Course Overview
This is an MBA level course on Risk Management for financial institutions. The quantitative level is commensurate with that and presumes a working knowledge of basic probability and statistics.

Although the course has no pre-requisites or co-requisites, students are expected to have taken the equivalent of a basic course in capital markets. Thus, students are expected to have a basic, common-sense understanding of yield curves, credit spreads, bond math and the essential characteristics of options.

Although all the major types of financial risk will be reviewed, the primary focus of the course will be on the measurement, management, mitigation and interrelationship of market, credit, and liquidity risk.

Risk management is an art and a science. It requires an understanding of markets, products, processes and systems, law and regulation, as well as quantitative methods. It also requires an examination and understanding of the causes and consequences of the systemic financial crisis and large financial losses that have occurred in the past. Although our focus will be on quantitative methodologies, these other subjects are a crucial part of the context for understanding financial risk.

The course will be a mixture of theory and practice, with a focus on how large banks actually measure, limit, and manage their financial risks.

Content
The course will consist of five parts:

- **First part – Brief overview**
  - Overview of the course and the major types of financial risk.
  - The components of risk management. Risk policies, risk analytics, risk measurement and reporting, risk monitoring and limits framework.
  - A review of standard accounting categories (Accrual, Marked-to-market, Available for Sale/OCl) used to measure value and income and their relation to how the risks of a portfolio are measured and managed.

- **Second part – Market risk**
The sub-types of market risk (trading risk, accrual interest rate risk, and equity investment risk).

A high level review of market trading risk, including:
- Discounted cash flow models and model risk.
- For each primary form of contract (cash, forward, swap or option) and each major type of market factor (interest rate, credit spread, FX, equity, commodity) we will review:
  - Discounted cash flow models and market risk factors, i.e. the fundamental prices, rates, and implied factors that determine market value.
  - The calculation of market factor sensitivities.
- The foundations for measuring, reporting, and managing market trading risk:
  - Market factor sensitivities and factor sensitivity limits.
  - Basic trading portfolio risk measures: Value at Risk (VAR), Expected Short-Fall, and stress tests.
- Value at Risk (VAR) in more detail
  - Alternative methods for measuring VAR
  - Historic volatilities and correlations of market factors in normal and stressed conditions. Normal vs. fat tailed distributions.
  - The use and misuse of VAR; supplementing VAR with other risk measures.

Measurement and management of interest rate accrual risk in the banking book.

Equity investment risk.

- Third part – Funding Liquidity Risk
Definitions of funding liquidity risk for both the banking book and the trading book. The relationship between funding liquidity risk and trading liquidity risk. Funding illiquidity as one of the two fundamental causes of financial collapse. Measuring and managing short-term and long-term funding liquidity risk.

- Fourth part – Credit risk
We will primarily focus on wholesale credit. The measurement of credit risk begins with the assessment of the probability of default (PD) of an obligor. Topics covered will include:
  - Historical default rates and economic cycles.
  - Different methods for estimating obligor risk ratings and PDs,
  - Historical rating transition matrices. Cumulative default rates and hazard rates.
  - Loss Given Default (LGD) and collateral.
  - Exposure at Default (EAD) for contingent credit.
- Credit spreads, PDs, and liquidity risk.
- Methods for simulating the probability distribution of the credit loss at a portfolio level; credit concentration risk
- Credit risk mitigation.

Counterparty credit risk is a form of credit risk arising from OTC derivatives and securities financing transactions (e.g. repos). The exponential growth of the OTC derivative market over the past 25 years (notional principal of over $648 trillion as end of 2011) has made this an increasingly important form of credit risk. In contrast to the credit risk of a loan portfolio, counterparty credit risk is characterized by uncertain future exposures, offsetting exposures and bilateral credit risk. Topics will include:

- Methods for simulating a counterparty’s exposure profile, taking into account the effects of legally enforceable margin and netting agreements
- The definition, measurement and hedging of the Credit Value Adjustment (CVA) for counterparty credit risk.
- Economic Capital for counterparty credit risk.

Regulatory pressure will result in many derivatives between large financial institutions moving to central counterparties (CCPs). We will discuss the current status of this and other regulations on derivatives.

Over the last decade an increasing number of banks have engaged in active credit portfolio management. The goals and methods of active credit portfolio management will be discussed.

**Fourth part – Economic and regulatory measures of firm-wide risk.**

**Allocation of capital and measurement of return on allocated capital.**

The definition and measurement of economic capital (EC). EC and the measurement of solvency risk. How EC is measured for each risk type. Measuring EC for the firm as a whole across all risk types. EC and systemic stress tests.


