

Structured Finance

Spring, 2013

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The structured finance (generally including asset securitization and credit derivative) market has grown significantly over the last few years and now exceeds both equity derivatives and corporate bond markets. We believe the outlook for growth remains strong as the product is increasingly adopted by traditional mainstream fixed income and credit investors and new instruments are developed very fast.

Against the background of rising regulatory concern about the evolution of structured finance market, a clear-cut definition of structured finance helps substantiate more viable debate about the resilience of credit risk transfer to financial shocks. This course is designed to deliver the premier of structured finance, help define the structured finance market and let you well understand the evolution of structured finance market.

The *Committee on the Global Financial System* (2005) defines structured finance more narrowly based on three characteristics that tend to be associated more specifically with asset securitization (rather than the entire universe of structured finance: “(i) pooling of assets (either cash-based or synthetically created), tranching of liabilities that are backed by the asset pool, (ii) de-linking of the credit risk of the collateral asset pool from the credit risk of the originator, usually through the use of a finite-lived standalone *special purpose vehicle* (SPV).”

In contrast, within a broader term, structured finance is used to describe a sector of finance that was created to help transfer risk using complex legal

and corporate entities. In this broader view, structured finance encompasses all advanced private and public financial arrangements that serve to efficiently refinance and hedge any profitable economic activity beyond the scope of conventional forms of on-balance sheet securities (debt, bonds, equity) at lower capital cost and agency costs from market impediments on liquidity. In particular, the distinction of the various methods of credit risk transfer through credit derivatives in a wider and narrower sense as well as securitization transactions illustrates the need for more comprehensive and judicious regulatory considerations.

Besides the complexity of structured finance fundamental, investments and issuances of structured finance require a wide-ranging, flexible and enforced supervision as well. Most structured investments (i) combine traditional asset classes with contingent claims, such as risk transfer derivatives and/or derivative claims on commodities, currencies or receivables from other reference assets, or (ii) replicate traditional asset classes through synthetication or new financial instruments. Structured finance is invoked by financial and non-financial institutions in both banking and capital markets if established forms of external finance are either (i) unavailable (or depleted) for a particular financing need, or (ii) traditional sources of funds are too expensive for what would otherwise be an unattractive investment based on the issuer's desired cost of capital. Regarding to structured finance issuance, it offers issuers enormous flexibility to create securities with distinct risk-return profiles in terms of maturity structure, security design, and asset type, providing enhanced return at a customized degree of diversification commensurate to an individual investor's appetite for risk. Hence, structured finance contributes to a more complete capital market by offering any mean-variance trade-off along the efficient frontier of optimal diversification at lower transaction cost. However, the increasing complexity of the structured finance market, and the ever growing range of products being made available to investors, invariably create challenges in terms of efficient assembly, management and dissemination of information. A good understanding of all these issues is incumbent on market participants as well as country officials charged with safeguarding financial stability and the sound operation of derivative markets.

The premier form of structured finance is *capital market-based risk transfer* (except loan sales, asset swaps, and natural hedges through bond trading), whose two major asset classes, *asset securitization* (which is mostly used for funding purposes) and *credit derivative* transactions (as hedging instruments), permit issuers to devise almost an infinite number of ways to combine various asset classes in order to both transfer asset risk between banks, insurance companies, other money managers and non-financial investors in order to achieve greater transformation and diversification of risk.

Asset securitization describes the process and the result of converting a pool of designated financial assets into tradable liability and equity obligations as contingent claims backed by identifiable cash flows from the credit and payment performance of these asset exposures. Securitization initially started as a way of depository institutions, non-bank finance companies and other corporations to explore new sources of asset funding either through moving assets off their balance sheet or raising cash by borrowing against balance sheet assets (“liquifying”) without increasing the capital base (*capital optimization*) in order to reduce both economic cost of capital and regulatory minimum capital requirements (*regulatory and economic motive*). ***There is a good example—Auction Rate Securities.*** Furthermore, since its inception, securitization has gone a long way in advancing further objectives beyond being a regulatory arbitrage tool. It has developed into an efficient and flexible funding and capital management technique for both financial institutions and large corporations. For example, ***the process of disintermediation & the function of transformation and fragmentation of asset exposures***

