Factors about the Corporate Bond Return

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Abstract. Recently, there are more and more literatures on the return factors of corporate bonds. We would like to provide a review of the latest factors affecting corporate bond returns. First, we summarized the classic models for studying corporate bond returns, such as CAPM Model, Merton Model and Fama-French Model. In this paper, the factors that affect the return of corporate bonds can be classified into micro and macro factors, and we collate the literature we have collected from these two perspectives.

Keywords: Corporate bond returns; Pricing factors; Economic model.

1. Introduction

According to Global Debt Report 2024, We can see what is happening in the bond market. First, since the global financial crisis in year 2008, sovereign and corporate bond markets have grown markedly, with total global sovereign and corporate bond debt reaching almost $100tn by the end of 2023, roughly equivalent to global GDP. Second, there was a significant increase in corporate bond issuance by nonfinancial companies, raising total corporate debt from $21 trillion to $34 trillion. There has also been rapid growth in the segment of the market for sustainable bonds, with $2 trillion in corporate sustainable bonds outstanding in 2023. The rapid expansion of the bond market is already a reality.

As the global bond market expands, the bond market has emerged as a critical component of financial systems worldwide. Bonds offer a more predictable stream of income compared to stocks, making them a vital tool for portfolio diversification and risk management. However, despite their importance, the research community has historically devoted less attention to bonds than to equities.

Studying bond returns is essential not only for individual investors seeking stable income but also for institutional investors, governments, and corporations that rely on the bond markets for financing and investment management. The predictability of bond returns, especially in an era of economic uncertainty, provides a haven for capital. Additionally, understanding the factors that affect bond returns can help in forecasting economic trends, as bonds are sensitive to changes in the economic environment and monetary policy.

Moreover, with the rising impact of global issues such as climate change and geopolitical tensions, the bond market is also evolving. Green bonds and sustainability-linked bonds are becoming more prevalent, indicating a shift in how economic growth and investment are perceived. Researching these new types of bonds and their performance characteristics is not only crucial for investors but also for policymakers and regulators who aim to foster sustainable economic practices.

In this context, this paper systematically combs the analysis model and elaborates the factors that affect bond returns from macro and micro aspects in detail.

In the paper, in the first section we state four important models used in bond return research, CAPM. Fama-French 3-factors, Fama-French 5-factor, and Merton model. In the second section, we state the factors that affect bond returns from both macro and micro dimensions based on literature material. For example, in the macro dimension, there are volatility, long-term reversal liquidity and so on. In the micro dimension, we point out some factors, such as inflation risk and financial crisis. And in the last part, we'll make a simple conclusion. The general content of this review is summarized, and the feasible study direction on the factors which affect the return of corporate bonds in the future is proposed.
2. Analysis model

In the history of the study of bond returns, there are many models. In this section, representative models are presented.

2.1 CAPM:

The footstone of the literature which is related to identify these some common factors in expected return is the Capital Assets Pricing Model. First of all, we will briefly introduce the origin of CAPM. Before CAPM was proposed, there was no clear understanding of how risk affected a company’s cost of capital, and then how it affected earnings. In 1961, a paper called Market Value, Time, and Risk was the earliest prototype of the CAPM (Treynor, 1961). Then William Sharpe published his own CAPM in 1964 based on Treynor's article and his own research.

\[ R = R_f + \beta (R_m - R_f) \]

The empirical failure of the CAPM has been widely confirmed and spawned a lot of literatures on additional assets pricing factors that explain the cross-sectional of anticipated return. For example, assessing factor models remains difficult even in the single asset, because of a variety of problems such as uncertain models and bad identification of models (Dickson et al., 2023). In addition to this study, there are also many studies that point out other problems of CAPM model.

However, there is no doubt that the CAPM model is of reference significance because it gives researchers who study bond pricing and bond return factors a general research method and research direction.

