

MOSCOW  
EXCHANGE

Moscow University  
Risk Management

Class #1 – Intro: Risk Management

Lecturer: Luis A. B. G. Vicente  
September/2015



# Class #1 – Risk Management

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- 1 Course Objectives, Program and Dynamics
- 2 Risk, Uncertainty and Complexity
- 3 Financial Institutions – Key Risk Dimensions
- 4 The Increasing Importance of Financial Risk Management
- 5 Annex



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# Course Objectives, Program and Dynamics

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## Objectives

Understand what financial risk management is all about

Risk management – *lato sensu* – as a discipline

Main risk dimensions in financial institutions

Focus on market risk and, to a lesser extent, credit and liquidity risks

Quantitative models and financial risk

Acquire the basic knowledge that will serve as the foundation for further development



# Course Objectives, Program and Dynamics

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## Format

14 classes during 3 ½ months

Handouts, bibliography, exercises

We will cover a lot of information during a very short period of time

Self study plays a major role

## Individual assessment

Individual written exam on 23.12, weight 40%

Individual project to be delivered by 23.12, weight 60%

Grades from 0 to 5,  $\geq 3$  pass,  $< 3$  fail



# Course Objectives, Program and Dynamics

Class	Date	Topic	Subject	Description
1	24.09 (LV)	Prelude	Intro: Risk Management	<ul style="list-style-type: none"><li>– Introduction and course dynamics;</li><li>– Risk, uncertainty and complexity;</li><li>– Main sources of risk in financial institutions: market risk, credit risk, liquidity risk, legal risk, compliance risk, reputational risk, strategic risk;</li><li>– The increasing importance of risk management activity in financial institutions.</li></ul>
2	30.09 (LV)	Finance	Financial Markets and Financial Instruments	<ul style="list-style-type: none"><li>– Fixed income instruments: government bonds, corporate bonds, fixed and floating;</li><li>– Equities: Listing, IPOs, secondary market;</li><li>– FX: main currencies, currency pairs;</li><li>– Derivatives: forwards, futures, swaps and options;</li><li>– Exchange vs. OTC markets.</li></ul>
3	07.10 (DA)	Finance	Interest Rate Theory I	<ul style="list-style-type: none"><li>– The time value of money;</li><li>– Principal and interest;</li><li>– NPV and IRR calculation;</li><li>– The yield curve: yield, spot and forward rates.</li></ul>
4	14.10 (DA)	Finance	Interest Rate Theory II	<ul style="list-style-type: none"><li>– Bootstrapping the yield curve;</li><li>– Pricing fixed income instruments;</li><li>– Duration and Convexity;</li><li>– Immunization.</li></ul>



# Course Objectives, Program and Dynamics

Class	Date	Topic	Subject	Description
5	21.10 (LV)	Finance	Mean-Variance Portfolio Theory and CAPM	<ul style="list-style-type: none"><li>– Random returns: mean, variance and covariance;</li><li>– Portfolio mean and variance;</li><li>– Diversification effect;</li><li>– The Markowitz Model;</li><li>– The Capital Market Line;</li><li>– The Capital Asset Pricing Model (CAPM).</li></ul>
6	28.10 (LV)	Finance	Basic Derivatives Pricing I	<ul style="list-style-type: none"><li>– Non-arbitrage arguments and derivatives pricing;</li><li>– Pricing linear derivatives – forward, futures and swaps;</li><li>– Options and the put/call parity.</li></ul>
7	04.11 (LV)	Finance	Basic Derivatives Pricing II	<ul style="list-style-type: none"><li>– Price dynamics and risk neutral pricing;</li><li>– Pricing options using the binomial model;</li><li>– Pricing options using Monte Carlo simulations;</li><li>– Pricing options using the Black-Scholes model.</li></ul>
8	11.11 (LV)	Market Risk	Linear Risks – Identification and Sensitivity Analysis	<ul style="list-style-type: none"><li>– Definition of risk factors and risk exposures;</li><li>– Linear decomposition of financial instruments into risk factors;</li><li>– Calculating risk exposures;</li><li>– Sensitivity analysis: single instruments and portfolios.</li></ul>



