

Product Risk Classification

Marc Aeberhard, Michael Aichinger, and Andreas Binder discuss UnRisk's pragmatic approach to mapping market, credit, and liquidity risk to a single rating score.

What is the PRC?

The product risk classification (PRC) is a risk indicator that is based on quantitative models. It allows us to compare the financial risk of investment products of different kinds and asset classes. The three relevant risk factors – market risk, credit risk, and liquidity risk – are all incorporated into the PRC. The PRC is a risk measure for single instruments, which does not consider portfolio aspects. It can be based on historical data and thus can vary during the lifetime of a product.

Aims and principles of a sound PRC calculation:

- The PRC calculation needs to be applicable across different asset and product groups and should integrate approved market standards for the assessment of product risk.
- The PRC calculation needs to be adequate, simple, and transparent. This means to include the relevant risk factors, to have a good data basis, and to have a transparent representation.
- If the PRC calculation is done in house, a neutral perception on the product risk needs to be ensured, which means that there needs to be an independence of product sales.

Fulfil regulatory requirements

The product risk classification is another building block for fulfilling requirements such as FIDLEG or MiFID II, which require checking the suitability and appropriateness of proposed investments as well as providing the customer with transparent and comprehensible information on all risks connected with the proposed investment. From a regulatory point of view, the PRC becomes important as soon as an advisor needs to assess whether a client is able to bear the financial risk of a specific investment product.

Methodology

Overview

Different methodologies for the calculation of PRC exist, ranging from complex to more pragmatic. Some of the methods rely on a more quantitative approach, whereas others are based on empirical findings.

Koh *et al.* [1] propose a framework that decomposes the degree of uncertainty into two components: risk and complexity. In their work, they state that risk can be quantified on a ratio scale and can be suitably managed. Furthermore, they quantify complexity on an ordinal scale. They use findings from the literature and



other empirical sources to define the factors contributing separately to risk and complexity.

In [2], the proprietary solution of Credit Suisse is described. They use market, credit, and liquidity risk for the calculation of PRC. Whereas the market risk is covered by volatility and maximum loss measures, the credit risk is described using credit ratings and country analysis. For liquidity risk, market capitalization and daily trade volume are taken into account. Each of the different risks get their own PRC score, and the final PRC is obtained by calculating a weighted sum.

A problem with both of the above-mentioned methods for calculating PRC is the amount of data used for it. In times of increasing cost pressure and shrinking margins, a more cost-sensitive approach for PRC is advantageous.

UnRiskOmega's pragmatic PRC approach

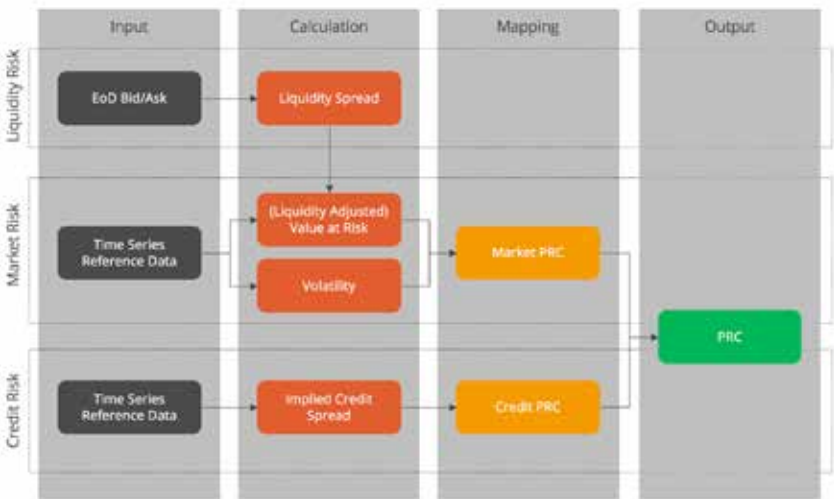
We base our PRC on three underlying risk indicators:

- **Market risk.** The market risk indicator is based on the volatility and liquidity-adjusted value-at-risk (LVaR) of the investment product. The volatility is the main risk driver of market risk, which can be adjusted upwards by the LVaR.
- **Credit risk.** The credit risk is calculated for investment products with interest-rate components. The main indicator is the implied credit spread, which is calculated from the difference between the fair value and the market price.
- **Liquidity risk.** The liquidity risk is calculated using the difference between the bid and ask prices (liquidity spread) of the investment product. It enters market risk in the form of the LVaR.

The bands mapping volatility and implied credit spread to the initial sub-PRC for market and credit risk are fixed together with the customer, taking into account their scale of favor (e.g., PRC scale of 1–5 or 1–7). For the calculation of the final PRC (global PRC), we use a conservative approach. It is calculated by taking the maximum of the market and credit sub-PRCs and avoids weighting functions. However, the PRC delivery always contains the sub-PRCs besides the global PRC.

