



# Research Area

## Markets & Alternatives Research

**Arturo Schembri**  
President, Minerva IMS

**Gabriele Maggio**  
Head, Markets and Alternatives, Minerva IMS

**Tommaso Beverina**  
Analyst, Markets and Alternatives, Minerva IMS

**Martina Schipani**  
Analyst, Markets and Alternatives, Minerva IMS

**Daniele Tana**  
Analyst, Markets and Alternatives, Minerva IMS

**Marco Uggeri**  
Analyst, Markets and Alternatives, Minerva IMS

## Corporate Debt Timebomb: is the Market correctly pricing it?

### A quantitative pricing model on Corporate Debt Bonds

#### Summary

<b>I – A Brief Introduction to corporate debt</b>	2
Private and public markets	2
Credit securities: description and risks	2
<b>II – Debt market overview</b>	3
Size and trends	3
Quantity over quality	3
Debt and the economic crisis	4
<b>III – Debt and interest rates</b>	5
<b>IV – The model</b>	6
Analysis of results	8
<b>V - Conclusions</b>	10



# I – A Brief Introduction to Corporate debt

## Private and public markets

Corporate debt is one way a company can finance its operations. It comprehends bank loans, bond issuing and credit lines. Debt capital differs from equity capital because it is a senior claim on the firm's assets and does not include voting rights, making the subscriber a creditor and not an actual shareholder.

Corporate debt instruments trade both on the private and public markets. The former's participants are institutional investors that offer customized solutions such as credit lines and loans. In the private market agency costs are minimized since the lender has a profound knowledge of the books and it is often secured through debt covenants, a position in the board of directors or salable assets. The public debt market instead is populated with a wider spectrum of investors and has more compelling agency issues. On the other hand, the public debt market is more liquid and the variety of its instruments has increased in the last two decades. Securitization, for example, has allowed companies to have more flexible funding and investors to diversify their exposure to different factors.

## Credit securities: description and risks

Credit securities are valuable financial instruments both for companies and for investors. In case of bankruptcy and liquidation of a company, subscribers of uncovered securities do not have a guaranteed repayment, and even secured debt holders would still need to follow repayment orders and priorities, eventually losing part of capital. In addition, the bankruptcy process has direct and indirect costs that erode both the value of a firm's assets and debt holders' returns.

Credit owners bear the risk of interest rate fluctuations in the event they do not hold the security until maturity. Such an exposure to price changes is often hedged through Treasury bond futures or swaps. From an issuer point of view, bonds and more in general debt are part of the total liabilities, and, if not correctly managed, they can cause serious problems to the balance sheets and overwhelm the cash flows of the company. Moreover, as the former is a core risk of the debt market in general, a consistent number of defaulted companies and unrepaid bonds can cause important damages to investors' assets, eventually triggering a chain reaction of insolvency in the wider economy.

Despite the possible risks, the credit market offers also loans for very indebted companies with bad credit standing. These leveraged loans are usually sold in the markets through collateralized loan obligations (CLOs) or can simply be issued with very low rated bonds. This portion, called junk or high yield, represents nearly one third of the entire US market and includes all forms of debt rated below BBB-, offering the highest returns and risks.

## II – Debt market overview

### Size and trends

The corporate debt market size is at his all-time high: after a constant increase in its dimension, it has seen a steep acceleration in size in the years following the 2008 crisis, reaching \$15 trillion in 2018 for US non-financial companies. This is 50% more than the outstanding debt of ten years before, and this trend is still present, with corporate non-financial debt at 46% of US GDP, the highest it has ever been.