# Course Objectives, Program and Dynamics

Class	Date	Topic	Subject	Description
9	18.11 (DA)	Market Risk	Value at Risk (VaR) – Definition and Parametric Estimation	<ul style="list-style-type: none"><li>– Value at risk definition;</li><li>– Parametric VaR estimation for a single instrument using linear risk exposures;</li><li>– Using the variance-covariance matrix to calculate parametric VaR estimates for a portfolio of financial instruments.</li></ul>
10	25.11 (DA)	Market Risk	Non-Linear Risks and Other VaR Estimation Techniques	<ul style="list-style-type: none"><li>– Limitations of the parametric approach;</li><li>– Full valuation techniques;</li><li>– VaR using historical simulations;</li><li>– VaR using Monte Carlo simulations.</li></ul>
11	02.12 (DA)	Market Risk	Extreme Market Events	<ul style="list-style-type: none"><li>– Fat tails, crisis and black swans;</li><li>– Stress testing;</li><li>– EVT estimates;</li><li>– Expected shortfall.</li></ul>
12	09.12 (DA)	Credit and Liquidity Risk	Credit and Liquidity Risk Management	<ul style="list-style-type: none"><li>– Default risk and loss given default;</li><li>– Ratings, yield spreads and the price of private debt;</li><li>– Credit transition models and credit risk estimation;</li><li>– Market liquidity risk, market depth, bid-ask spreads and liquidity risk adjustments;</li><li>– Funding, liquidity mismatch, gap analysis.</li></ul>





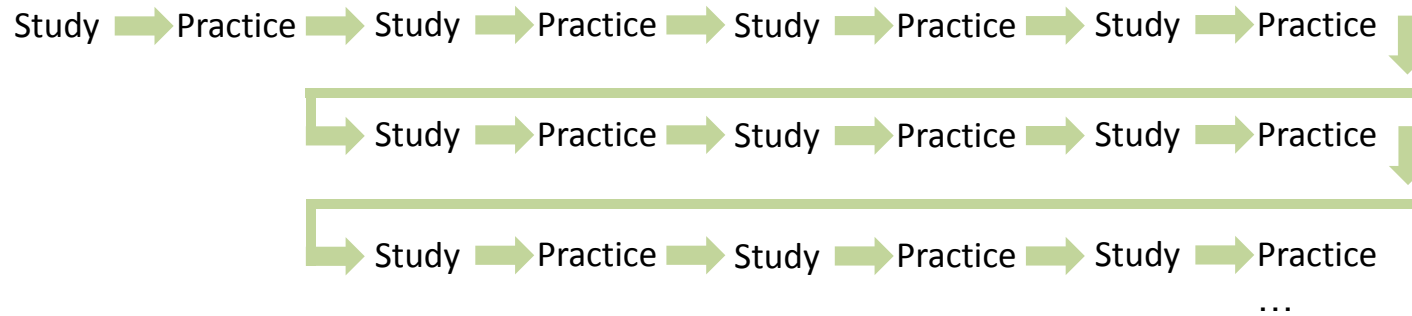
# Course Objectives, Program and Dynamics

Class	Date	Topic	Subject	Description
13	16.12 (LV)	Epilogue	Current Issues in Risk Management	<ul style="list-style-type: none"><li>– The complexity spiral;</li><li>– Limitations in financial modelling;</li><li>– Lessons from recent financial crises and bank failures;</li><li>– Global regulation of financial markets.</li></ul>
14	23.12 (LV & DA)	Final Exam	Final Exam	<ul style="list-style-type: none"><li>– Final exam.</li></ul>



# Course Objectives, Program and Dynamics

## Becoming a professional risk manager



## Financial risk management is a relatively new discipline

Financial innovation

Changes in prudential regulation

Advances in risk modeling

Models provide only approximations – need for real world experience



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# Risk, Uncertainty and Complexity

## Classical definition of risk and uncertainty

Frank Knight, 1921

### Risk

Known outcomes, known probabilities

Tossing an unbiased coin

Outcomes

Head or tails

Probabilities

50%, 50%

### Uncertainty

Known outcomes, unknown probabilities

Getting caught cheating on your girlfriend/boyfriend

Outcomes

Forgiven or not forgiven

Probabilities

Unknown\*

(\* Very low, anyway)