2.2 Merton Model: (1974):

The Merton Model could be used to explain expected returns of corporate bond. Merton model is a credit risk assessment model published by Robert C. Merton in 1974 to analyze and quantify the risk of corporate default. The formula is as follows:

\[
\begin{align*}
E(V) = & V N(d_1) - D e^{-rT} N(d_2) \\
Default\ Probability = & N(-d_2) \\
d_1 = & \frac{\log \left( \frac{V}{D} \right) + (r + \frac{\sigma_V^2}{2})T}{\sigma_V \sqrt{T}} \\
d_2 = & d_1 - \sigma_V \sqrt{T}
\end{align*}
\]

\( V \) is the current market value of the assets, and \( D \) is the total debt of the firm, which is also the default point. \( r \) is the risk-free interest rate. \( \sigma_V \) is the volatility of the firm's assets' value. \( T \) is the time to debt maturity and \( N \) is the cumulative distribution function of the standard normal distribution.

This model is based on option pricing theory, especially the Black Scholes model, which treats corporate equity as a call option, while corporate debt can be understood as a put option. The central assumption of Merton's model is that the asset value of the firm follows a geometric Brownian motion and that the market is fully efficient, that is, all information is already reflected in the asset price. In this model, if the value of the firm's assets at maturity is lower than the debts value, the firm defaults because it cannot repay its debt. In this case, shareholders will choose not to repay the debt, resulting in creditors gaining control of the company's assets and shareholders losing ownership of the company.

2.3 Fama French 3-Factors Model (1993):

As we all know, compared with CAPM, Fama-French pricing model is more convincing in bond and stock pricing markets. it introduced the following equation for the corporate bond returns:

\[ E(r_i) - r_f = \alpha_i + \beta_{i,1}(E(r_m) - r_f) + \beta_{i,2}E(SMB) + \beta_{i,3}E(HML) + \epsilon_i \]
The SMB is the firm size premium factor and the HML is the value premium factor. From the Fama French model, the publicly traded companies with small market caps (SMB) produce higher returns than the bigger market cap company and the company with high book-to-market ratios (HML) that generate higher returns in comparison to the market. If these factors are the only influencers in the market, the excess return of any stock should be completely explained by the risk premium on these 3 factors, thus the $\alpha$ should be 0. If the alpha is positive, it indicates that there are other factors that will affect the excess bond returns which are not included in this model (Fama and French, 1993).

The proposed model has a profound impact on the study of asset returns, which provides a more complex and comprehensive method to evaluate and explain asset returns.

2.4 Fama French 5-Factors Model (2015):

The Fama-French 5 factors model was proposed by Fama and French (2015). The new model adds 2 additional factor to improve the Fama and French 3 factors model which came up in 1993. The five-factor model has a stronger explanatory power for the factors affecting bond returns than the original one and the new one can explain the phenomena that the three-factor factors cannot explain. The original model is specified as follows:

$$E(r_i) - r_f = \alpha_i + \beta_1[E(r_M) - r_f] + \beta_2 E(SMB) + \beta_3 E(HML) + \beta_4 E(RMW) + \beta_5 E(CMA) + \epsilon_i$$

Where the $r_i$ is the return on bonds, the $r_f$ is the risk-free rate, $r_M$ is the market return, as the development of 3-factors Fama-French model, the RMW (Robust minus weak) is the spread of return between profitable and unprofitable companies, and CMA (Conservative Minus Aggressive) is the spread between companies which invest conservatively versus companies that invest aggressively. (Fama and French, 2015).

3. Micro Pricing factors

This section will explain the micro-level pricing factors that affect the return of corporate bonds. Including profitability, default risk, volatility risk, reversal, momentum, liquidity risk, downside risk, ESG involvement, analyst factor and ETF ownership.