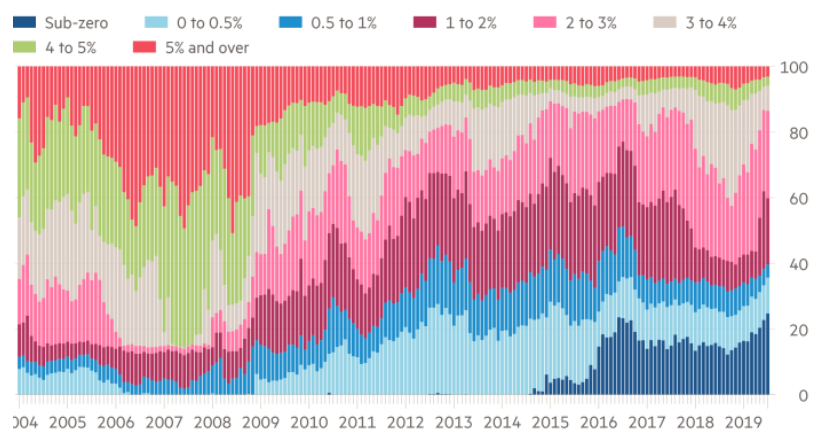
Also, globally, the debt market is breaking new records, with the highest weekly debt issuances of \$140 billion in the first week of September 2019, and a total of \$434 billion for the entire month.

This incredible increase in volume, both in US and globally, is driven by two factors: the recovery process from the 2008 recession and the monetary policies that central banks are taking since the crisis. After 2008, recession businesses needed capital to fund new investments and meet the increasing demand, and the economic expansion that came afterwards fueled further the growth of new companies and the recovery of the old ones. The growth in debt issuing squeezed spreads and, this has been a trend that, combined with extremely dovish monetary policies, has taken yields to new record lows. Central banks have drastically reduced interest rates since the crisis, eventually breaking the zero lower bound and offering free debt to banks, companies and countries, and started applying the quantitative easing strategy, growing their balance sheets and therefore causing a spike in money supply and an even stronger reduction of the yields. The central banks' behavior encouraged leveraged recapitalizations and the growth of stock buybacks, which in 2018 hit a record high in the U.S., reaching \$806.4 billion for the S&P 500 constituents. More than half of all buybacks of 2018 have been funded by debt, encouraged not only by the all-time low interest rates but also by a \$1,5 trillion tax cut passed by Trump in 2017. At the same time, companies in the U.S. are drastically reducing their cash balances and spending more than half of corporate profits (56%) to fund the rest of these buyback, according to a recent Bloomberg research, triggering new fears about future investments, reduction of capital expenditures, and rapidly growing debt.

### Quantity over quality

The effects of these circumstances are visible throughout the whole credit market: the combination of lowering spreads in all the rating segments and the all-time low interest rates caused an incredible reduction of yields and a spike in credit securities prices. Companies are taking advantage of the monetary policies and are continuing to borrow more capital, with incredible examples of high yield bonds issued for the first time ever with lower than 4% yield, as it happened with Restaurant Brands International (owner of Burger King).

Global bond market, by yield (% share)



Source: ICE Data Indices  
© FT



Despite the suboptimal situation, more capital continues to flow in credit rather than in equity, funding a market with over \$14 trillion of negative yield debt and triggering a progressive shift in investment preferences from investment grade bonds to high yield bonds in a search for sufficient returns. The growing demand has caused the acceptance of more risk, even though highly priced and low yielding, with bonds yielding more than 10% amounting to just 0.4% of the global fixed income universe.

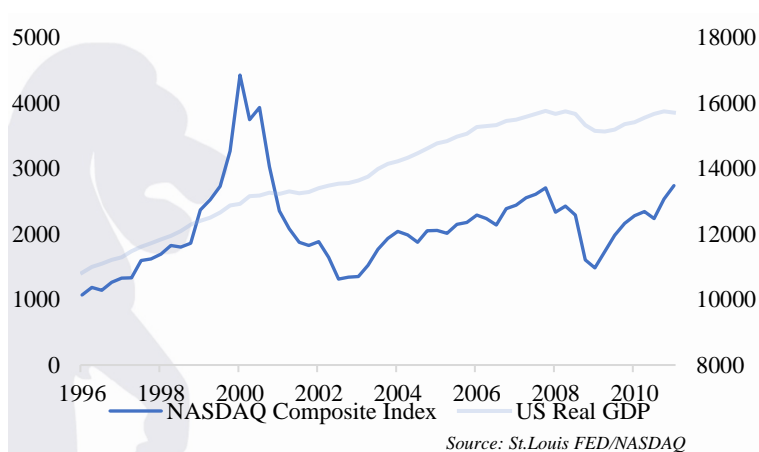
Current prices of corporate bonds have in fact been defined 'idiotic' by the hedge fund Lansdowne Partners, and Pimco as well warns about the danger of a mispriced debt, especially in the unfortunate event of a new recession.