Credit derivatives are predicated on the isolation and transfer of credit risk as reference asset. As a common working principle, they involve the sale of contingent credit protection for pre-defined credit events and/or asset performance. In their basic concept, credit derivatives sever the link between the loan origination and associated credit risk, but leave the original borrower-creditor relationship intact. In general, we distinguish between credit derivatives in the *narrower* and in a *wider sense*. In addition to *pure*

credit derivatives, such as Credit Default Swaps (CDSs), Total Return Swaps (TRSs), and *credit spread options*, the broader classification of derivatives in a wider sense also includes *hybrid* and *securitization* products with constituent credit derivative elements, such as *traditional collateralized debt obligations* (CDOs) of bonds and loans, or other *partially funded* or *unfunded* structured finance products, e. g. *credit-linked notes* (CLNs) and *synthetic* CDOs, which are essentially securitization transactions for refinancing (through cash flow restructuring) and tranche-specific credit risk transfer (though the sale of credit protection or the issuance of *leveraged super-senior* (LSS) tranches).

We discuss single-name CDS, TRS, CLN as well as the CDS index market in the first half of this course. The second half takes an in-depth look at the exotic credit derivatives market including correlation and volatility products; e.g., CDOs, LSSs , Credit Spread Option, etc.

Structured finance is a fascinating field of study. In particular, the recent financial crisis on the subprime market, the leveraged loan market, the Government Sponsored Enterprises (i.e., Fannie Mae & Freddie Mac) and the Auction Rate Securities (ARS) continues to bring new impacts on our financial markets. What happens in these markets affects the quality of our lives every day in many different ways. Moreover, these financial markets are dynamic institutions continually "putting on a new face" in the form of new services, new instruments, and new methods. Thus, there are abundant materials deserved to be studied. Due to the limited time, however, this course provides only **the fundamental introduction** to these vast, quick- & ever-changing markets. To those want to build their career upon this area, they should strengthen their knowledge in this area through continued reading and personal involvement, e.g, writing a thesis.

The course is intended for advanced MBA/EMBA students, particularly those who are specializing in the field of finance, business administration, international business, or economics. On the analytical tools, the math. used in this course has been kept to a minimum so that students need not worry whether their quantitative trainings are enough or not. However, students should be equipped with good knowledge in probability and statistics.

The course meets once a week. Analytical abilities are grounded on the conceptual foundations developed in the lectures on each topic and via exercises. So, there will probably be homework assignments every week. The news appearing on international media such as Reuters, Bloomberg & Wall Street Journal and local media, for example Economic Daily News and Commercial Times, are probably adapted in homework assignments so that we can relate this course to the current issues on our economy. I encourage students to bring related issues into the class, therefore grades will be based on class discussion (15%), homework assignments (15%), and a final closed-book examination (70%).

There is no a definite textbook. However, I shall more or less follow the following book: (1) Frank Fabozzi, Henry Davis, and Moorad Choudhry, "Introduction to Structured Finance", 2006, John Wiley and Sons Pte Ltd. (2) Janet Tavakoli, "Structured Finance and Collateralized Debt Obligations: New Developments in Cash and Synthetic Securitization", 2nd Edition, 2008, John Wiley and Sons Pte Ltd. These books are good ones and deserve to be held. They are certainly not inexpensive so that whether buy or not is up to you.

The following topics will be covered. The reading list is not complete, and will be added to. It is not my intention to discuss every topic on the list because of the limited time. Thus, how far we can go depends on how much time we together want to spend.

Topic 1 Credit Derivatives & Definition of Structured Finance.

