Pricing Strategies of Coupon Bonds in Condition of COVID-19

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ABSTRACT

This article is about how COVID-19 has affected the pricing of bonds and how is the YTM of a bondable impacts the bond when it is issued into the open market. Furthermore, this paper discussed the liquidity impact in terms of how old bonds behave compare of how old bonds behave compared to newly issued bonds and the correlations between the bond and the uncertainties within the market in multiple aspects. Additionally, the idea of credit risk to bonds and how it can have a significant impact on the pricing of industrial bonds. Subsequently, the expansion of credit risks in the fast growth of China's bond market. Last but not least, our essay introduced the possible flaws within the bond model itself, and the massive impact it may have resulted in this particular period as the bonds are more likely to be called during this pandemic. Finally, it introduced a brief idea of the possibility of calling a callable bond in advance and the consequential impact which will result in the final return.

Keywords *: COVID-19, bond market, pricing*

1. INTRODUCTION

The bonds are able to be regarded as the debts from the issuers which have four main categories in the market-corporations, municipalities, government, and agency. Generally, companies are going to use bonds while facing the need for cash to finance the loan, the coupon is the interest that the issuers ought to pay to investors who purchased the bonds. Additionally, the price of every bond is usually $1000 which is the face value of the bond, and the premium shows the price of bonds will be higher than the face value and discount means the bond price will be lower than $1000 when the bonds enter into the open market with free barriers to enter or exit in general. As for the volatility, bonds are more stable than stocks or equities so that most of the old would like to invest in bonds instead of stocks, the level of sensitivity that the bonds respond to the changes of interest rates is reflected by the duration of the bond, to be more specific, the prices of bonds will decrease with the increase of interest rate-inverse relationship.

We review lots of literature for bond pricing. Huang and Zhong [1] conducted a study on convertible bond pricing based on credit risk. The main idea of this article is that the estimated price of a convertible bond is different from the actual price because of credit risk and the three steps of the development of the convertible pricing model are single-factor two-factor model, and credit risk model. This article is well organized and based on the paper "Empirical Test of Convertible Bond Pricing Model under Stochastic Interest Rate", the author also mentioned the limitations of the new bond pricing model with the credit risk at the end of the essay. Also, Gong, Zhao, and Si [2] researched the finite element method of convertible bond pricing. The main idea of this paper is to establish the new bond pricing model under the consideration of the influence of redemption, back selling, and early conversion on bond pricing including the limitations of the model, the solution scheme and numerical simulation compared by the theoretical values and market values. In addition, Zheng, and Chen [3] studied the model of convertible bond pricing. The structure of this article is clear, focusing on the analysis of the contents of convertible bonds and mentioned the Rate-price portfolio model that affects the issuance of bonds. Also, the author derived a two-factor pricing model of convertible bonds by the risk-free arbitrage principle including the special Black-Scholes model. In the paper written by Zhang and

Tao [4], the application in convertible bond pricing of the Black-Scholes model has been mentioned. What is more, the paper from Liu [5] analyzed both domestic and foreign derivative financial products. The trigger structured interest rate bond is a very important type of structured product developed greatly in China. Additionally, the paper written by Wu and Hu [6] analyzed the difference between convertible bonds and ordinary corporate bonds and the pricing methods that need to consider both bonds and stocks.

This paper is to analyze the liquidity and risk of bond pricing and discuss the relevant development trend of bond pricing, and it is divided into five parts-introduction, main body, discussion, conclusion. The introduction mentioned the basic theories and reviewed three articles to witness the research on bond pricing. In the part of the main body, it analyzed three macro factors which will affect the bond pricing and derived a formula. In discussion, it showed a case study based on COVID-19 and the conclusion summarizes the main body and discussion. The section of evaluation discussed the imperfect part of the paper and how it can be improved.

2. MAIN BODY

Bonds are debt certificates issued to investors when governments, financial institutions, and companies raise funds, promising to pay interest at a certain interest rate and repay the principal on agreed terms. Debt certificates (bonds) are liquid, and bondholders can transfer bonds according to their needs and actual market conditions in order to recover the principal and realize investment income in advance. As a result, a market for trading bonds was derived, and a mathematical model for bond valuation, namely pricing, was born.

$$PV = \sum_{t=1}^{T} \frac{CR*FV}{(1+YTM)^t} + \frac{FV}{(1+YTM)^T} \quad (1)$$

Future value FV; Present value PV; Yield to maturity YTM; Coupon rate CR; Time T

The coupon part is a geometric sequence, and after summing, it is simplified as follows:

$$PV = \frac{CR*FV}{(1+YTM)^t} * \left(1 - \frac{1}{(1+YTM)^T}\right) + \frac{FV}{(1+YTM)^T} \quad (2)$$

This model explains the discounted value corresponding to the sum of the interest and principal of each period of the investor holding the bond, which is the price of the bond in the market.