The general quality of the debt of non-financial businesses according to Standard & Poor's is the lowest over the last three expansions: the share of investment grade bonds is now at 78.4% of the whole market, well below the 90.4% of the recovery period after the 2001 crisis.

### Debt and the economic crisis

Concerns about the crisis in the financial world is relatively recent: the 2001 Dotcom Bubble resulted in little real effects on US economy, consolidating the idea of resilient rational markets, capable of surviving financial turmoil with little damage. This belief was supported by data showing a small real GDP decrease opposed to a 77% fall on the NASDAQ index.

What was not taken into account after 2001 was the rapidly increasing complexity and interconnection of the financial sector that the shocking 2008 crisis uncovered. The notorious chain effect, that started through high CDO default rates and the Lehmann default, continued with a credit crunch and resulted in a fall in world's GDP and a long economic slowdown, highlighting the crucial role of debt in economic stability.



The trigger for a debt crisis is often a low cost of capital that lowers the banks' margins, forcing them to lend money to riskier borrowers, increase leverage and invest in assets that are more volatile in order to be profitable.

Low quality credit is a liability that can be made invisible in financial statements in a multitude of ways. In a hyper leveraged system, a small hit on default rates can spread financial tension and make it too expensive to re-finance the debt for net borrowers. Strong illiquidity leads to the disappearance of the inter-banking reserve market and the default of numerous weaker operators therefore creating uncertainty, inflation and recession. Tension signals appeared recently in the inter-banking reserve market during September, when US overnight repo rates exceeded 10%.

FED addressed the matter ascribing to it some technical issues like the proximity of US corporate taxes collection, an abnormal liquidity demand; however, an anomaly like that is concerning.



While quantitative easing helped avoid recession risks after 2011, it created the perfect environment for high liquidity through low rates, leading to an increase in overall corporate leverage that reached the alarming peak of 52% of the US GDP at the end of 2019, even higher than the pre-2008 crisis level of 44%.

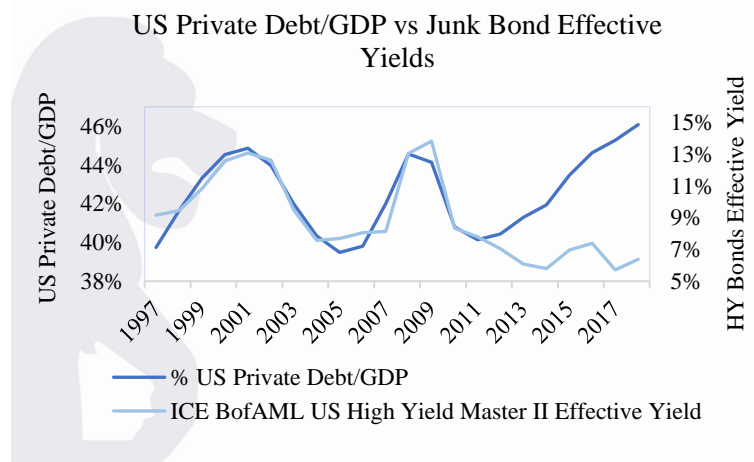
Institutions are aware of the risks of leverage and are trying to depurate banks' balance sheet from toxic assets. The ECB effort in dealing with the large amount of Non-Performing Loans held by Italian banks is a great example of a successful de-leverage policy.