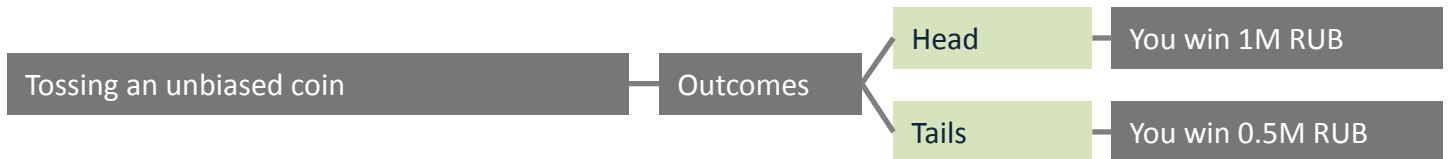


# Risk, Uncertainty and Complexity

## Another interpretation – Two-tailed and lower-tail risks

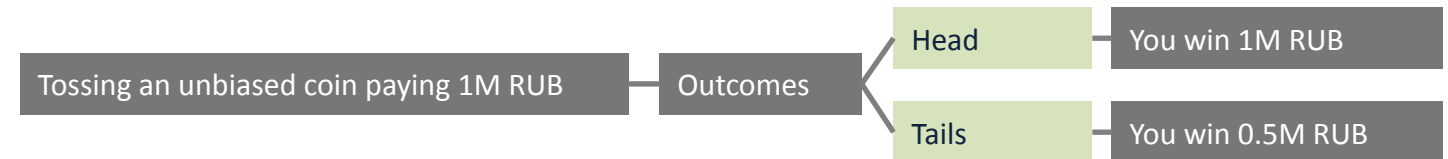
### Two-tailed

Uncertainty about future outcomes



### Lower-tail

Uncertainty about future adverse outcomes



Lower-tail risk is also known as “downside risk”

In risk management, more often than not

Models consider all possible outcomes

Yet the main objective is to estimate downside risks

This is reflected in standard definitions of financial market risks



# Risk, Uncertainty and Complexity

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Complexity makes matters even worse

Non-linear financial instruments

Contingent claims

Highly coupled markets

High frequency trading

Incomplete markets



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# Financial Institutions – Key Risk Dimensions

## Key Risk Dimensions

### Market Risk

- Risk of losses due to adverse market movements.

### Credit Risk

- Risk of losses given the default of a borrower or;
- Risk of losses given a (negative) change in a borrower's credit outlook (decrease in market value).

### Liquidity Risk

- Risk of losses because market prices are too size sensitive (shallow markets) or;
- Risk of not having resources on a timely fashion (funding risk).

### Operational Risk

- Risk of losses due to IT failures, human error, fraud, insufficient contingency planning, etc.

### Legal Risk

- Risk of losses due to violation of laws and/or regulations or;
- Risk of losses due to defective contracts.

### Image/Reputational Risk

- Risk of losses due to events that would damage the company's reputation.

### Strategic Risk

- Risk of losses due to poorly implemented business strategies.





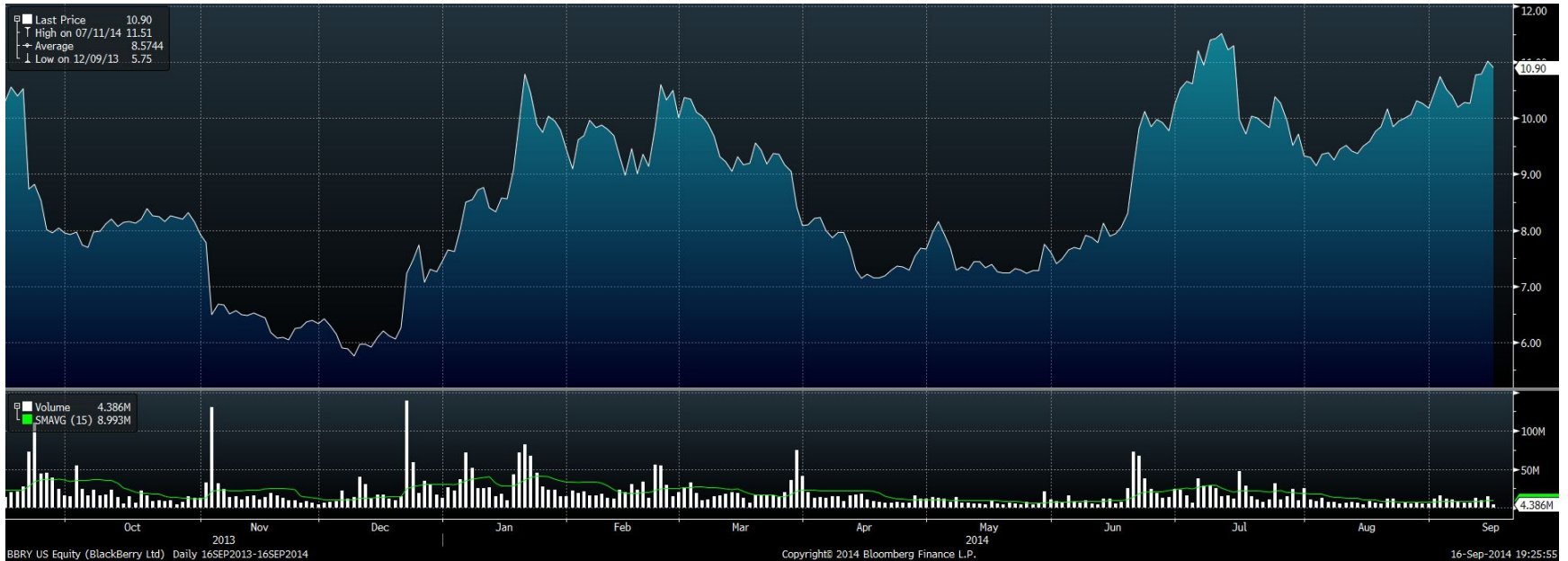
# Financial Institutions – Key Risk Dimensions