This study will optimize the mathematical model of bond pricing from two perspectives and summarize the papers related to the impact of bond liquidity and credit risk-related literature.

2.1. Liquidity impact

The premise of market pricing is that bonds have a trading market, that is, they have a certain degree of liquidity. The premise of market pricing is that bonds do have a trading market which means they have certain liquidity. Even with the same other characteristics, bonds issued by the same bond issuer will generate relative premiums or discounts due to differences in liquidity. For example, newly issued national bonds have better liquidity than old national bonds, so the price is higher. The concept of liquidity risk proposed by Acharya and Pedersen [7] refers to the risk of changes in asset transactions and prices due to the impact of uncertain liquidity in the market. Liquidity risk can be caused by the uncertainty of excess or insufficient liquidity, which will affect the speed of asset transactions and affect asset prices. In the short term, market liquidity risk changes the current Yield of bonds, which affects investors' short-term bond transaction prices and transaction costs. In the long term, market liquidity risk changes the yield-to-maturity of bonds, which affects the cost of corporate bond issuance and funding liquidity.

Wang and Wen [8] analyzed the impact of liquidity risk on bond pricing, especially on the immediate yield and yield to maturity of corporate bonds and enterprise bonds. The liquidity risk of the bond market is significant for both corporate bonds and enterprise bonds, and the impact of liquidity risk on enterprise bonds is greater than that of corporate bonds. And there is significant cross-market liquidity risk spillover in the bond market. The impact of cross-market liquidity risk on enterprise bonds is greater than corporate bonds. The bond market liquidity risk and cross-market liquidity risk have a greater impact on corporate bonds than corporate bonds, indicating that corporate bonds are more capable of digesting unexpected bond market and fast market liquidity risks than enterprise bonds, which indirectly explains the corporate bond market Information validity is better than enterprise debt. In addition, the spot yields of the two bonds are also affected by maturity risk and default risk, and the impact on corporate bonds is greater than corporate bonds, indicating that corporate bonds are more dependent on the macroeconomic environment than corporate bonds

2.2. Credit risk impact

Credit basic mainly analyzes the macro-environment, industry environment and its development status of the enterprise; credit risk mainly refers to the rating situation, once the rating is downgraded or negative outlook, bonds will be negatively affected. For example, the default of Chaori Bond (China's first bond default event) made investors begin to reassess investment in China's bond market. Before this, local governments

and banks in China had assisted companies in financial difficulties to meet their debt repayment obligations. Such rescue operations have caused some investors to ignore the basic credit risk of bonds. This default is likely to make investors reconsider the relationship between the risk and return of domestic bonds. This will make credit risk a more important factor in bond pricing. This ultimately results in bonds with high credit ratings that are generally more valuable than bonds with low credit ratings [9,10].

For industrial bonds in the bond market, if the influence of macro factors and liquidity are controlled, credit risk has significant explanatory power for the pricing of industrial bonds. At the same time, the impact of credit risk on industrial bond interest rates is more refined than the difference in bond credit ratings. In the long run, as the scale of China's bond market continues to expand, credit risks will continue to accumulate, and the influence of credit risk factors on the bond market will continue to increase. Therefore, research on credit risk has academic value and has certain practical significance [11].

3. DISCUSSION

These days, the impact comes from the COVID-19, and it has a more far-reaching impact globally. The COVID-19 has reduced global mobility, and monetary and fiscal policy can do little about it.

Major strategic achievements have been made in epidemic prevention and control in China, and the economy has maintained a steady recovery. The consumer sector has been slower to repair than the production sector, with some areas barely repaired, and a retaliatory rebound in consumption is unlikely to follow. While some offline activities can be replaced online, many industries ultimately rely on human contact. When there is less mobility, both within and between countries, less economic activity is associated with it. Perhaps the negative effects of the epidemic will not end until the mobility of the population is restored, and this is not a problem that economics can solve, but a medical breakthrough. As a result, even with powerful policy tools in place today, it is difficult to deliver the stimulus as quickly as before.

The questions to focus on are: Will cash flow be sufficient if the COVID-19 shuts down the economy for too long? Are there individual risk points that could lead to a chain reaction? It may be too early to talk of a sustained rebound in risky asset prices if the real economy is repaired before they stop falling. The decline in risk asset prices is not easy to end immediately, and the recovery of the real economy is likely to be slow, so the risk asset prices are still likely to be a market rebound, followed by another decline.