### III – Debt and interest rates

Conventionally, bonds yields have been a good proxy for debt risk and a good defense mechanism against dangerously high debt levels. There is a solid correlation between private-debt to GDP ratios and average interest rates, meaning that using debt as a source of funding becomes more expensive as the overall leverage, and its related risks, increases, forcing corporates to de-leverage and rely on equity to be profitable.

This system has shown a big weakness: central banks’ monetary policies have recently squeezed, overthrowing the correlation between debt levels and debt costs. It is interesting to focus on High Yield/Junk Bonds (bonds considered “speculative assets” by rating agencies) because, having little to no collateral, they carry a bigger default risk.

Applying a regression analysis to 1997 to 2011 data it is possible to find a strong correlation between US Private Debt/GDP and HY effective average yields, measured with the BofAML US High Yield Master II Index, which tracks the performance of US dollar denominated below investment grade rated corporate debt publically issued in the US domestic market, resulting in a  $\beta$  of 1.07 and R2 of 0.85. It is clear on the chart that from 2011, the overall private debt stopped influencing interest rates creating a huge gap of around 8% between our estimated yield and the effective average yield.



Source: St. Louis FED

The deformation of the debt markets has noticeable symptoms such as the rise of negative rate bonds, both in corporate and sovereign markets.

Before 2012 negative rates were considered a contradiction, but now they are a solid reality so much that 2% of the European high yield/junk bonds paradoxically present a below 0% yield. The result is the massive increase in the now cheaper leverage.

On the demand side, fixed income has traditionally been considered a semi-riskless tool and is highly present in traditional low risks portfolios. Frequently the minimum amount of fixed income instruments on portfolios total assets is established by contract, maintaining the demand of bonds consistent, despite of the bad returns. This mechanics drives an increase in asset managers’ risk appetite in bonds market to achieve adequate returns for their clients, resulting in a riskier system.



## IV – The model

We adopt a model that allows us to detect both how the market reacted to the increase in debt financing and the market pricing sensibility in the corporate bond sector during the past ten years beyond yield to maturity fluctuations.

We use a modified version of the capital asset pricing model (CAPM) that allows us to price investment grade bonds starting from two spreads: the beta spread between investment grade and high yield bonds and the spread of high yield debt over treasury notes.

The capital asset pricing model requires estimating the beta of the asset in order to estimate the sensitivity of some measure of the selected assets (ex: price) to some independent variable. As a matter of facts, CAPM purpose is typically to measure the sensitivity of a stock's price relative to the overall market (e.g. S&P 500) in order to estimate the cost of equity. While it is possible to use CAPM to calculate the cost of debt, there are other, more precise methods to figure it out but, for the purpose of our research, the CAPM will be a valuable and sufficient tool to reveal the pricing path of US investment grade bonds during the last decade.

To have a more effective model, instead of creating two different corporate debt portfolios, we consider 10 years monthly data of two bonds index, SP5IGBIT (for investment grade) and SP5HYBIT (for high yield). We use these two bond indices to compute variances and betas for the respective rating segments. We would rather use indices since they allow us to have data from a big pool of companies. The monthly frequency instead allows us to have precise data and inhibit the presence of companies that may have changed rating during the time frame considered.

Given the previous considerations, smaller fixed portfolios with companies that remained either Investment Grade or High Yield in the past 10 years would have provided a partial analysis of the market dynamics.

What inspired our model is the assumption that for high yield debt the yield to maturity (YTM) is a poor estimator of the cost of debt since both the probability of default and the expected loss are substantial. The capital asset pricing model could assess a better proxy. In order to build our model, we assume it also for investment grade debt structuring the pricing on the high yield corporate debt.

The model we constructed is the following:

$$r_{ig} = [(Spread_{HY} + 10yYTM) + (\beta_{ig} - \beta_{HY}) * equity\ risk\ premium]$$

We use the spread of high yield bonds over Treasury as reported by S&P:

<i>Rating is</i>	<i>Spread over treasury</i>
D2/D	19,38%
C2/C	14,54%
Ca2/CC	11,08%
Caa/CCC	9,00%
B3/B-	6,60%
B2/B	5,40%
B1/B+	4,50%
Ba2/BB	3,60%
Ba1/BB+	3,00%

The spread employed to price the BBB rated corporate bonds was the CCC one, the spread used to price A- bonds was the B-one and so on until AAA bonds for which we used BB+ rated bonds' spread over treasury.