– A Market Overview

- Market evolution: Moving Beyond Single-Name CDS
- Market importance: The Role of Credit Derivatives
The Growth of Credit Derivatives
- Market structure: By product; Where is Activity Concentrated?
- Market size: Size Relative to the Corporate Bond Market
- Market participants & Reference entities
- Market challenges: Cash Settlement of Index and Tranches
The Assignment (or Novation) Challenge
Deepening the Market

Topic 2 Credit Derivatives

- Documentation and Credit Derivative Terms
- Credit Default Swaps
- Credit Default Swap Index
- Basket Default Swaps
- Asset Swaps
- Total Return Swaps
- Economics of a Total Return Swap.

Topic 3 CDS Basics & Valuation

Default swaps are a means of transferring credit risk between counterparties. This section gives an overview of the basics using an example transaction. It also discusses the pricing of single-name default swaps including the asset swap approach and the use of default probability models to imply survivability of a reference entity.

Topic 4 Unwinding CDS -- Mechanics for terminating contracts

When entering into credit default swaps, the well established arbitrage relationship with the cash market is typically the relative value starting point. The procedure for unwinding default swap trades though is a key difference between cash and synthetic credit markets. The methodology and results can at first be counterintuitive.

Topic 5 Upfront Pricing of CDS -- Compare upfront vs. running CDS spread

CDS usually trades on a full running spread basis. Under certain conditions, however, it can trade on a full upfront payment basis or on some combination of upfront payment and running spread. The payoff profile of upfront CDS versus running CDS is crucially dependent upon the timing of future defaults. This section discusses upfront pricing of CDS in more detail.

Topic 6 Valuing the CDS Basis -- Comparing CDS with the cash market

The arbitrage relationship provides a fundamental linkage between default swap premiums and asset-swapped par bonds. However, the yields on the two instruments frequently do not correspond to what this arbitrage relationship tells us. The difference between the asset swap spread and the CDS premium is known as the CDS basis.

Topic 7 What Drives the Basis? Why do cash and default market spreads diverge?

The yield of corporate bonds and premiums on default swaps are linked through the asset swap arbitrage relationship. In theory, the spreads should trade closely in line. In reality it is the exception rather than the norm for CDS to trade on a flat basis to the cash market. In fact, the relationship can be highly volatile and the levels can diverge greatly. The CDS basis can be negative or positive as an end result of a range of forces both structural and technical pulling the CDS in different directions.

Topic 8 CDS Structural Roadmap -- Key structural considerations

We discuss some key structural considerations, with a primary focus on documentation and interpretations of the 2003 ISDA Credit Derivatives Definitions (2003 Definitions). For CDS investors, these structural issues mostly come into focus when credit events occur or when reference entities become subjects of M&A activities. A full legal analysis is beyond the scope of this topic of a fixed income research report.

(No lecture for this topic, yet the reading material will be distributed)

Topic 9 Basic Principles of Securitization.

- What Is a Securitized Transaction?
- Illustration of a Securitization
- Reasons Why Entities Securitise Assets
- Benefits of Securitization to Investors
- What Rating Agencies Look at in Rating Asset-Backed Securities
- Description of the Collateral
- Prepayments Measures
- Defaults and Delinquencies.

Topic 10 Securitization Structures

- Use of Interest Rate Derivatives in Securitization Transactions
- Credit Enhancement
- More Detailed Illustration of a Securitization.

Topic 11 CDS Indices -- The ABCs of CDX and iTraxx indices

The introduction of CDS indices, such as the iTraxx in Europe and Asia, and CDX in North America and Emerging Markets, have revolutionized the trading of credit risk due to their liquidity, flexibility and standardization. In this session, we will discuss the indices in general and the two major index groups, iTraxx European and CDX North America, in particular.

Topic 12 CDS Investment Strategies -- Using CDS to enhance returns

CDS investment strategies are significantly broader than those for cash credit instruments. Investors can take either long or short credit positions, use funded structures such as CLNs, combine CDS and bonds in basis trades and construct curve trades (both in different maturities and ranking). CDS technology has also introduced more advanced risk and sensitivity measures of credit investment strategies.