3.1 Profitability:

In the bond market, it exists profitability premium. Initially, The spread of return between profitable and unprofitable companies is presented by Fama-French 5-factor model. In this model, if we control other factors unchanged and only consider profitability, companies with higher profitability may have better solvency, thus reducing the default risk of companies and resulting in lower returns on their bonds (Fama and French, 2015). A similar point is made in another research, it documents that corporate bonds issued by less profitable firms have a better performance than the bonds issued by companies who has high profitability, and this profitability premium is in line with compensation for default risk (Campbell et al., 2016).

3.2 Default risk:

Default risk is undoubtedly one of the important factors affecting the return of corporate bonds. The effect of bond default events on daily bond yields following rigid payment defaults is examined by Wang et al. (2024). There is an obvious increase in abnormal returns of corporate bonds after corporate bond default. It is important to note that this impact changes between different credit quality and the different type of bonds. Companies with lower credit quality or that are not listed are more affected by default events.

3.3 Volatility risk:

According to Chung et al. (2019), the bonds with high aggregate volatility have a low average return. In addition, with a high idiosyncratic volatility (The idiosyncratic volatility refers to the unique
volatility of a particular asset or stock relative to the overall market. Specific volatility which cannot be explained by the overall volatility of the market is the part of the volatility of asset returns), the bond has high expected returns.

Similarly, another paper investigated a relation between pricing of jump (The jump risk is a sudden and non-continuous large move in the price of an asset because of an unexpected event or new information) and volatility risk in the corporate bonds pricing, and they demonstrate that bonds with higher volatility betas have lower expected returns. The jump and volatility effects are prominent and increase as rating decreases. The impacts of volatility risk are stronger during the financial crisis and the jump risk is more significant in periods of stress (Chen et al., 2022).

3.4 Reversal:

Bali et al. (2021), present that corporate bonds that have underperformed in the last 3-5 years will have higher returns in the next 3-5 years. And the long-term reversals are stronger in bonds of the insurance companies under greater constraints.

Ivashchenko (2023) demonstrated empirically that in informed trading, the part of reversal targeting larger volume days could be increased because of information asymmetry. On the contrary, there is no such impact in uninformed trading.

Also, here is another article from Zhang and Wang (2021) that mentions reversal. They document a remarkable price reversal in Chinese corporate bonds on basis of the data from 2008-2018. According to their research, corporate bonds with lower recent returns have outperformed those with higher recent returns in the past few months. The reversal profits are most pronounced when the formation period reaches 9 months, and this effect vanishes when the formation period extends to 12 months.

3.5 Momentum:

The momentum refers to the continuous movement of asset prices in a certain direction. Ho and Wang (2018) use an action detection method to capture price reversals in the momentum cycle. They verified the method through presenting remarkable changes in the refined American momentum portfolios, due to the lack of the momentum effect in investment-grade (IG), and they propose an overre. They found that a winner (loser) in the past in the momentum portfolios with a lower (higher) QR (quantile risk) index is likely to produce higher (lower) future returns and the QR-momentum strategy could create remarkable abnormal returns. Based on the findings of Hong and Stein (1999), they introduced a QR index to identify the possible changing points for bonds in the later phases of the momentum cycle, at this moment the prices of bonds are too high compared with intrinsic values.

3.6 Liquidity risks:

Considering this factor, Lin et al. (2011), incorporate the Fama-French three factors in the pricing model of corporate bond:

\[ r_{it} - r_{ft} = \alpha_t + \beta_{IMKT} Mkt_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{DEF} DEF_t + \beta_{TERM} TERM_t + \beta_{ILL} ILL_t + \varepsilon_{it} \]

They use long-span data sets to present the role of liquidity risk in the pricing model of corporate bond. They found that liquidity risk has an impact on pricing corporate bond. Also, according to another research in 2024, the corporate bond carries an extreme illiquidity (ELL) premium. This premium permeates all rating categories and intensifies in times of financial crisis and high uncertainty (Chen et al., 2019).