The integration of risk measurement with strategic planning. Economic capital, regulatory capital and solvency risk. Liquidity risk constraints. Optimizing the return on economic capital and regulatory capital.

Measuring marginal EC or marginal regulatory capital requirements for businesses and transactions. Return on risk vs. shareholder value added.
Fifth part – Analysis of large financial losses in the past.

Leverage, solvency risk and funding liquidity risk in a financial crisis. Funding liquidity risk and trading liquidity risk in a financial crisis.

Depending on questions and class discussions, we may not have time for every topic. Judgment will be used to ensure that the most important issues are covered.

Guest Lectures
Industry practitioners may give some guest lectures.

Pre-requisites and Co-requisites
None

The course assumes a basic understanding and a general familiarity with the types of traded capital market instruments (i.e. debt and equity securities, foreign exchange, forwards, swaps, options and other derivatives). The course assumes an understanding of discounted cash flow models as applied to bonds and forward contracts and an understanding of the essential components and features of Black-Scholes option formula.

Goals of course
The primary objective of the course is to teach you the nature of the major types of financial risk and the principles and methods underlying the quantitative measurement, management, and mitigation of these risks. There will be a particular focus on the market risk in trading portfolios, the several forms of credit risk, funding and trading liquidity risk, and the interaction of market, credit and liquidity risk.

Lectures
The primary content for the course will come from the lectures. The lectures will consist of original material which will be distributed as a PowerPoint file before each lecture.

Textbook
No textbook is required. (See “other reading material” below).

Homework
I will assign homework exercises which you can work on by yourself or in a group. The exercises are to facilitate your own learning. The more you work on
problem solving the better you will learn the material. The homework will not be graded.

**Other reading material**
I will provide additional reading material on selected topics. Some of the material will be background information to supplement class lectures and will be required reading. Some of the material will be optional reading if you want to dig deeper on some topics.

**Method of Evaluation**
The grade for the course will be based on class participation (10%), the mid-term (30%) and the final exam (60%).
## Tentative schedule of lectures (subject to change)

<table>
<thead>
<tr>
<th>Date</th>
<th>Num</th>
<th>Primary topic(s) covered in lecture</th>
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<tbody>
<tr>
<td>Jan 29</td>
<td>1</td>
<td><strong>Course Overview. Market Risk.</strong> Factors Sensitivities (FS) of spot FX, equities and commodities.</td>
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<tr>
<td>Feb 3</td>
<td>2</td>
<td>FS for debt securities</td>
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<td>FS of forwards and futures</td>
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<td>10</td>
<td>FS of forwards and futures continued</td>
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<td>12</td>
<td>FS of options and FS summary</td>
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<td>17</td>
<td>When does spot FX arise in in a multinational financial institution? Measuring and managing spot FX risk. Two different accounting treatments (MTM and OCI).</td>
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<td>19</td>
<td>Setting FS limits.</td>
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<td>24</td>
<td>VAR</td>
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<td>April 2</td>
<td>26</td>
<td><strong>Accrual Interest Rate Risk</strong> in the banking book</td>
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<td>Mar 3</td>
<td>10</td>
<td><strong>Funding Liquidity Risk and trading liquidity risk</strong></td>
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<td></td>
<td>5</td>
<td>Liquidity risk continued</td>
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<td>10</td>
<td><strong>Mid-Term Exam</strong></td>
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<td>24</td>
<td><strong>Credit Risk</strong> – Introduction to credit risk. Basic risk parameters needed to measure credit risk: EAD, PD, and LGD.</td>
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<td>26</td>
<td>Continuation of basic concepts and methods for measuring credit risk.</td>
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<td>31</td>
<td>Continuation of basic concepts and methods in credit risk.</td>
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<tr>
<td>Apr 2</td>
<td>16</td>
<td>Counterparty credit risk of OTC derivatives</td>
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<td>7</td>
<td>Counterparty credit risk and CVA</td>
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<td>9</td>
<td>CVA continued</td>
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<td>14</td>
<td>Other Risks: <strong>Operational Risk, Model Risk</strong> and model validation.</td>
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<td><strong>Economic Capital</strong></td>
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<td>Economic Capital continued for specific risk types</td>
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<td>23</td>
<td><strong>Basel and regulatory capital</strong></td>
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<td>28</td>
<td>Basel and regulatory capital continued.</td>
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<td>30</td>
<td><strong>Financial Crisis</strong> – Lessons learned.</td>
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