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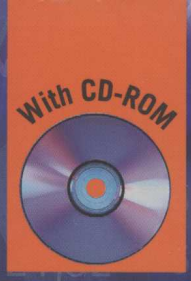

Cash CDO modelling in Excel

A Step by Step Approach

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Darren Smith and Pamela Winchie

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Foreword

The fixed income markets have always been centres of innovation and creativity. This much is apparent from even a cursory glance at developments in recent and not-so-recent history. However it is only in the last thirty years or so that such innovation has really been required, as economic markets changed significantly and capital started to move freely. The bond markets have been the conduit through which vital capital has been raised; continuing product development in the markets has made a significant, and irreplaceable, contribution to global economic progress. The range of products available is vast and always growing, as the needs of both providers and users of capital continually alters in response to changing conditions. This economic dynamic means that market participants observe a state of constant learning, as they must if they are to remain effective in their work. Inevitably we are required to become specialists, as each segment of the debt markets demands increasingly complex approaches in addressing its problems and requirements.

Of course, users of capital are not limited to existing products for raising finance or hedging market risk exposure. They can ask an investment bank to design an instrument specifically to meet their individual requirements, and target it at specific groups of customers. For example it is arguable whether the growth of some of the so-called "credit-card banks" in the United States could have occurred so rapidly without the securitisation mechanism that enabled them to raise lower-cost funding. Witness also the introduction of the synthetic collateralised debt obligation (CDO), allied with a credit derivative, following rapidly on the development of more conventional CDO structures and designed to meet purely credit risk management requirements. The increasing depth and complexity of the markets requires participants to be completely up-to-date on the latest analytical and valuation techniques if they are not to risk being left behind. It is clear that we operate in an environment in which there exists a long-term interest in the application of ever more accurate valuation and analytical techniques.

The arcane and specialist nature of the structured finance markets means that as a topic they are rarely reviewed in the mainstream media. This contributed to a great deal of misunderstanding amongst legislators, journalists, the general public and even some regulators in the wake of the financial crash of 2007-2008. That "CDOs" were stated by some to have been the cause of the crisis reflects the general level of ignorance at all levels. This is unfortunate. To blame the crash on financial engineering is akin to blaming cars for road deaths. Legislation in the wake of a rise in road fatalities is usually connected with making the roads safer, not banning cars. Without a doubt, heavy losses on holdings of structured credit securities were behind the trouble at some banks, but amongst the high-profile bank failures were a number of

institutions that did not hold such assets, and had instead neglected their liquidity management. The simple fact is that securitisation and financial innovation have been a force for much good in the world, particularly in an era of globalisation. To take one example, one should know that the mobile phone industry is a large user of capital markets finance. To witness, as I have done, a rickshaw puller on the streets of Dhaka, average salary $1 per day, using a mobile phone is to observe the social benefits of a free market in capital, technical innovation and financial engineering coalescing in one exotic moment.

Speaking personally, I stress the importance of constantly staying at the leading edge of financial market research and development to ensure that, as bankers, we continue to deliver quality and value to our clients. Much of the innovation and product development in the markets originates from an ongoing discussion with the client base, as banks seek to meet their customer requirements.

That is why this book, from two experienced practitioners, is such a welcome publication. It is a rare beast in the universe of finance literature in actually telling one how to do something, rather than being simply an academic treatise on how one does things in a classroom. It is the authors' clarity of approach and focus that I am most excited about. They provide insight into practical techniques and applications used in the structured finance markets today. The content also sheds light on the scope and significance of these techniques in the world of finance. I am impressed by the level of detail herein on exactly how to go about building the cash flow model, something that I believe would be of use to a wide range of finance professionals, not just those concerned with structuring CDO transactions.

Another feature about this book that I personally recommend is its value for first-time practitioners. If one is working on an asset-backed security (ABS) or CDO transaction at a bank that has not previously closed such a deal, then this is a useful reference to have on the desk. Post-credit crunch, many banks that had not previously originated ABS deals sought to close "in-house" transactions to create collateral for use at the European Central Bank and Bank of England repo windows. The contents of this book would be of great interest to such bank practitioners. As such, this book deserves a wide readership.

It is a privilege to be asked to write this foreword. The authors have produced a work of the very highest quality. As focused as it is comprehensive, this is an excellent contribution to the literature and sure to become a key reference work for anyone with an interest in the securitisation and structured finance markets. My hope is that this exciting and interesting new book spurs readers on to their own research and investigation; if they follow the application and dedication evident in this work, they will not be going far wrong!

