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TRZYSTOPNIOWA OCENA RYZYKA KREDYTOWEGO
OBLIGACJI RZĄDOWYCH
W OBLICZU GLOBALNEGO KRYZYSU FINANSOWEGO

[**słowa kluczowe:** rating kredytowy, swapy ryzyka niewypłacalności, zmienność historyczna, zmienność implikowana, ryzyko kredytowe]

Streszczenie

Problem ryzyka kredytowego stał się jednym z kluczowych zagadnień w trakcie globalnego kryzysu finansowego z 2007 roku. Na rynku kapitałowym jest szereg instrumentów, które mogą pomóc w ograniczeniu ewentualnych strat finansowych. Autor zwraca szczególną uwagę na tradycyjną metodę oceny ryzyka w postaci ocen ratingowych oraz na te alternatywne w postaci swapów ryzyka niewypłacalności oraz analizy zmienności. Wykorzystując powyższe instrumenty autor tworzy model, który może być wykorzystany w efektywnej selekcji ale także w monitorowaniu portfela składającego się z instrumentów dłużnych.

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THREE-LEVEL GOVERNMENT BOND CREDIT RISK
ASSESSMENT AGAINST
THE BACKDROP OF THE GLOBAL FINANCIAL CRISIS

[**keywords:** Credit Rating, Credit Default Swap, Historical Volatility, Implied Volatility, Credit Risk]

Abstract

Credit risk became one of the key elements of the 2007 global financial crisis. On the market we have a number of instruments that can help us reduce potential losses. The author draws special attention to a traditional method in the form of credit rating and to the alternative methods in the form of credit

default swaps and volatility analysis. By taking the above risk measurement tools the author creates a model that can help effectively select and monitor a portfolio consisting of fixed income instruments.

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2007 Global financial crisis

Risk, and more specifically credit risk is one of the key elements of the financial market environment. This term became especially important during the recent global financial crisis. Just a few years back investors thought that they were able to create risk free or nearly risk free instruments that would bring relatively high yields. Mortgage Backed Securities (MBSs) were one of those instruments. They very often offered the highest triple “A” ratings but at the same time the return on capital was greater than for example from sovereign bonds. Thanks to financial engineering and the structuring process investment banks were able to propose very attractive instruments. The financial crisis, however, very quickly revealed the real value of those instruments and the economy as a whole.

Bruyere et al. (2006) quotes „*Banana Skins 2003, a CSFI Survey of the Risks Facing Banks*” and draws special attention to credit risk. In 2003 survey among 231 investors was conducted, where credit risk and complicated financial instruments were said to be the biggest threat to the banking sector. Between 1996 and 2003 credit risk was mentioned many times as a potential danger to the financial system.

Financial markets are very well interconnected and it is very easy to invest across many different markets, regions and countries. In terms of assessing risk, market players can use universal tools, such as credit ratings. Credit Rating Agencies (CRAs) have a very strong position in most developed markets. Even though during the financial crisis they underestimated the risk and inevitably caused loses to many investors they still act as an important element in the financial markets world. The oligopoly market certainly is a factory that did not motivate major CRAs to significantly improve the service offered to investors.

Alternative credit risk measurement tools

Looking back at the 2007 global financial crisis one needs to point out the importance of credit default swaps (CDSs). This instrument became for many investors an alternative tool for credit risk assessment. A CDS is a relatively new fixed income derivative instrument and in simple terms it acts as an insurance policy that is paid out when the debtor fails to repay a loan or if there is a credit event that triggers payout. For this reason the primary use of CDSs is transfer of credit risk between two counterparties. However, since CDSs are quoted constantly by multiple banks and other financial institutions, an investor can also easily assess what is the current risk priced into a specific debt instrument (higher risk means higher price and vice versa). This derivative instrument filled a “time gap” that became very clear during the global financial crisis and which was often observed when riskiness of certain instruments surged in a short period of time and at the same time reaction of CRAs was much delayed. Figure 1 presents a five-year sovereign Greek credit default swap versus points in time when CRAs adjusted their rating.

On the 15th of September Lehman Brothers filed for bankruptcy. This date is very symbolic and is also reflected in the Greek CDS market. Although the global crisis was recognised much earlier, this event triggered large changes in the financial market. Since the beginning of October 2008, one can observe an increase in the price of swaps that had for many years remained on a relatively low level. From 1st October to 14th January (on the 14th Jan the first rating agency adjusted its long term rating) the CDS spread quadrupled. The premium rose from 60bp to 240bp. Only after this sudden increase Standard and Poor’s adjusted its rating from A to A-. Two other main CRAs, Fitch and Moody’s, reacted on 22nd October 2009 and 22nd December 2009 respectively, when the crisis was going through its next stages and investors had time to assess the increased credit risk. Greece is not the only country where one can observe a time lag between the surge in risk and different reactions of CRAs and the CDS market.¹

¹ The author will be publishing his PhD thesis in 2017 in which he investigated reaction of credit rating agencies, credit default swaps and volatility analysis in three European countries: Greece, Spain and Portugal. Similar time lags to the one found in Greece can be observed in the other two countries.

