An Exploratory Study in the Pricing of Credit Default Swaps

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1. Background and aims of project

A 'credit default swap' (CDS) is a financial instrument that is traded over-the-counter, and so the data required to analyse these instruments are generally not available to practitioners. In 2004, ITRAXX was launched to give investors the ability to trade in credit risk. Using such products, capital structure arbitrageurs try to uncover inconsistencies in the pricing of risk in between the stock market, the corporate bond market and the credit derivatives market. If such an inconsistency exists, a credit derivative pricing mechanism will allow investors to exploit the potential of reaping substantial arbitrage profits. For instance, Bystrom (2006) finds a significant positive relationship between stock price volatility and the CDS spread in Europe, while Norden and Weber (2004) find a negative correlation between the CDS spread change and stock returns. In a study that takes a different approach, Longstaff, Mithal and Neis (2003) show that the CDS and stock market both lead the US bond market. To our knowledge, there is no study that looks at the CDS spread and the Australian equities market. We hope to bridge this gap in the literature by making a modest contribution to the literature on credit default swaps. Our first objective in this study will be to investigate the relationship between CDS spreads and the Australian equity prices and return volatilities, using ITRAXX Australia. The second objective will be to extend the study, and see whether or not a relationship exists for the Asia-Pacific region. Once we have gained a better understanding of the Australian CDS, our third objective will be to price Australia CDS. This will be undertaken by obtaining over-the-counter data from various Australian financial firms, and fitting this data to a number of models used in pricing CDS.

2. Significance and innovation

Constructing models to explain and to predict CDS is a significant undertaking. CDS are among the most complex derivative prices in the world, and this is because of the unique features that the CDS possess, these being the non-standardization of the physical product, various disclosure requirements, and the lack of understanding of credit default risk. Modelling CDS and trading in this market is an extremely difficult process, so much so that the Investment Banks have not priced them, but instead rely on Standard and Poor's estimate. This is important both for the market participants who operate in the physical market, and for those trading in credit derivatives. As such, this provides a strong incentive for further research into the CDS.

Our work is innovative in that we will use time series models to explain CDS in Australia, and the Asia-Pacific region. The second contribution will be to investigate how to model CDS using econometric models as opposed to the current stochastic processes.

3. Description of Approach

The empirical methodology will be conducted in two stages. The first stage will consist of obtaining time series data for ITRAXX indices and equity prices. This will be obtained from the International Index Company, and from Datastream. Once the data is cleaned and re-organised, a regression will be estimated along the lines of

what Bystrom (2006) does, where the CDS spread is modelled as function of its own lagged values, contemporaneous stock returns, and lagged stock returns:

$$\Delta CDS_t = a_{0,t} + a_{1,t}\Delta CDS_{t-1} + a_{2,t}r_t + a_{3,t}r_{t-1} + \varepsilon_{t,}$$

Where

ΔCDS = change in ITRAXX Australia CDS index spread from *t-1* to *t* (in %),

r_t = contemporaneous stock index return at time *t* (in %),

r_{t-1} = lagged stock index return from time *t* to *t-1* (in %)

ε_t = normally distributed error term.

The second stage will be to obtain the over-the-counter data from selected financial institutions. This will be facilitated through the auspices of the Melbourne Centre for Financial Studies (RMIT is a founding member) which has agreed to be the link between Victorian financial institutions and researchers requiring proprietary data. Data from two institutions will be used at this stage. One major bank has already indicated a willingness to collaborate with the project. Once these variables are collected, they will be organised into portfolios of standardised CDS and non-standardised one. Following the work of Duffie and Singleton (1999), and Jarrow and Turnbull (1995), we will model the CDS as a function of the credit risk, the recovery rate, and potential cash flow:

$$CDS_i = \beta_0 + \beta_1 CR_i + \beta_2 RR_i + \beta_3 PCF_i + \mu_{i,}$$

Where

CDS_i is the price of the credit default swap for corporate bond *i*.

CR_i is the probability of default risk, i.e. the hazard rate or credit risk for corporate bond *i*.

RR_i is the recovery rate of corporate bond *i*.

PCF_i is the potential cash flow (i.e. either terminal or recovery cash flow) for corporate bond *i*.