Professor Moorad Choudhry
Department of Economics
London Metropolitan University
30 March 2010

Acknowledgments

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1 Introduction

There has been a lot written on credit derivatives during the past few years. However, much of what has been written about traditional "cash flow" collateralized debt obligations (CDOs) has been of an introductory nature. It has often been written from a research or legal point of view and there has been little discussion about the modelling and evaluation of these structures. In many books, cash CDOs are mentioned as part of a more generalized introduction to asset backed securities. According to data published by the Securities Industry and Financial Markets Association, the cash flow CDO market was over USD 400 billion in 2006. Unfortunately, the market in 2007 through 2009 was overshadowed by the "credit crunch", largely brought on by sub-prime mortgages, a major contributing factor was structured finance CDOs and their valuation. Contagion effects in the credit market virtually caused the collapse of all lending. A major theme was the mistrust in the markets that arose because of the lack of an agreed-upon valuation technique for structured finance vehicles (including CDOs). Notwithstanding these events, the authors believe that CDOs and specifically the modeling of CDOs, deserves more serious and dedicated attention.

The aim of this book is to introduce the modelling of cash flow CDOs, including construction of cash flows for both the underlying collateral and the issued notes, the evaluation of default probabilities and expected losses for rating agencies, and techniques and approaches that investors may use to value them. A newcomer to the CDO market ideally will be able to use the ideas in this book to construct her or his own models. A wider aim of this book is to encourage and promote discussion and debate about the modelling, evaluation and valuation of cash flow CDOs.

The authors acknowledge that there is not necessarily one right way to model. Every model is a compromise between several objectives including speed, flexibility, visibility, degree of automation, ease of change and verification. The book expounds the authors' views on best practice and utilizes their experiences in discussing the advantages and disadvantages of different approaches.

This book adopts a step-by-step approach to building a rudimentary model so that any reader who "sticks the course" will have a useful tool to evaluate cash flow CDOs and a template that can be built upon to suit personal taste and requirements.

1.1 TO EXCEL OR NOT TO EXCEL?

When cash CDOs were first being modelled, most modellers used spreadsheets as there was no dedicated software available. Over time, investment banks, large investors and collateral managers have developed or purchased licenses for dedicated CDO systems. These systems have varied from management tools to modelling and evaluation tools, depending on the needs of the users.

There are strengths and weaknesses to every system and tool. Microsoft Office Excel's biggest strength is that it allows for a great deal of flexibility: trivial changes to a model can be

done with relative ease. However, when changes are made that are more than trivial, without a disciplined and organized approach, this ease of change can quickly become Excel's biggest weakness. One of the themes of this book is consistent application of organization to avoid the chaos that can easily creep into a workbook model making it unusable over the medium to long term. This book will discuss techniques to layer a model design, by taking advantage of the spreadsheet layout. By limiting the links between the functional parts of the model, it is easy to replace those functions in the future. The authors have replaced Collateral Sheets and Waterfall Sheets on several occasions during the time they have been using similar models without impacting the rest of the model. This is achieved by limiting links between the inputs and outputs between the functional worksheets.

Most cash flow CDOs are bespoke: although they may start from a general template, they are customized investments that are tailored to specific investor requirements. Once a modeller has created a basic model using spreadsheets, the flexibility exists with Excel to quickly model and test new CDO structures. In contrast, if software or systems are developed away from spreadsheets, extensive support from a programmer may be required to make changes or the modeller may have to learn to program in a higher-level programming language. This can significantly delay the evaluation of a new feature or structure.

Another benefit to using Excel worksheets for cash flow modelling is their origin and pedigree in auditing and accounting. Worksheets still offer one of the best frameworks on which to base an audit tool. Even rating agencies use worksheets as the basis for the tools they offer.

This book assumes a certain familiarity and working knowledge of Excel. Should the reader find their knowledge insufficient, then one of the many excellent books on Exel should help remedy the situation.

1.2 EXISTING TOOLS AND SOFTWARE

What are the alternatives to using bespoke spreadsheets to evaluate CDOs? While the authors do not advocate any one of these systems and this book is not intended to be an advertisement for any of these systems, they believe it is important for the reader to know that there are alternatives available. Generally these can be broken down into:

- CDO management systems usually provided by trustees or other third parties to enable investors and asset managers to evaluate changes to the underlying asset/risk portfolio.
- Third party data and modelling systems mainly used by investors to track their portfolios without the onerous task of updating from trustee reports. Often these systems provide little or no analysis facilities but can be extended by bespoke development, either by the supplier or the licensee.
- Rating agency supplied systems, which frequently do not deal with the underlying structure and mainly model the performance of the underlying asset portfolio according to the rating agencies, criteria. At the time of writing, the exception to this is CDOEdge, which is a tool that Moody's Investor Services sell to model cash flow transactions to their methodology.

- Analysis systems which, to be successful, typically have a mechanism to encode the priority of payments cash flows of the CDO. They will also have means to do default, interest rate or other scenario analysis either by simulation or scenarios.

These systems are often expensive and require the vendor to maintain them. The modelling explained in this book is not necessarily looking to replace these systems but complement them. Often it is useful to interface spreadsheet models to these systems to avoid duplication and maintenance of underlying data.