FRE 6123: Fall 2019
Re-Engineering Risk Finance

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Course Outline: Motivations

- Risk Finance: Risk management and Assets Pricing are both fundamental foundations to Financial and Risk Engineering.
- Risk and Data have now assumed the front row seat of Finance.
- Re-Engineering Financial Risk Management is defined by how we our models and data define their existence, their properties, present and future, their consequences, their models, their validity , resilience and their tracking. Pricing and the management of risks are fundamental purposes we have focused attention to.
- Quant risk management is how we bridge theory and practice in an era where financial relationships in the Business of Finance has changed. Relationships between Financial Institutions, Traders, Globalization, Technology, Regulators etc. their consequences and implications defines financial risks.

The foundations of conventional Financial Risk Management

- Increasingly, there are well paid jobs for financial risk managers. Why?? Regulation complexity etc. Compliance; Greater uncertainty and global risks due to the mutation of finance (compared to a predictable future), Global Strategic, regulatory and what not have contributed to a financial environment far more difficult to understand and profit from. Financial engineers with a far broader sense of finance compared to fundamental fince is therefore in a far greater demand
- What does Risk Finance requires: A broad appreciation of financial economic theories, mathematical, computational and statistical finance to model, hedge, analyze and solve and manage financial risks; A greater understanding of Macroeconomic trends, political and geopolitical risks and assess their effects on returns, losses, contagions and financial sustainailty
- Risk Finance includes but requires far more than the standard models tools for pricing financial futures, options, volatility, extreme risks, contagions, Optional Greek sensitivity and risk sensitive portfolios.
- Risk Finance is more than a technique, it is a commitment to a controllable financial culture change

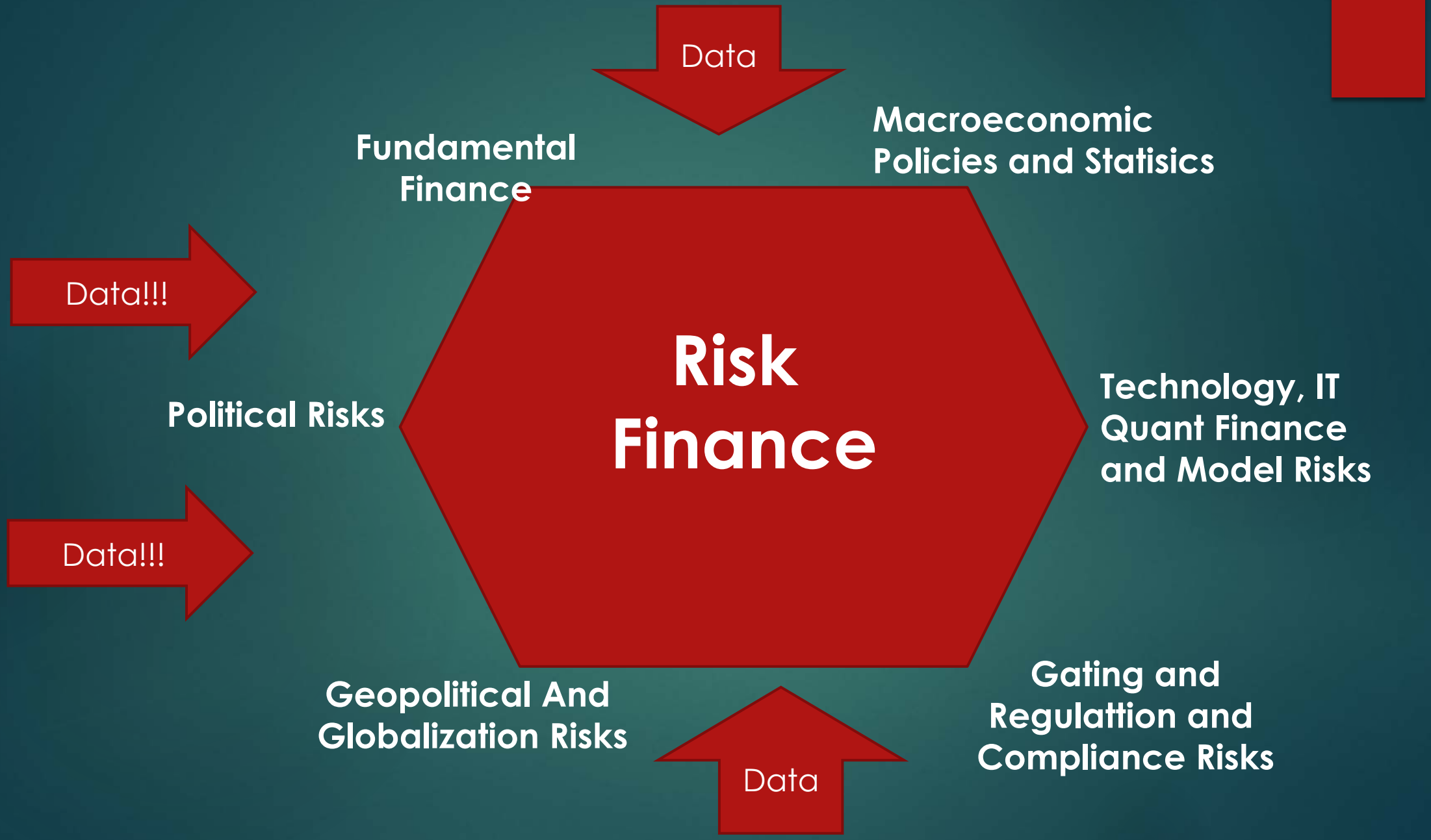
Risk Finance and Data Today

- Data is both managed and managing.
- Managing data is a function that statistical analysis attends to.
- Data Algorithmic Management states what we we want or can.
- Data science, Machine Learning, Deep Learning and Artificial Intelligence
- dictates what we want , what it want us to do and what we endup doing

- Both, imply risks and controls that are structurally different with consequences we can hardly predicts and estimate
- Conventional financial engineering is model and statistical based
- Data finance, is its inverse, it uses algorithms and data to to construct the models and their estimates dictating what we ought to do.