In Figure 1 we show the calcula-

Figure 1: Flow of PRC calculation



tion flow for the PRC. By using the implied credit spread for the credit PRC, we do not need country- and industry-specific credit ratings. Also, using the bid-ask spread instead of market capitalization and daily trade volume allows us to reduce the amount of data significantly.

Our PRC calculation is currently used by more than 20 customers. The convincing argument in most cases was that comparisons to other methods have shown that the more pragmatic approach gives qualitatively the same PRCs and performs equally or even better in terms of stability for lesser cost.

Example

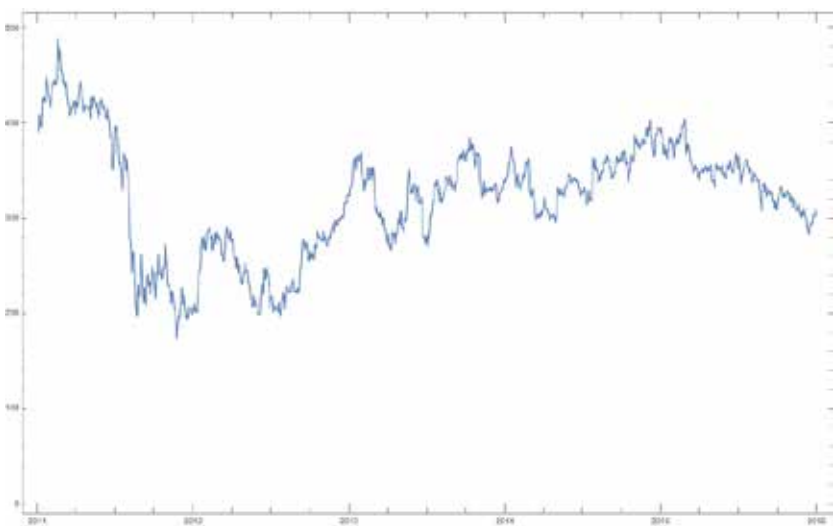
As an example we show the PRC calculation of an equity. Figure 2 shows the price of RBS on the LSE between 2011 and 2016. The market value is 302 GBp.

Based on monthly returns, we obtain a volatility of around 34.4 percent p.a. Based on yearly returns, we obtain a 95 percent VaR of 43.3 percent relative to the market value (130.845 based on the market value). Figure 3 shows a typical mapping table for the calculation of the PRC for a 1-5 scale. The liquidity adjustment due to the bid-ask spread is negligible for the equity at hand.

Figure 3: Mapping table for the calculation of PRC for a 1-5 scale

Liquidity Risk		Market Risk		Credit Risk	
LR Indicator		MR Indicator	Volatility	CR Indicator	Imp. Credit Spread (Bp)
50% x Liquidity Spread / MTM		1	< 5%	1	< 100
		2	5.0% - 12.0%	2	100 - 200
		3	12.0% - 20.0%	3	200 - 350
		4	20.0% - 40.0%	4	350 - 550
		5	> 40.0%	5	> 550
		MR Increment	Value at Risk		
		0	< 20%		
		+1	20% - 50%		
		+2	50% - 80%		
		+3	> 80%		

Figure 2: Price of RBS on the LSE between 2011 and 2016



In our example the market risk indicator based on the volatility is 4. This value is incremented by 1, leading to a market PRC of 5. As equities have no implied credit spread, the global PRC is equal to the market PRC.

Summary

Summing up, UnRiskOmega's PRC is a simple and transparent way to compare relevant risk factors of single instruments across all asset classes. To obtain the relevant sub-PRCs also for structured instruments, the powerful valuation and risk engines of UnRisk are incorporated in the core of UnRiskOmega's PRC.

About UnRisk Omega AG

UnRiskOmega AG was established in 2016 by the three owning companies: multilateral AG, uni software plus AG, and MathConsult AG. The goal of UnRiskOmega is to provide smart and reliable software solutions for the financial industry, supporting them in all aspects of wealth management and risk

management. The solution and services portfolio ranges from comprehensive advisory solutions up to scalable risk services for highly complex risk assessments. With UnRiskOmega, financial institutions can count on a reliable and competent partner.

About the Authors

Marc Aeberhard is responsible for the business development of UnRiskOmega AG. Michael Aichinger and Andreas Binder both have a strong background in quantitative modeling and risk management. They are the authors of the book *A Workout in Computational Finance* (Wiley, 2013).

REFERENCES

- [1] Koh, S.K.B., Koh, C.C.F., Lee, D.K.C., Lim, K.G., Ng, D., and Phoon, K.F. 2015. A risk- and complexity-rating framework for investment products. *Financial Analysts Journal* 71(6), 10-28.
- [2] Krebs, M. 2011. Modell zur Risikoklassifizierung von Anlageprodukten. *Der Schweizer Treuhänder* 11, 934-939.