# Financial Institutions – Key Risk Dimensions

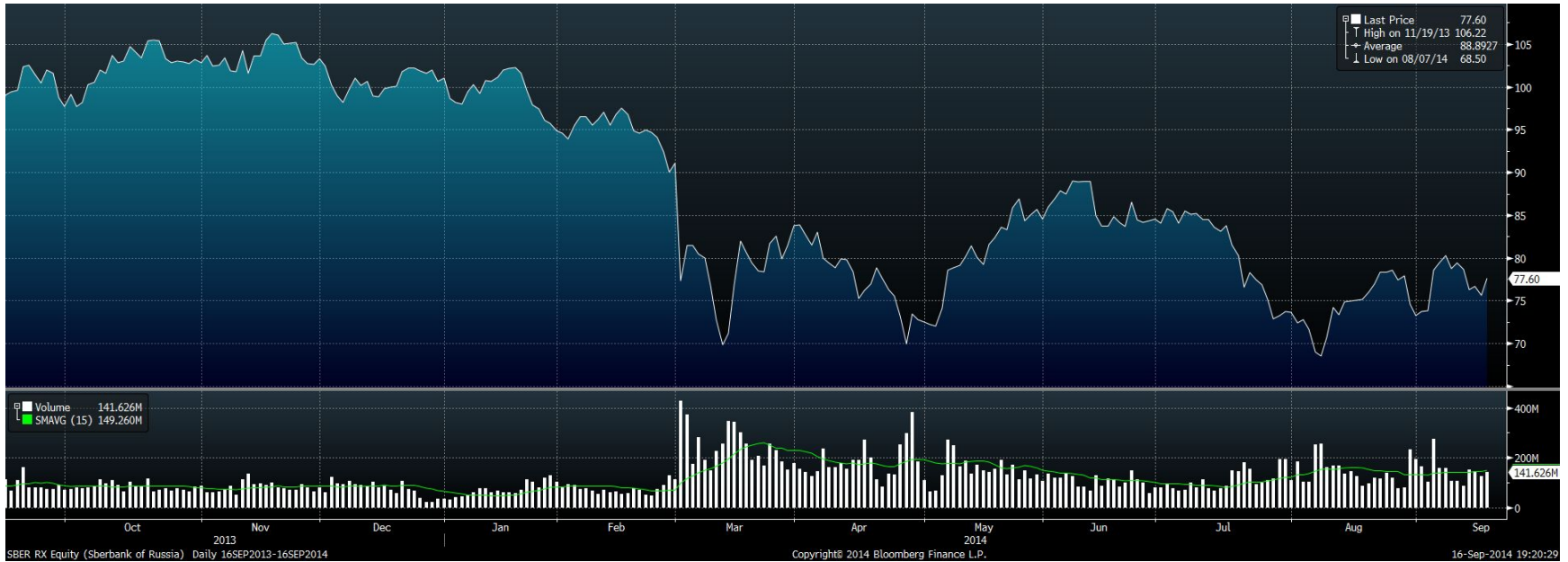
## Market and Liquidity Risk - Blackberry