Betas for both Investment Grade and High Yield indices have been computed with the usual formula:

$$\beta = \frac{\sigma(rS\&P, rIndex)}{\sigma^2(rIndex)}$$

In particular, we use the covariance between S&P500 return and Bond Indexes on annual basis and the variance of each index.

We expect a low level of Betas, in particular, the Investment Grade Beta close to zero (or even negative) and accordingly an overall negative Beta Spread that, multiplied for the equity risk premium, will reduce the computed yield on High Yield Debt (Spread + 10yYTM).

We assumed a 5% equity risk premium.

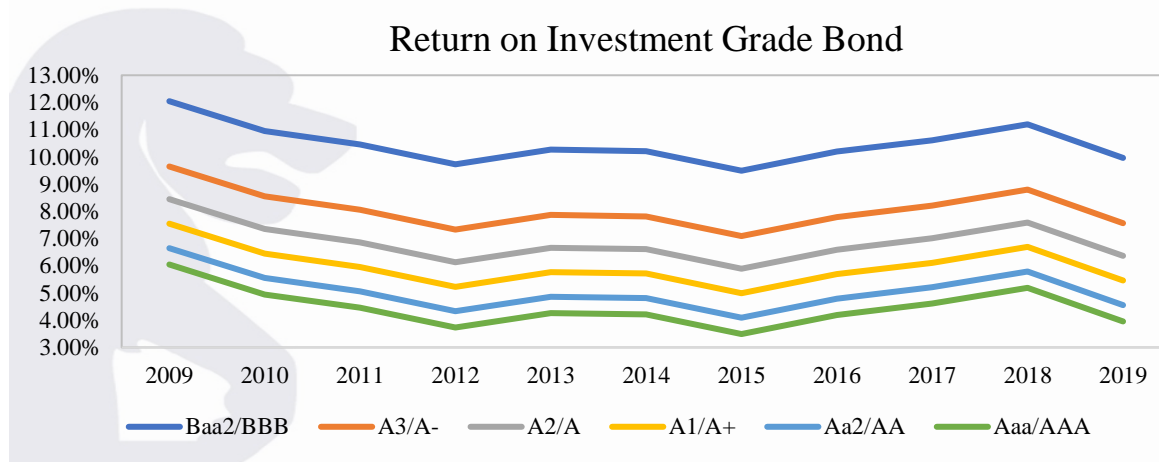
	Year										
	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
Cov(S&P,SP5IGBIT)	-0.00006	-0.00002	0.00000	0.00007	-0.00007	0.00005	0.00013	-0.00002	0.00013	-0.00020	0.00073
Cov(S&P,SP5HYBIT)	0.00031	0.00026	0.00002	0.00018	0.00045	0.00020	0.00026	0.00018	0.00069	0.00059	0.00091
var(S&P)	0.00153	0.00195	0.00013	0.00087	0.00155	0.00055	0.00061	0.00093	0.00213	0.00311	0.00415
Beta(IG)	-0.03690	-0.00935	0.02978	0.07984	-0.04192	0.09931	0.21192	-0.02214	0.06165	-0.06349	0.17579
Beta(HY)	0.20096	0.13395	0.17410	0.20917	0.28760	0.36416	0.42898	0.19214	0.32612	0.19077	0.21838
Beta Spread	-0.2379	-0.1433	-0.1443	-0.1293	-0.3295	-0.2649	-0.2171	-0.2143	-0.2645	-0.2543	-0.0426
10YTreasury Annual Ret	2.15%	2.91%	2.33%	1.84%	2.14%	2.54%	2.35%	1.80%	2.78%	3.22%	3.26%
Equity risk premium	5.00%										

Therefore, we have an estimate of the global yearly price for corporate debt. The model's outputs allow us to understand two important trends: how the market priced the growth in debt volume and what is the spread between the effective market yield and the price based on our risk assessment as computed in our model.



