 4 regressors.

Table 2 shows that the coefficients of market, dividend, volatility, quality, and size factors are close to 0.5 whereas the coefficient of value factor is close to one. High yield bond returns hence shift equally with value factor returns but only partly with other risk factor returns. Additionally, size factor occurs in Table 2 only once (column 1y) and momentum factor not at all. This means that momentum factor has no high explanation power on high yield bond returns at any return horizon.

Table 3. Correlations between returns of high yield bond index and risk factors

	Returns			
Risk Factor	1m	3m	6m	1y
Market	0.68	0.78	0.82	0.78
Value	0.40	0.42	0.62	0.69
Dividend	-0.40	-0.50	-0.52	-0.34
Volatility	-0.47	-0.60	-0.71	-0.69
Quality	-0.45	-0.52	-0.62	-0.59
Size	0.50	0.53	0.52	0.52

Table 3 shows the correlations between returns of the high yield bond index and risk factors. As we can see, market, value, and size factors have positive and dividend, volatility, and quality factors have negative correlations with high yield bonds. Interestingly, the correlation between size factor and high yield bonds remains unchanged while correlations of other risk factors increase as investment horizon lengthens from one to six months. However, the most important observation about the correlations is that even though positive coefficients of the quality factor in tables 1 and 2 indicate that the factor would be a company specific risk factor, negative correlation in table 3 classifies the factor to the same group with two possible stock specific risk factors – dividend and volatility factors.

4. COMMENTS

Before going closer to the comments from the results in tables 1, 2 and 3, I want to highlight the fact that part of the bonds in high yield bond market index is issued by unlisted companies. The percentage of unlisted companies has however decreased from 60 % of 1277 bonds at the beginning of January 2002 to 40 % of 2227 bonds at the end of September 2015, according to Bloomberg.[5] Thus, it is possible that the influence of market factor on the high yield bond index increases from 2002 to 2015 because the percentage of public listed companies in the index increases as well. However, this may not be the reason why the market factor has an explanation power relative to the high yield bond index in monthly, quarterly, semiannual, and annual return horizons.

The reason for market factor's explanation power on bond returns may result from the relationship between the gross domestic product of US and the market factor. As Lappalainen (2016) shows, three-month changes in the GDP explain completely three-month changes in market factor. Equity markets (or market factor) would hence be at least semi-efficient and corresponds to the fundamental value of real economy in a mid-run. Every company regardless of their form of business has an influence on real economy, which means that they also have an influence on equity markets with a short-term lag. In that case, changes of the market

[5] Because unlisted companies have not obligation to report their equity level to public and their amount in the high yield bond index is notable, I cannot study the explanation power of risk factors directly to the equity levels of the companies in the index. Therefore, I use only daily prices of the index in the regressions.

factor correspond to changes in equity levels of both listed and unlisted companies in a semi-long return horizon in US markets.

The characteristics of value companies may tell us why the value factor has an explanation power on high yield bond returns. Fama and French (1995) show that companies with low market to book price of equity (P/B) have lower profits than companies with higher P/B ratio. Also, Daniel and Titman (1997) find that the return of the value factor is rather due to the similar characteristics of value companies which become distressed simultaneously than due to unique "distress factor". This profitability or distress risk may hence be the reason why the value factor also explains bond returns. If equity markets are indeed at least semi-efficient, the market value of the company's equity corresponds to the expected level of the equity in a long-run. As the distress risk increases or the profitability of the company decreases from the previous level, the expected equity level decreases as well. This leads to the decrease in the market valuation of the equity and eventually to a low P/B ratio because the future equity level does not yet show in the current equity level. Now, the only situation when the market valuation increases from its current level in a long-run is when the expected profitability (or equity level) of the company increase and, hence, the distress risk decreases. Positive return of the value factor would then be due to the upswing of the expected profitability of the underlying companies. Increased profitability increases also the equity-to-bond ratio of the company and, thus, shows as positive returns on high yield bonds.

Lettau and Ludvigson (2001) and Arshanapalli, D'Ouville and Nelson (2004) also support this reasoning by finding that value factor is sensitive to the news and probabilities concerning bad economic states in the future. Because less profitable companies are at higher risk in bad economic times, the increase in probabilities of these times decline the returns of both the value factor and high yield bonds. In this case, the link between the value factor and high yield bonds would be related to a weak profitability and, hence, to the distress risk. The company with low profits may even be classified as value company in equity markets and as high yield company in bond markets. This, however, requires more research.

Market and value factors explain the expected equity level of the company possibly via the GDP and the distress risk from monthly to (semi)annual investment periods. But why is that the size factor replaces the value factor in annual returns as the top 4 driver of the bond index? Fama and French (1995) may give us some hint about the matter: they find that also small-sized companies have low profitability when compared to big-sized companies. Additionally, Loughran (1997) finds that the value factor has a stronger influence on small than big companies. So, even though it is not clear whether the value factor influences to the annual bond returns through the size factor or not, it is clear that these factors are more or less linked together.

The quality factor is possibly one of the most complicated factor to draw conclusions from. This is because there is a number of methods to determine the quality of the company. For the quality factor index I use in this study, MSCI determines the quality via three fundamental business variables: return-on-equity, debt-to-equity, and earnings variability. It is clear that all of these variables affect to the expected equity level of a company, which may be the reason why the quality factor is a possible company specific risk factor. At the same time, however, the quality factor may be also an asset specific risk factor. Asness, Frazzini, Israel, and Moskowitz (2014) find that the quality factor is negatively correlated with market, value, and size factors and has similar characteristics as volatility factor. Similarly, as I find, the quality factor is negatively correlated with high yield bonds, which indicates that the factor is also a possible stock specific risk factor. The important question is thereby whether the quality factor is an independent true risk factor or only a sum of other true risk factors.

Results of this study indicate that dividend and volatility factors are stock specific risk factors which are unfavorable for bondholders. Dividend factor which equals to a dividend payment policy of a company naturally has an influence on expected dividends and, hence, on stock returns. This influence, however, remains only during a short investment period from one to three months. As opposed to dividend factor, volatility factor may not have as straight forward effect on expected dividends. Because volatility factor is determined by the volatility of stock price which equals to the volatility of the expected equity level, volatility factor illustrates the stability of the company's equity in time. The more stable is the expected equity level of a company, the more the company may be ready to pay dividends to shareholders. This would be because the company would not find it to jeopardize their profitability when they pay (higher) dividends. This reasoning is also supported by the research results of Jordan and Riley (2013) who find that idiosyncratic volatility of a stock is the main driver of the volatility factor. Overall volatility of the markets has not as much influence on the expected cash outflows to shareholders as the company specific volatility of the equity. In summary, stable expected equity level of a company ensures higher expected cash outflow to shareholders in a long-run.

This paper highlights the theory that risk factors can be categorized to company and asset specific risk factors. Both company and asset specific factors have different influence on the investment returns from the company as the first group affects to changes in the equity value of the company and the second to cash outflows to asset holders. To clarify the truthfulness of this theory, we yet need more research in the future.

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