Topic 13 Credit-Linked Notes

- Description of CLNs
- Illustration of a CLN
- Investor Motivation
- Settlement
- Forms of Credit Linking
- The First-to-Default Credit-Linked Note

Topic 14 Exotics Credit Derivatives -Tried and Tested

Since late 2003, the credit derivatives market transformed itself from a primarily single-name only market to a more complex market of single-name, index, correlation and options. Starting from this topic, this course deals primarily with correlation and volatility based products. This includes single-tranche synthetic CDOs (STCDO), first-to-default (FTD) baskets, CDS options and other related products.

Reading List

1. Andersen, L., J. Sidenius, and S. Basu, "All your hedges in one basket," *Risk magazine*, November 2003.
2. Black, F. & J.C. Cox, "Valuing Corporate Securities: Some Effects of Bond Indenture Provisions," *Journal of Finance*; 1976; 31, 351-367.

3. Duffie, D. and K. Singleton, "Modeling Term Structure of Defaultable Bonds," *Review of Financial Studies*; 1999; 12, pages 687-720.
4. Elizalde, Abel, "Credit Risk Models I: Default Correlation in Intensity Models," *Working Paper*, CEMFI and UPNA, December 2005.
5. Elizalde, Abel, "Credit Risk Models II: Structural Models," *Working Paper*, CEMFI and UPNA, November 2005.
6. Elizalde, Abel, "Credit Risk Models III: Reconciliation Reduced – Structural Models," *Working Paper*, CEMFI and UPNA, November 2005.
7. Elizalde, Abel, "Credit Risk Models IV: Understanding and pricing CDOs," *Working Paper*, CEMFI and UPNA, December 2005.
8. Giesecke, K., "Portfolio Credit Risk: Top Down vs. Bottom Up Approaches," *Frontiers in Quantitative Finance: Credit Risk and Volatility Modeling*, Wiley(2008)
9. Hull, J. and A. White, "Valuing Credit Default Swaps I: No Counterparty Default Risk," *Working Paper*, April 2000, U. of Toronto.
10. Hull, J. and A. White, "Valuing Credit Default Swaps II: Modeling Default Correlations," *Working Paper*, April 2000, U. of Toronto.
11. Hull, J., and A. White, "Valuation of a CDO and nth to Default CDS without Monte Carlo Simulation," *Journal of Derivatives*, 12(2004), 8-23.
12. Hull, J. and A. White, "Valuing Credit Derivatives Using an Implied Copula Approach," *Journal of Derivatives*, 14, 2(2006), pages 8-28.
13. Hull, J., and A. White, "Dynamic Models of Portfolio Credit Risk: A Simplified Approach," *Journal of Derivatives*, 15,4 (2008),9-28.
14. Laurent, Jean-Paul & Gregory, Jon, "Basket Default Swaps, CDO's and Factor Copulas", *Working Paper*; 2003.
15. Li, David X., "On default correlation: A copula function approach," *The Journal of Fixed Income*; Mar. 2000; 9, 4; ABI/INFORM Global, pg. 43.
16. Li, David X., "Constructing a Credit Curve," *Credit Risk Special Report; Risk*, November 1998.
17. McGinty, L., Beinstein, E., Ahluwalia, R. & Watts, M., "Credit Correlation : A Guide", JPMorgan, 2004.
18. McGinty, L., Beinstein, E., Ahluwalia, R. & Watts, M., "Introducing Base Correlation", JPMorgan, 2004.

19. McGinty, L. and R., Ahluwalia, ““A Model for Base Correlation Calculation”, JPMorgan, 2004.
20. Merton, R. C., “On the Pricing of Corporate Debt: The Risk Structure of Interest Rates,” *Journal of Finance*, 29(1974), 449-470.
21. O’Kane, D. and M. Livesey, “Base Correlation Explained”, Lehman Brothers, 2004.
22. Parcell, Ed. And James Wood, “Wiping the smile off your base (correlation curve),” *Technical report, Derivative Fitch*, 2007.
23. Vasicek, O., “Probability of Loss on Loan Portfolio,” KMV Corporation (1987).
24. Vasicek, O., “Limiting Loan Loss Distribution,” KMV Corporation (1991).
25. Vasicek, O., “ Loan Portfolio Value,” *Risk*, 15, December, (2002) 160-162.