Some small and micro enterprises have withdrawn from the market due to the rupture of the capital chain and other reasons, thus weakening the overall supply. On the one hand, the epidemic has caused most enterprises to suspend production. Although enterprises began to resume work in an orderly way in April 2020, with the integration of the global economy, all countries have become an important link in the supply chain. By 2018, China had become the largest trading partner of more than 120 economies, especially in the automotive, electronics, chemicals, textiles, finance, and other industries. Problems in any one link can lead to a breakdown in the entire supply chain. Therefore, in this epidemic, the resumption of work of domestic enterprises is not enough to fully resume production, but also depends on the resumption of work of upstream and downstream enterprises. If upstream enterprises in foreign countries are unable to resume work, the resumption of the production capacity of downstream domestic enterprises can not be realized either. The foundation of finance is the real economy, so the financial market can be regarded as a microcosm of the whole economy. In the case, where the real economy's self-repair function does not restore, cash flow pressure will continue to crush financial markets. Due to the epidemic, international import and export control makes it impossible for goods to go out and materials to come in, which will also cause the rupture of the entire industrial chain.

Since the outbreak of the epidemic, many countries have implemented travel and entry controls, which directly affected the tourism and aviation industry in relevant regions, and then affected the contraction of related services such as catering, accommodation, shopping, transportation and finance. The weakest and most vulnerable groups in China are MSMEs, and MSMEs had suffered a lot from the COVID-19. So it can be concluded that the epidemics weaken economies.

4. CONCLUSION

With the support of the theories and formulae, there is an internal discussion session in an attempt to summarize the following conclusions. The coupon bond market has been affected drastically by the virus in many aspects.

There is only one basic and most reliable way to price bonds, that is, market pricing. Of course, market pricing is that bonds have a trading market (only the secondary market is discussed here). That is, they have a certain degree of liquidity. Even with the same other characteristics, bonds issued by the same bond issuer will generate relative premiums or discounts due to differences in liquidity. For example, newly issued national bonds have better liquidity than old national bonds, so the price is higher (the yield is lower), which is the liquidity premium. Liquidity premium refers to

the time and cost required to convert an investment asset into cash. Converting an asset into cash at a price close to the market price in a relatively short period means that the asset has higher liquidity. For example, the liquidity of government bonds is good, and the liquidity premium is meager; the bonds issued by small companies have poor liquidity, and the liquidity premium is relatively high. In terms of setting bonds, it has been found that businesses are likely to set the prices of their bonds at a par value(when the coupon rate is equal to YTM) , it is a common idea that no investors would spend over the product's face value they prefer spending less or equal to the products par value, in this case, if the business sets its YTM above the market rate of interest, consequently no investors would invest in their bonds.

Distinctive bonds are calculating in the security market, like the bonds issued by the federal government, bonds issued by corporations, bonds issued by local state, or foreign bonds issued by a foreign government. With different contractual features, some bonds have provisions that allow the issuers to pay off early, which leads investors to see them at different risks, prices, and expected returns. COVID-19 has globally suspended the rapid development of the financial market as investors have seen. Primary sectors are not able to reach and extract natural resources as supply is available for manufactures to produce final products. People isolating at home have no extra demand except daily necessities. For, tertiary sectors, a closing state is triggered. Service offering businesses stopped operating due to the low-demanding for daily essential products. Over such depression years, every business is suffering from low-level sales revenue and bearing the high fixed costs. What they face consequently is a big loss, so let alone paying coupons to bondholders. Therefore, countless corporations fell into bankruptcy. Therefore, with the effects of Covid, countries are required to come up with some feasible policies in order to fix this problem, they are trying to motivate purchasing within the country (expanding monetary policy) .

Calling bonds is a special case in this scenario, it is known that some small businesses went bankrupt during this critical time, however, some medium-sized businesses are recalling their bonds in advance in order to save their sales because they may have forecasted a big loss in the future cash flow. Therefore, this will result in the change of the expected rate of return which is the YTM of the bond in which case the calculated yield to return will exceed the expected return. Notice also the YTM of a bond changes whenever inflation rates in the economy change, which is almost daily. An investor who purchases the bond and holds the bond until it matures will receive the YTM that existed on the purchase date, but the bond that has been calculated in which yield to maturity changes on a daily basis between the purchase date and the maturity date. So this can be seen as one of the defects of this model that it is only working when (1) the probability of default is zero; (2) The bond cannot be called.

This research has found out that a company is more likely to call its bond if they are able to replace their current high coupon debt with cheaper financing. Broadly speaking, a bond is likely to be called if its price is above par because above par means that the going market interest rate is less than the coupon rate. In short, if current interest rates are well below an outstanding bond's coupon rate, a callable bond is likely to be called. Thus, COVID-19 has massively impacted businesses and subsequently, there have been many bonds recalled by many businesses and in this case, an unexpected loss for those investors who may have been anticipating a ten-year rate of return is now shortened which will result in fewer earnings.

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