The results are the following:

	Year										
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Baa2/BBB	12,05%	10,95%	10,46%	9,73%	10,26%	10,22%	9,49%	10,19%	10,61%	11,19%	9,96%
A3/A-	9,65%	8,55%	8,06%	7,33%	7,86%	7,82%	7,09%	7,79%	8,21%	8,79%	7,56%
A2/A	8,45%	7,35%	6,86%	6,13%	6,66%	6,62%	5,89%	6,59%	7,01%	7,59%	6,36%
A1/A+	7,55%	6,45%	5,96%	5,23%	5,76%	5,72%	4,99%	5,69%	6,11%	6,69%	5,46%
Aa2/AA	6,65%	5,55%	5,06%	4,33%	4,86%	4,82%	4,09%	4,79%	5,21%	5,79%	4,56%
Aaa/AAA	6,05%	4,95%	4,46%	3,73%	4,26%	4,22%	3,49%	4,19%	4,61%	5,19%	3,96%



### Analysis of results

As we can appreciate from the chart the market started pricing at higher value the investment grade companies from 2012, with a momentary drop between 2014 and 2015.

The graph demonstrates how quantitative easing policies pursued by FED since 2009 depressed the yields with a clearly steadily decreasing trend. Consequently, the price of investment grade bonds rises and in parallel, the volumes start to grow since 2009. According to our analysis, the boom in the debt volume started to consistently affect debt price in 2012 with the exception of a small drop in 2015 in which a flight to quality took place due to an increase in beta spread. Nonetheless, we see a decrease in both High Yield and Investment Grade Betas due to better economic conditions related to the US post-crisis economic expansion. The decision of the FED to halt the quantitative easing led to a bit of uncertainty in the US credit market triggering a higher demand of highly rated bonds.

A possible explanation for the lower returns in 2019 that contradict both our thesis and the market trend since 2015, as shown by the graph, are US interest rates cuts. Last year has been a challenging year for the Federal Reserve due to political pressures, inefficient communication and sudden shift in the economic outlook. The Fed stance from hawkish has turned dovish and during the year, the chairman Jerome Powell has cut the federal fund rate of 25bp three times reaching 175bp down from the previous 250bp. This interest rate dynamic has significantly affected the pricing in our model in two ways: reducing the size of the first component (SpreadHY+10yYTM) and affecting the returns of the two indices on corporate bonds, SP5HYBIT for high yields bonds and SP5IGBIT for investment grades ones, and consequently affecting the difference in betas. Moreover, the modified duration of the two indices significantly differs in fact for SP5HYBIT index is 5.76



and 7.71 for SP5IGBIT. Therefore, the downward trajectory could be also justified with a higher sensibility SP5IGBIT to interest rate fluctuations. Given the formula:

$$\Delta B/B = -D^* * \Delta i$$

It is immediate to understand that SP5IGBIT constituents will have increased more than SP5HYBIT in terms of price and the reverse is true in terms of yields.