# Financial Institutions – Key Risk Dimensions

## Market and Liquidity Risk - Sberbank





# Financial Institutions – Key Risk Dimensions

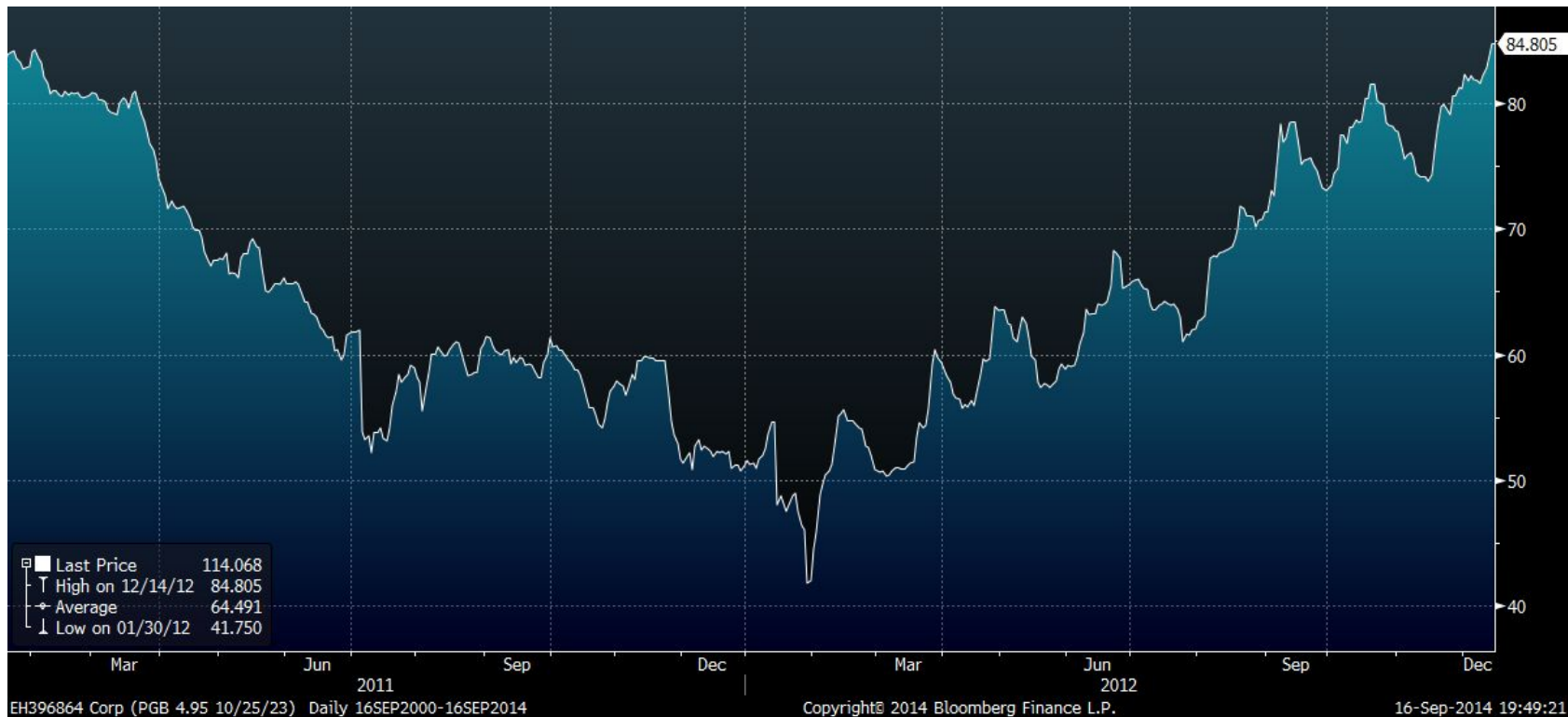
## Credit Risk - Greece





# Financial Institutions – Key Risk Dimensions

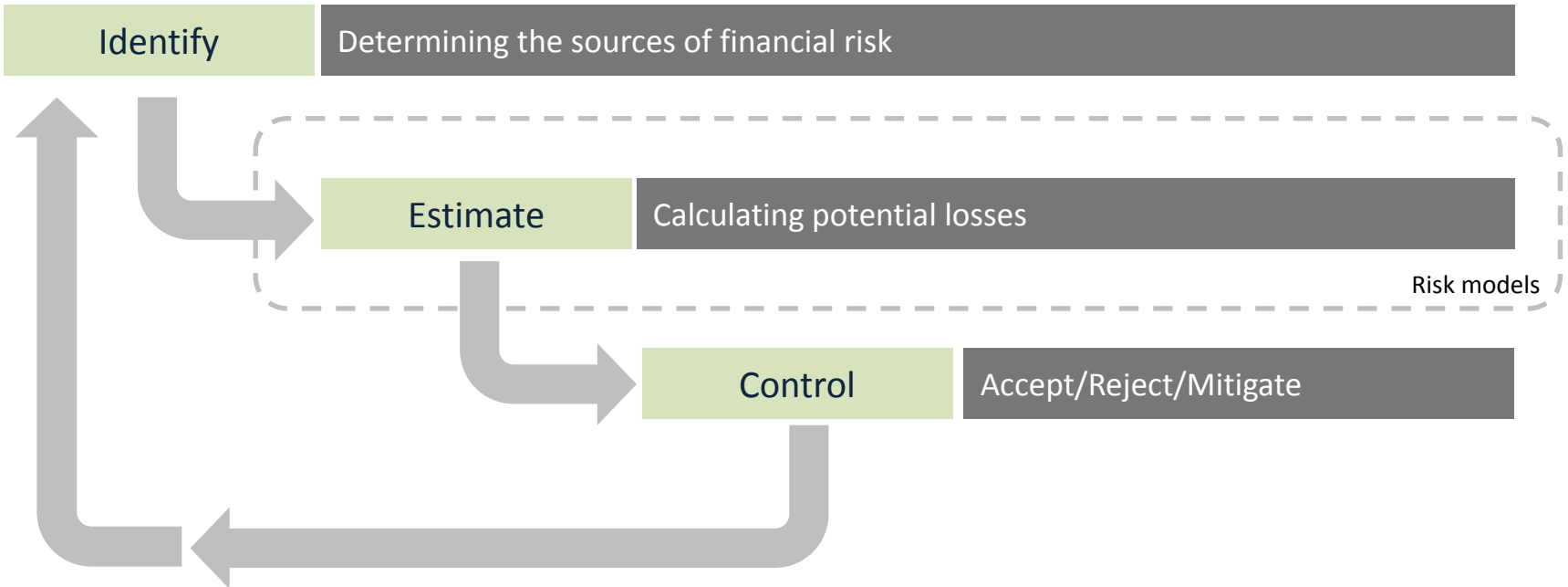
## Credit Risk - Portugal





# Financial Institutions – Key Risk Dimensions

## Financial Risks – Identification, Estimation and Control



**Model Risk** An ongoing hot topic throughout the course



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# The Increasing Importance of Financial Risk Management

## From the financial sector perspective

Financial innovation creates new risks – non-linear derivatives, securitization, credit derivatives...

More often than not financial institutions cannot afford the costs of avoiding some markets and/or products

Clients demands for “one-stop-shop” platforms

Race for profitability – comparison with competitors and investor attraction

Better risk management means more adequate allocation of resources and improved capital protection

Shareholders push for profitability but at the same time want investment protection

## From the regulators perspective

Individual bank failures entail huge social costs

Possibility of contagion and systemic failure

Adequate risk management fosters financial stability





# The Increasing Importance of Financial Risk Management

## Financial Innovation

Is there a real social benefit in financial innovation?

This is actually a much debated topic

Essentially, financial innovation created the means for:

- Enhanced hedging/insurance opportunities, lowering overall costs

- Cheaper access to financing for companies and individuals

Yet, there is a strong argument for limiting the use over-complex, over-leveraged instruments