Credit default swaps also had a negative influence on the global financial crisis. One of the examples is American International Group Inc., which was bailed out and taken over by the US government for 85 billion US dollars. US authorities were worried about the harmful effects the bankruptcy of AIG could have on the financial markets. The state intervention took place a week after the Lehman Brother collapse (Hilsenrath J.E. et al. 2008). The entity that caused all the turmoil was AIG Financial Products which was incorporated in 1987 and invested in over-the-counter derivative products (Baranoff, 2012). Before the global financial crisis began, investment banks were using on mass scale structured products based on the property market. Those instruments were protected by CDSs issued by entities such as AIG FP. The value of protected instruments was 440 billion US dollars. When the crisis began, underlying instruments dropped sharply in value which strained AIG FP financial position. This was further undermined by credit ratings cuts (Xinzi, 2013). In order to protect the markets from even bigger chaos the US state decided to intervene and rescue AIG.

The growth of the credit default swap market was hindered because of the global financial crisis. However the CDS market still remains liquid and many market players take advantage of these instruments but not in its speculative function but using pricing as a risk measurement tool that fills the time lag observed in credit rating space.

Volatility analysis as a risk measurement tool

Volatility analysis is less common but also used as a means to assess credit risk. The most popular and known volatility tool is the VIX index, which is also called the “fear index” (Bossafx, 2016). It represents markets’ expectations based on the S&P500 options market and it reflects the mood and market sentiment (CBOE, 2016) and can be a risk leading indicator.

The global financial crisis is clearly visible in Figure 2, especially around the time of the Lehman Brothers collapse. From mid-September to the end of October 2008 VIX index surged by 2.5 times and gave a clear signal to investors about dramatic changes to the market. S&P 500 is a US stock index, however, when any large scale changes appear on this index investors can be sure that that it will have a knock on affect on the other asset classes round the world.

The financial crisis is also visible on the Greek sovereign market. Figure 3 shows ten-year government benchmark bond (upper chart) and historical volatility (lower chart).

The financial crisis in Greece started with a slight delay, however the affects were clearly visible. The price of a ten-year government benchmark bond from mid 2009 dropped significantly and this drop was accompanied by a sharp increase in historical volatility. Volatility does not reflect the direction of the prices, however, in the case of Greece's high volatility it also meant a sharp drop in prices and an increase in credit risk.

Three-level government bond credit risk assessment against the backdrop of the global financial crisis

Historical and implied volatility are measures that strongly react to changes in the markets. By utilizing them as risk measurements tools together with credit ratings and credit default swaps they can give a much better insight into credit risk. Using just one measurement may not be enough and during times of financial turmoil it is important to use a wide selection of tools and monitor them constantly.

On Figure 4, a three-level government bond credit risk assessment is presented that can be utilized for bond selection and bond portfolio monitoring.

The first stage of the model utilizes credit ratings. The tool provided by CRAs can significantly reduce the number of instruments that investors can consider for investment. Very often the most important criteria is to select an "investment grade" bond rating only. In case of Moody's this would be any bond equal to or above the "Baa3" level.

In the second stage, CDS premium is used to gauge the riskiness of a bond. This stage verifies the credit ratings and also can reduce the number of instruments investors would consider buying. This stage is critical especially when there are events in the market that CRAs could not foresee and react swiftly to. Any sudden spike in CDS premium or a high level of price in comparison to other similar types of bonds would need to be thoroughly investigated.

The last stage involves volatility analysis. The most appropriate volatility would be the implied volatility. Since this type of volatility is not quoted on

most markets, investors can utilize historical volatility (as on Figure 3). High historical volatility for specific bonds in comparison to other instruments in the portfolio indicates both higher riskiness or attractiveness of the instrument. As volatility shows just magnitude and not the direction, investors in periods of relative high volatility must pay special attention to those instruments and if required either reduce or increase investments in specific instruments.

Practical application of the above model is shown in Figure 5 where a series of bonds is presented with the following information: grade of bond (investment grade or junk bond, column F), five-year CDS price (column G) and historical volatility level (column H). The last column takes into consideration information in all columns and indicates whether an investor should buy or refrain from buying certain debt instruments from a credit risk perspective.

Investment opportunities according to the model are as follows:

A. Possibility of investment when following criteria are met:

Investment grade rating. This is a prerequisite for most portfolio managers. Another criterion is the level of CDS: lower than 500bp and the level of volatility: less than 10%. With these criteria met the last column “I” is labelled as “Yes” indicating low credit risk associated with a financial instrument.

B. Lack of investment opportunities in the case of:

Speculative credit rating and (or) the price of CDS above 500bp. The level of historical volatility is of less importance in comparison to low credit rating or high CDS price level. In the case of lack of investment opportunities the last column “I” is labelled as “No”.

C. Further analysis of credit risk required when:

Historical volatility (above 10%). Such circumstances require further analysis of risk. Rapid changes in the price does not always mean increased risk. This may be a signal of increased demand due to the higher investment attractiveness. In the case of high volatility column “I” is labelled as “Check”.