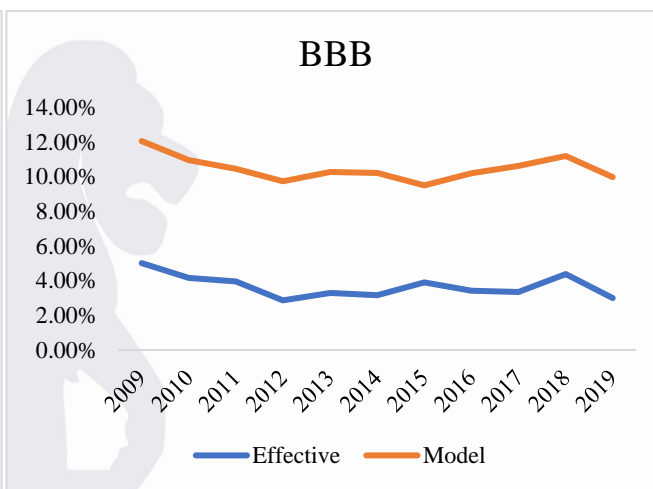
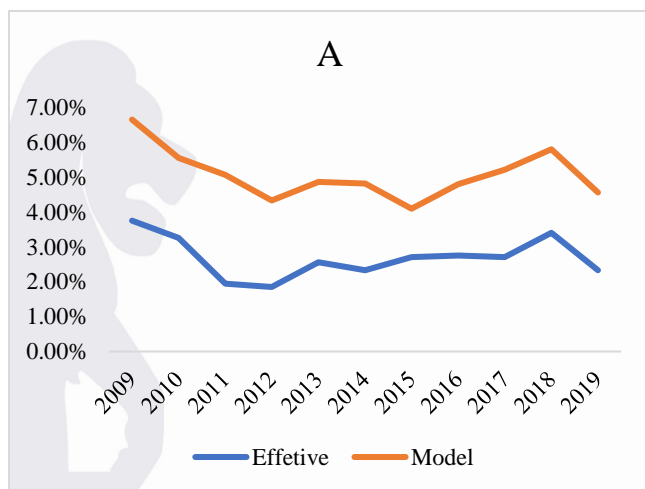
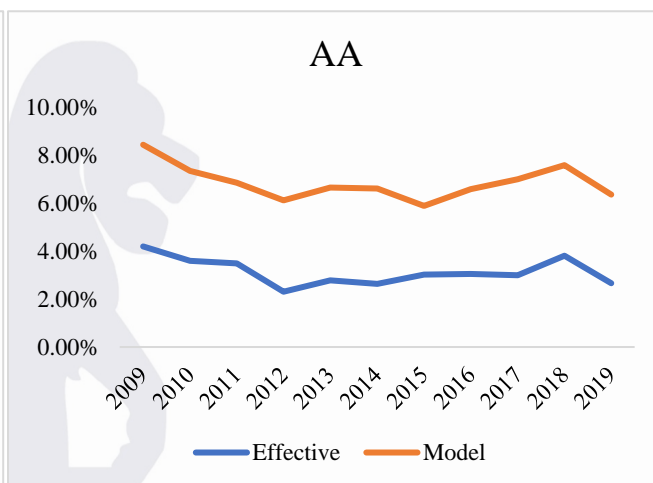
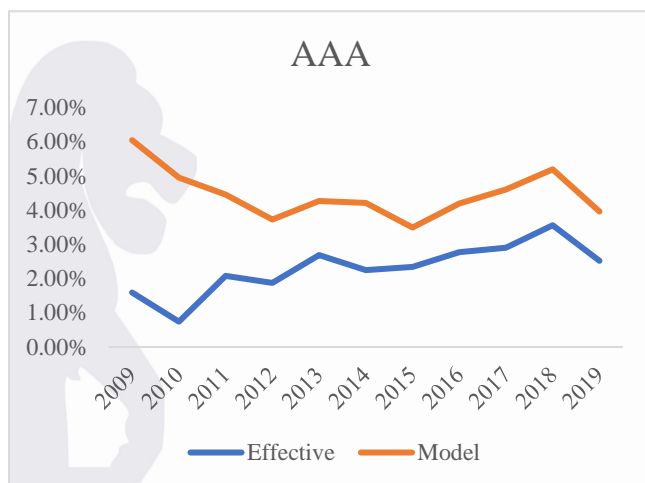
The second output displays the Bond Yield spread between the effective market returns and the one estimated by our model.

To measure the market pricing of investment grade corporate debt we use four different indices computed by S&P Dow Jones Indices. In particular, we use S&P500 Investment grade corporate bond indices with four different ratings: AAA, AA, A and BBB. These indices are computed with investment grade bonds issued by the constituents of S&P500. S&P Dow Jones Indices have launched these indices in 2015 and the previous data is back-tested and based on the application of the same methodology. Although the yields before 2015 are affected by the selection of index constituents in hindsight, these still represent a comprehensive estimate.