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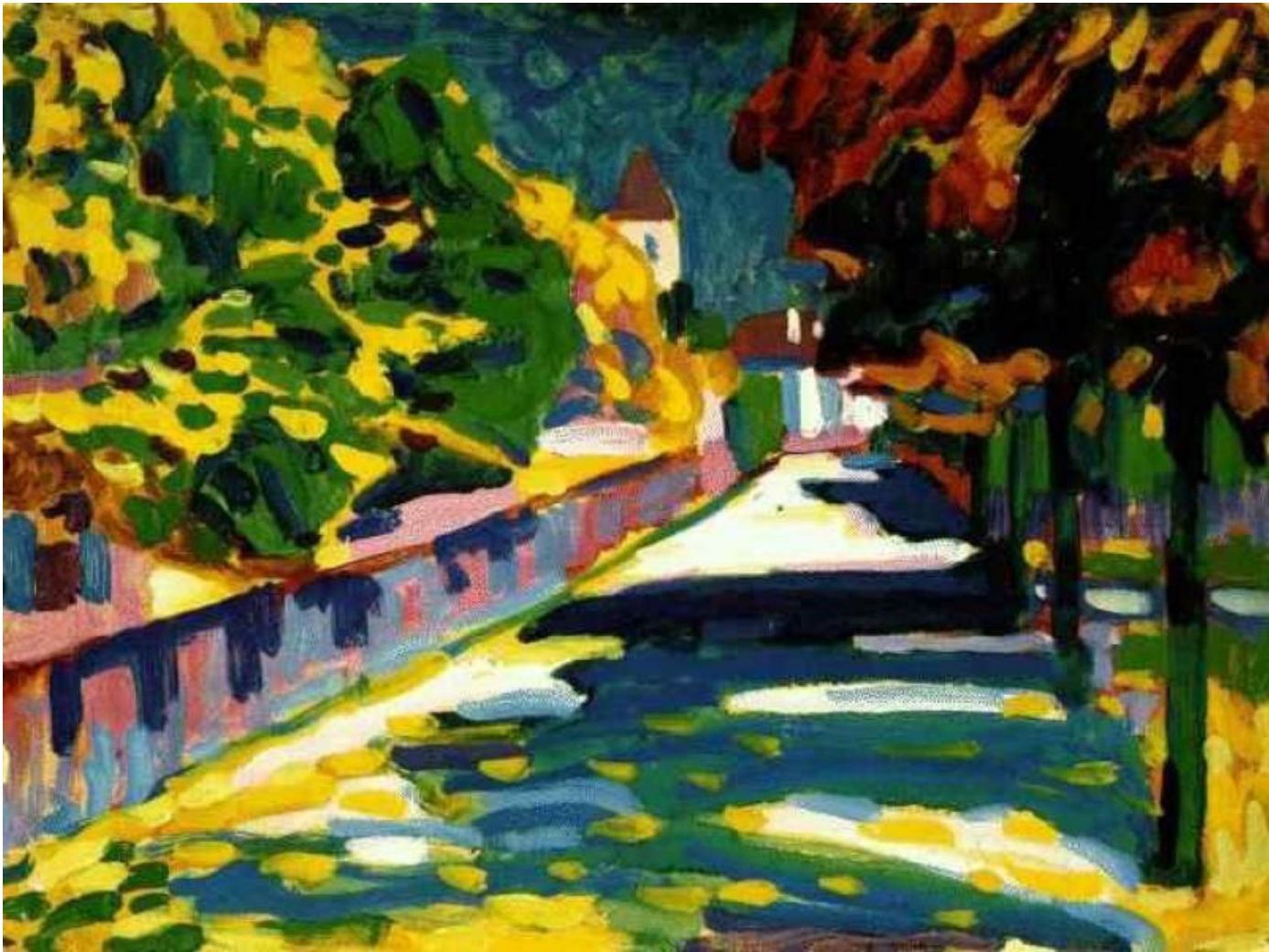
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## Useful References

- Risk Management and Financial Institutions, John Hull, (2012);
- Value at Risk: The New Benchmark for Managing Financial Risk, Philippe Jorion (2006);
- A Demon of Our Own Design: Markets, Hedge Funds, and the Perils of Financial Innovation; Richard Bookstaber (2007);
- The Present and the Future of Financial Risk Management, Carol Alexander (2005),  
[http://www.carolalexander.org/publish/download/JournalArticles/PDFs/JFEc\\_3\\_1\\_3-25.pdf](http://www.carolalexander.org/publish/download/JournalArticles/PDFs/JFEc_3_1_3-25.pdf)
- Q&A: Emanuel Derman on Model Risks, Why Quantitative Finance is not a Theory, and Bailout Ethics, Risk and Emanuel Derman (2011),  
<http://www.risk.net/risk-magazine/interview/2108323/-emanuel-derman-model-risks-quantitative-finance-theory-bailout-ethics>



Vassily Vassilyevich Kandinsky, *Autumn in Bavaria*, 1908