In another paper, Acharya et al. (2013), offer another method to illustrate the relationship between liquidity risk and corporate bond returns (conditional approach). They presented that pricing of liquidity risk in bonds is conditional depending on the economic state—the liquidity becoming more important in the time of recession. The impact of liquidity shocks on assets prices depends on the conditions, becoming especially stronger in depressed economic times. They also analyzed the impact
of conditional liquidity risk on corporate bonds, which illustrate that in the periods of financial and economic stress, liquidity becomes a more important determinant of bonds pricing model compared to normal times.

On the contrary, there are some papers demonstrating the effect of illiquidity premiums in corporate bond markets. Li et al. (2022), examined the impact of illiquidity levels on pricing of corporate bonds with an international dataset including developed and emerging economies. With their results, the corporate bonds with less liquidity have wider bid-ask spreads and display higher expected returns and global credit spread. However, illiquidity premiums remain noteworthy exclusively in emerging markets after controlling the common risk factors. In the emerging economies, making an investment in corporate bonds which have less liquidity can generate considerable abnormal returns before and after considering transaction costs.

And Wang (2023) makes similar points in his research. He examines the impact of the liquidity of corporate bonds for listed companies in China on credit spreads. He selects monthly trading data of listed companies in the Chinese market. He finds that the more liquid the bonds of listed companies are, the less risk compensation investors demand, that is, the smaller the credit spread required. Therefore, according to this study, corporate bonds held by listed companies with better liquidity in the Chinese market will have lower excess returns when other factors remain consistent.

3.7 Downside risks:

To assess the effect of downside risk on bond prices, Huang et al. (2023) created a measure for asset downside risk called the downside variance premium, defined as the difference between risk-neutral equity downside variance and physical downside variance. Their findings indicate a strong positive correlation between the downside variance premium and future returns of corporate bonds. However, they did not find a clear relationship between the individual variance risk premium (the differences between physical expected variances) and future corporate bond returns. Additionally, the predictive power of the downside variance premium is more pronounced in non-investment-grade (speculative grade) corporate bonds compared to investment-grade (IG) bonds and is stronger for long maturity corporate bonds than for short maturity bonds.

3.8 ESG involvement:

With the definition of sustainable development gradually rooted in people's hearts, ESG factors have a bigger influence on corporate bond return. Taking a sample of bonds issued by publicly traded firms in Chinese market from 2009 to 2020, there is a significantly negative relation between ESG rating score of companies and corporate bond return (Jiang et al., 2023). In another article, a similar view is mentioned, according to Lian et al. (2023), the bond credit spreads are lower for listed companies with better performance in environmental, social, and governmental domain. Because the good performance in ESG decreases the financial risk of corporate bond, reinforce corporate transparency, and lower debt agency costs.

For Liu and Lin (2023), with the transaction data for corporate bonds in Chinese market, they use the method of textual analysis of newspapers and covariance estimates of bond returns to build a climate change news index, and they figure out that corporate bonds with a higher climate change news beta also have lower future returns. Besides, the tiny climate change news beta premium is more significant in the tensive period of climate change news.

In the context of global warming and other environmental problems, carbon risk is playing an increasingly important role in ESG factors in recent years. Duan et al. (2021) finds a new factor cannot be illustrated by a systematic list of bond characteristics and exposure to known factors. And they draw an opposite conclusion to the "carbon risk premium", with bonds of less carbon-intensive firms earning higher returns. The underreaction of investors to predictability of environmental issues for the company's cash flow news, credit and environmental issue could be an important reason for this conclusion.
3.9 Analyst factor:

Some studies suggest that analysts' views and expectations influence corporate bond returns. In the Chinese market, Li and Zhang (2022) developed a data regression model and discovered that both research report attention and analyst attention significantly affect the credit spread. This implies that, all else being equal, corporate bonds that receive more favorable expectations from analysts and research reports tend to have lower returns. To some extent, analysts have effectively monitored the default risk of listed companies.