The results displayed below are incredibly constructive since they show a great synchronization in terms of trend between the market returns and the model's one and a relevant difference in term of spread.

The charts clearly show an upward trend since 2012 in the YTM priced from the market. Indeed, prices reflect the acknowledgment of an outstanding increase in debt financing due to the favorable monetary environment and have partially priced the risk of a credit boom in current and past yields. In addition, the effects of the new easing cycle of the FED are clear and considerable, since they have swiftly disrupted the six yearlong ascending trend.

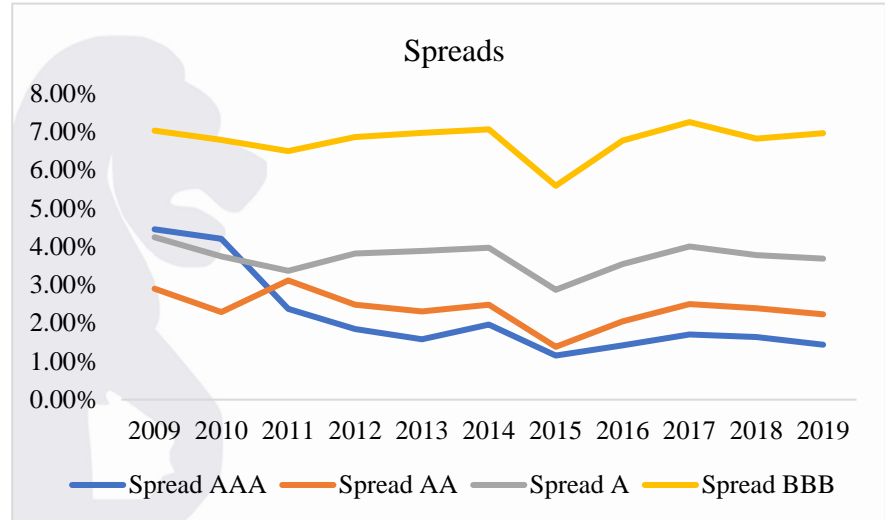
Furthermore, since 2016 the yields on AA rated bonds have been slightly lower than AAA rated ones. This is significantly disturbing and it creates an alarming signal. In fact, in 2019, the spread between AAA rated and AA rated bonds has been 0.19% and the spread between BBB rated ones, the lowest rating in the investment grade spectrum, and AAA rated has been just 0.47%. These spreads are consistent with the dovish monetary policies undertaken in 2019 and seem to imply that the market has priced in further expansionary FED polices. This seem to be comparable with the traditionally known Greenspan put, priced by the market before the 2008-09 financial crisis, this "put" was based on the assumption that in case of downward trend in the credit and financial markets the Fed would have provided the liquidity and the expansionary policies to sustain valuations. Although there are numerous differences between the pre-crisis period and the current one these price dynamics should be alarming for investors especially in the context of a late period business cycle and a world with record high levels of liquidity.



Our model is clearly more conservative in terms of valuation.

As we can see from the spreads below how the market is currently underpricing the debt not reflecting the effective risk hidden behind the size of debt's volume that our model tries to catch.

As we can see below the spreads become more significant with BBB graded bonds and there is a lower but still significant difference between A, AA and AAA rated ones.



## V – Conclusions

It is important to point out that the aim of our model is not to have an accurate pricing of the debt in order to find arbitrage opportunities based on the spread with the effective yield of the market. The purpose is to use different inputs to detect if the market is currently underestimating a certain type of risk hidden behind the growth in debt volume.

In conclusion, looking at our model, it seems like that the market reacted to the increase in debt volume, perceiving investment grades bonds riskier throughout the last 5 years. However, comparing the results with the effective market yields it seems like the market is still not pricing part of the risk related to debt volume size, probably because of good economic conditions for US corporates in recent years and a newly procrastinated hypothesis of recession in the global economy.