# ACTUARIAL SPREAD WHITE PAPER

#### Credit Research Initiative of the National University of Singapore

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#### ABSTRACT

Actuarial Spread (AS) is an alternative credit risk measure to the CRI Probability of Default (PD). It was introduced by the Credit Research Initiative (CRI) at the National University of Singapore in July 2014. Built on the design of conventional Credit Default Swaps (CDS) without involving an upfront fee, the AS reflects the risk of the obligor by summarizing the information embedded in the term structure of the CRI physical probability of default (PD) and the discount rate. In short, AS offers a new perspective on a firm's credit worthiness and acts as an intuitive communication tool in a metric that is familiar among market participants.

### CONTENT

OVERVIEW	2
CONSTRUCTION	3
	3
APPLICATION	4
CONCLUSION	6
	7



#### **OVERVIEW**

Introduced in 2014 by CRI, Actuarial Spread (AS) provides a new perspective for credit risk. Constructed on the design of conventional Credit Default Swaps (CDS) excluding the upfront fee, the AS reflects the credit risk of a firm by summarizing the information embedded in the term structure of the physical (real-world) CRI Probability of Default (PD) and the risk-free discount rate. Therefore, it is equivalent to computing the CDS spreads based on their "actuarial" values by using the CRI PD. See Figure 1 for an example of historical time series of AS.





#### Coverage

CRI provides AS with tenor ranging from a minimum of 1-year to a maximum of 5-year in one year increments for all firms that CRI has produced PD, i.e., about 65,000 firms in 120 countries. The CRI AS is updated on a daily basis for about 33,000 currently active exchange-listed firms and it is currently denominated in USD, computed using discount rate curves extracted from a combination of USD LIBOR and Swap rates.



## CONSTRUCTION

Credit Default Swaps (CDS) spreads have been widely used as a credit risk indicator of a reference obligor. As the spreads are analogous to the fees charged for default protection, obligors with higher spreads are often associated with higher credit risk.

Focusing on the credit component, CRI introduced the AS in July 2014 as a simpler measure of credit risk for reference firms. Sharing the same contract structure as the conventional market CDS (without an upfront fee), the AS is computed using the CRI PD as proposed by Duan (2014). Computing Actuarial Spreads requires an appropriate discount rate curve. The curve is currently extracted daily from a combination of USD LIBOR and Swap rates, and is applied to all firms under the CRI coverage.

For more details on the implementation of this model and AS construction, please refer to the <u>RMI-CRI Technical Report (2017)</u>.

### COMPETITIVENESS

The CDS spreads are expected to be related to the risk aversion and the liquidity of the traded derivative. In contrast, the AS depends solely on the likelihood of default under the physical probability measure and the discount rate. The AS is a measure of the obligor's credit quality in the real world, not distorted by risk premium and market liquidity.

There exists an empirical relationship between actively traded CDS spreads and the AS. This relationship plays a key role in credit benchmarking - especially for companies which have no CDS quotations on public markets or which have CDS that are not liquid enough to assess the risk of default in neither a timely nor an accurate manner. Furthermore, the AS is able to provide an assessment of credit quality for a firm even when it has no traded CDS.



#### **APPLICATION**

#### Example for Empirical Pricing of CDS1

Eastman Kodak is an American company that produces imaging, printing and photography products. It filed for Chapter 11 bankruptcy protection on January 19, 2012 and later emerged back from bankruptcy on September 3, 2013. Its shares began to trade under a different ticker in NYSE on November 1, 2013. In Figure 2, Kodak's market CDS spreads (Bloomberg) and Kodak's AS are plotted for the last year before its bankruptcy filing.



## Figure 2: One-year daily time series of 5-year CDS market spread and the CRI AS leading up Eastman Kodak's bankruptcy filing on January 19, 2012.

Even though the CDS spread is usually much larger than the AS, the two time series generally moved in tandem, which points to the possibility of establishing some empirical relationship between the two spreads.



<sup>&</sup>lt;sup>1</sup> Example from Duan (2014)

By plotting the log Spread ratio with its lagged value shown in Figure 3, we observe that there is a strong statistical relationship between the two. A simple lagged regression of the log ratio of the CDS spread over its corresponding AS yields a high  $R^2$  of 85% with the predictive equation:

$$\ln\left(\frac{S_t}{S_t^{(a)}}\right) \approx 0.1487 + 0.9296 \times \ln\left(\frac{S_{t-1}}{S_{t-1}^{(a)}}\right)$$

Where  $S_t$  refers to the CDS spread at time t and  $S_t^{(a)}$  refers to the AS at time t.



Figure 3: The log-ratio of the 5-year CDS spread over its corresponding AS versus the same log-ratio on the previous trading day.



#### CONCLUSION

The AS offers a new perspective on credit risk by reflecting the credit risk of the obligor, which is summarized in the term structure of the CRI physical PDs. It acts as an intuitive communication tool in a metric that is familiar among market participants. The computation of the AS is based on the features of standard CDS contracts using the CRI PD. An additional benefit of using the AS is that it is available for a much larger set of firms when comparing to the use of CDS as a risk benchmark.



## REFERENCES

Duan, J. C. (2014). "Actuarial Par Spread and Empirical Pricing of CDS by Decomposition", *Global Credit Review*, *4*, 51-65.



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