3.10 ETF ownership:

According to Rhodes and Mason (2023), the ETF ownership could undermine bond price informativeness of bond prices by altering the flow of firm-specific information to bonds. With the earnings announcement, they find that bonds with lower ETF holdings respond more to earnings news, but bonds that has the high level of ETF do not. Moreover, there is a positive relationship between investment-grade bond returns and ETF ownership.

4. Macro Factors

This section explains the factors affecting corporate bond returns at the macro level. Includes equity markets factor, inflation volatility risk, financial crisis and economic policy uncertainty.

4.1 Equity markets factors:

Equity markets factor could be an influencer of corporate bond returns. Equity markets factors used to explain corporate bond returns include the MKT, SMB, HML mentioned in the Fama-French model. With the findings of Lee et al. (2020), short-term equity returns are negatively related to subsequent returns for corporate bond in cross-sectional regressions.

There is another equation from Lin et al. (2011), can be used to explain the equity markets factors. There is a related equation to measure the impact of equity market factors on corporate bond returns, the equation follows:

\[ Z_t = \beta_{\text{LIQ}_{eqy}} + \beta_{\text{MKT}_{eqy}} + \beta_{\text{SMB}_{eqy}} + \beta_{\text{HML}_{eqy}} + \beta_{\text{LIQ}_{eqy}} \]

Where the LIQ_{eqy} denotes the Pástor–Stambaugh liquidity factor and they find the only \( \beta \) gets the statistical significance in various regressions.

4.2 Economic policy uncertainty:

Economic policy uncertainty can have an impact on corporate bond returns. Fiscal policy is a big part of economic policy. Tavares and Valkanov (2001) analyze how the taxes and government spending affect the corporate bonds return. They conclude that there is a negative causal relationship between tax stock and expected corporate bond returns, this effect is statistically significant. The government spending shocks impact corporate bonds return positively, but the impact is significant only in the short horizon for corporate bonds. There are also studies showing that monetary policy could have an impact on corporate bond returns. According to Guo et al. (2021), they got a significantly negative response of corporate bond return to policy shocks, the effect is strong in low-grading bonds. And the future interest rates play a big role in the negative response.

4.3 Inflation volatility risks:

Ceballos (2021) examined the influencing power of inflation volatility risk in corporate bond return. He demonstrated a significant negative volatility risk premium between high and low-inflation beta portfolios after adjusting for common risk factors in the corporate bond markets. This finding
holds true when utilizing bivariate portfolios and cross-sectional regressions, and when incorporating other relevant volatility factors.

4.4 Financial Crisis:

Aboody et al. (2014) examined effects of government actions and related policies on the corporate bonds. They separate bonds to 2 categories—IG bonds and speculative grade (non-investment grade) bonds. During financial crisis, the relationship between bond yields and discount rates changed from negative to positive for both speculative and investment bonds. This reversal is consistent with the Federal Reserve lowering interest rates during the economic recession as well as the times of crisis because bond returns and earnings declined together.

5. Conclusion

This review is about the determinants of corporate bond returns, and first state some classical models that can be used to estimate bond returns. We divide the factors mentioned in the literature into micro and macro. At the micro level, the factors include volatility risks and liquidity risks; At the macro level, the influencing factors include equity markets factors, downside risks, ESG factors, inflation volatility risks, financial crisis, Long-term reversal, Momentum and ETF ownership.

But so far, there is no complete model that can be used to accurately estimate the return of corporate bonds, and there is no conclusion on the factors affecting the return of corporate bonds. In the context of the third technological revolution, a variety of new factors affecting bond returns will spring up. For example, new influences such as the digital transformation of companies and the application of AI. Existing literature and research do not cover these emerging factors, so existing models and factors that affect returns are not sufficiently explanatory to new situations. Therefore, in the future, it will be an important research direction to prove whether emerging factors (such as the application of AI in a company or the degree of digitization of a company) can significantly affect corporate bond returns.

References