Risk Finance is changing today

- From a finance of implied certainty to one of recognized uncertainty while data assumed embedded in randomness is measured as a presumed certainty.
- From a complete market finance to that of a derived finance of Macroeconomic policies and teir statistics; Political Risks, Geopolitical events and their consequences and Globalization
- Gating—including regulation and compliance to a world of competing regulations and the costs and consequences of non-compliance. (see next graph)
- With a data analytics approach altering and challenging conventional statistical models analyses.


Data
Fundamental Finance
Macroeconomic Policies and Statisics
Data!!!
Political Risks
Risk Finance
Technology, IT Quant Finance and Model Risks
Data!!!
Geopolitical And Globalization Risks
Data
Gating and Regulattion and Compliance Risks

What the Course seeks to do:

- The course provides an introduction to the Risk Finance of today
- Introduce the quant and statistical fundamental elements of Risk Finance
- Extend these tools to the new complexity and challenges of risk and data finance.
- Provide Applications, learning exercises and Discussion of cases
- Bridging the theories of risks and their practice.
- Expanding the outreach of financial risks and data management

- What you have to do:
  - Attend Classes; Homeworks—conceptual and quantitative; read scheduled papers;
  - Mid Term Exam; Final Exam; Report a Project at the end of the term.
- What I will distribution:
- PPT for some lectures: Lecture notes to prepare for my lectures;
- Text book on the fundamental aspects of Risk Finance (published) and Financial Data and AI (in process)
  - Reference Book 2015: Charles Tapiero Risk Finance and Assets Pricing Wiley
  - Reference Book: Charles Tapiero, Engineering Risk Finance,
  - Reference Book (in process): Financial data and Artificial Intelligence
- An assistant will be available to help you in your homework

Selected Topical Elements of the course

- **Introduction to Risks Today?** Risk? Math? Compliance? Regulation? Valuation? Price? Exchange decisions? Hedging? Trading? , Financial Products (stocks, bonds, options, etc.) …what are these and why are these also important and is Risk Prone
- **Specific Financial Risk Quant Elements?** Risk, Compliance, Risk Measurement and Management, Hedging, Trading, Risk Management, Compliance and Regulation valuation and price
- **Decisions and Risk Management:** Risk? And Uncertainty, present vs the future, the future present!; Utility ; Markets Theory and Pricing in Finance: Option and Hedging; Financial Products…liquidity, denominations and obligations, Options, the Greeks; Credit Risk and Credit Derivatives And More …if we can
- **Data and Financial Risks:** Statistical Learning (mostly Bayesian approaches), Elements of data science applied to credit risks, time series applications, global warming, predicting stock prices etc.

Detailed Course Outline at a Glance: Part 1

- Lecture 1: Introduction and Overview: Risk Finance Today! , Finance and Data; Risk Management, Globalization, Financial regulation and Asset Pricing, Risk and Uncertainty : Ref: Chapter 1, Tapiero C.S., Wiley
- Lecture 2: Measuring Risk, Statistical Risk Models and Risk Exposure in Finance (Lecture Notes to be distributed, see also Chapter 8)
- Lecture 3: Measuring Historical Volatility and ARCH-GARCH Modeling
- Lecture 4: Utility Theory-Definition and derivation of Essential Terms, Chapter 3; Utility and Financial Risk Management-Applications, pricing (certain equivalent, premium), portfolio management Chapter 3 second part
- Lecture 5: Discounting, Bonds and default bonds, Credit Risks, Insurance, chapters 3 and chapter 7
- Lecture 6: Review of Problems and Homeworks and Mid Term Examination

Continued: Part 2

- Lecture 7: Complete markets, Probability Measures and the meaning of risk neutrality and Assets Pricing. Models' risk pricing approaches: Options as Financial Insurance Products: The Binomial Model, and Discrete Time Models, Chapter 5 (with numerous applications)
- Lectures 8-9: A presentation of Lognormal continous time finance and derivatives. The Greeks, and Financial Risk Management lecture notes and case applications to credit risks and credit derivatives, debts and loans risks with options)
- Lecture 10-11: Data and Risks, and Risk Finance Data; outline of the data (Black Box approach); implied statistical models and inverse modeling.
- Lectures 12: Element of Machine Learning and Risk (mostly applied by case problems with Bayesian Networks, and Neural Networks to financial time series)
- Lecture 13: Globalization, Compliance and Regulation and stattegic risks
- lecture 14: Final Examination and Projects presentation

Risks and Finance

Galaxy of Risks

(Partial listing)

CAPITAL MARKET RISK ADVISORS

I will no be able to cover everything !!!

But you should be motivated to pursue these topics at more advanced and complex problems.

your own.