² The 500bp border criteria for CDS and 10% criteria for volatility is based on a study the author conducted while working on his PhD. These values however can be adjusted depending on the risk aversion of an investor.

Conclusion

One of the reasons for uncertainty in the financial markets is lack of one effective and trustworthy risk measurement tool. The global financial crisis forced market players to look for new ways of coping with this problem. Using only traditional methods, for example in the form of credit ratings, is not adequate in today's complicated environment. Investors need to be flexible and select various alternative risk measurements according to changing conditions.

The model proposed in this article is based on the use of traditional risk measures in the form of credit ratings and alternative measures in the form of CDSs and volatility analysis. These alternative measures allow to effectively monitor a large portfolio of debt instruments and to facilitate investors in more efficient risk evaluation.

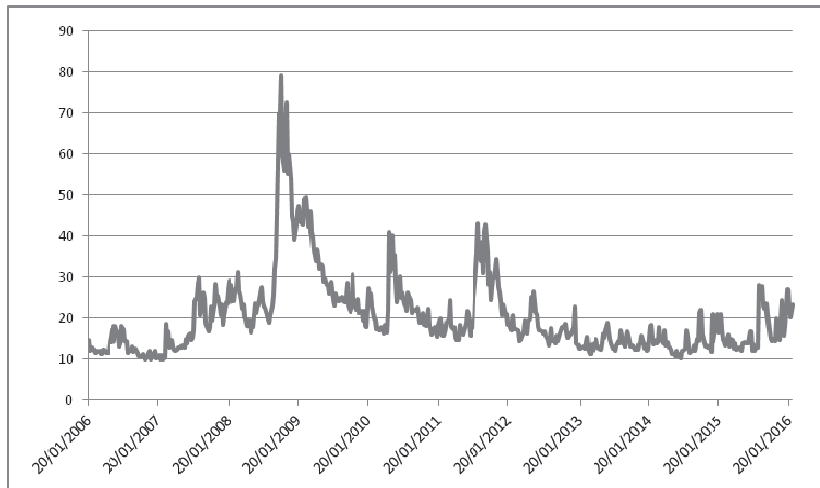
It needs to be highlighted that use of alternative methods is a necessity but sometimes it does not provide investors with clear answers. For this reason it is always important to look critically both at the selection of risk measurement tools and instruments themselves.

Figure 1. Five-year Greek CDS versus credit rating changes



Source: Thomson Reuters Eikon (20/07/2011)

Figure 2. VIX Index



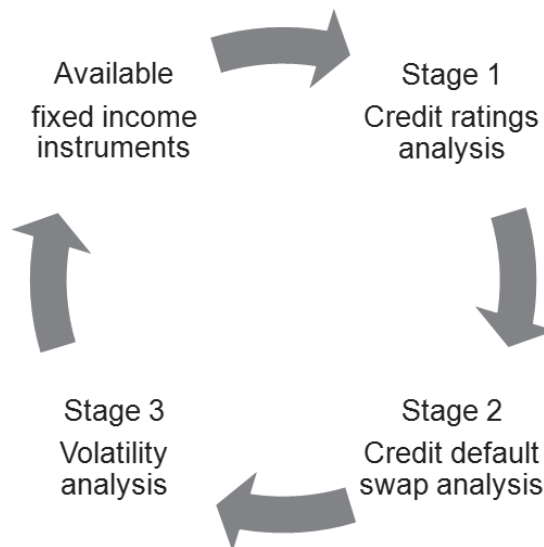
Source: Thomson Reuters Eikon (06/02/2016)

Figure 3. Ten-year government benchmark bond (upper chart) and historical volatility (lower chart).



Source: Thomson Reuters Eikon (06/02/2016)

Figure 4. Three-level government bond credit risk assessment



Source: Own elaboration

Figure 5. Three-level government bond credit risk assessment – practical application model

					Stage 1	Stage 2	Stage 3	Stage 4
Issuer - A	Cupon - B	Maturity - C	ISIN - D	Currency - E	Credit Rating - F	5-year CDS - G	Historical Volatility (10/252) - H	Invest? - I
Spain	3.133	17.04.17	XS0075681345	JPY		99.27	2.618	Check
Spain	3.1	21.04.17	XS0075723360	JPY	Investment grade	99.27	0.204	YES
Spain	2.1	30.04.17	ES0000012412	EUR	Investment grade	99.27	0.348	YES
Greece	4.5	03.07.17	XS0078057725	JPY	Speculative grade	1076.6	0	NO
Greece	3.375	17.07.17	GR0110029312	EUR	Speculative grade	1076.6	11.743	NO
Spain	5.5	30.07.17	ES0000012783	EUR	Investment grade	99.27	0.437	YES
Greece	3.8	08.08.17	XS0079012166	JPY	Speculative grade	1076.6	0	NO
Spain	4.75	30.09.17	ES00000123R5	EUR	Investment grade	99.27	0.409	YES
Portugal	4.35	16.10.17	PTOTELOE0010	EUR	Speculative grade	190.2	1.324	NO

Source: Own elaboration based on Thomson Reuters Eikon (16/01/2016)

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