



**May  
2010  
Moscow**

---

**Historical Development  
Of  
Risk Management  
And  
Theoretical Background**

**Prof. Dan Galai**



# Major Dates

---

- - **1944 The Bretton-Woods agreement on fixed exchange rates.**
- - **1968-1972 Moving to flexible exchange rates**
- - **1973 Opening of the CBOE**
- - **1982 Options on exchange rates**
- - **1988 The BIS Accord on credit risk**
- - **1998 The BIS Accord on market risk**
- - **2007 The Sub-Prime Crisis**
- - **2008 Basel II**

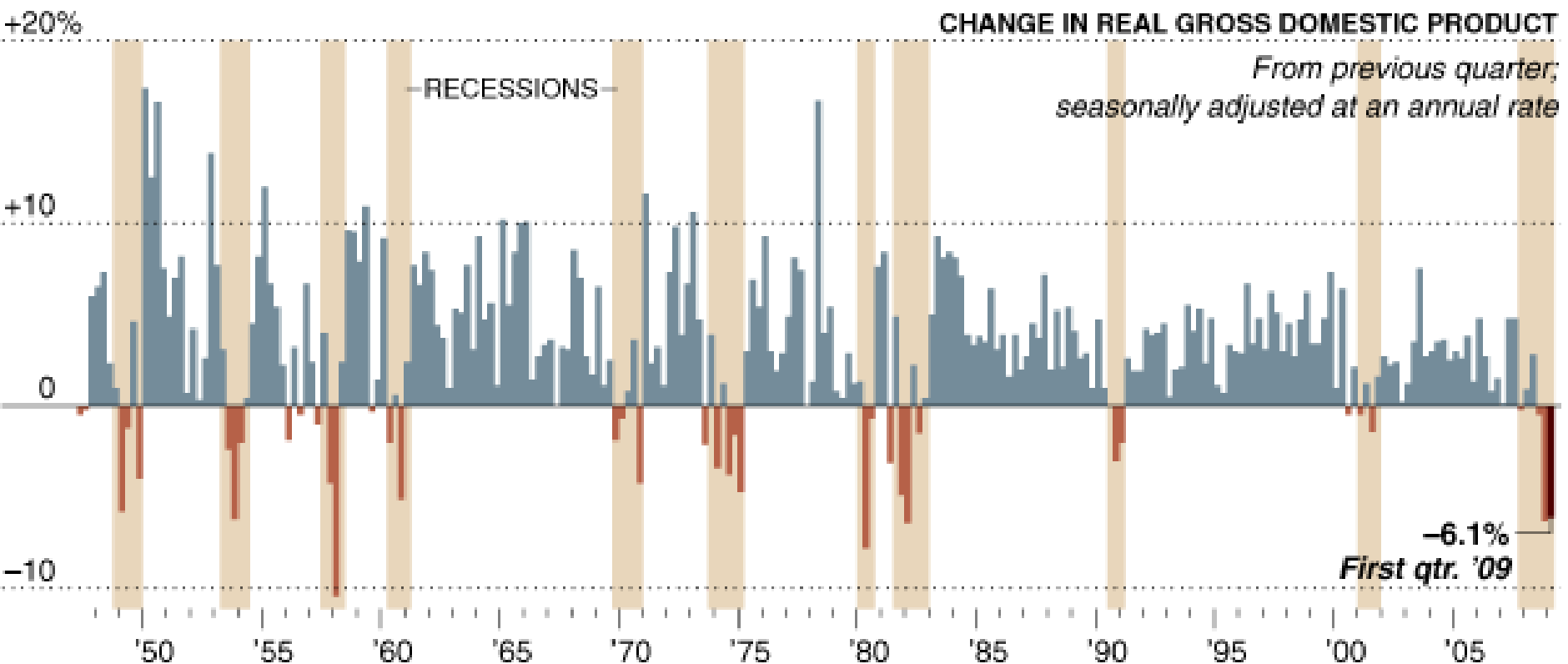


# The Recent Crisis

---

- **Last severe recession was during 1989-91**
- **US was on the verge of a recession after Oct. 2000**
- **Consumer goods sector compensated for industrial sector**
- **Low interest rates, especially after Sep. 11, 2001**
  - **years of real estate expansion**
- **Excess liquidity pouring to the US**
- **Search for yields-creation of credit derivatives and the sub-prime market**

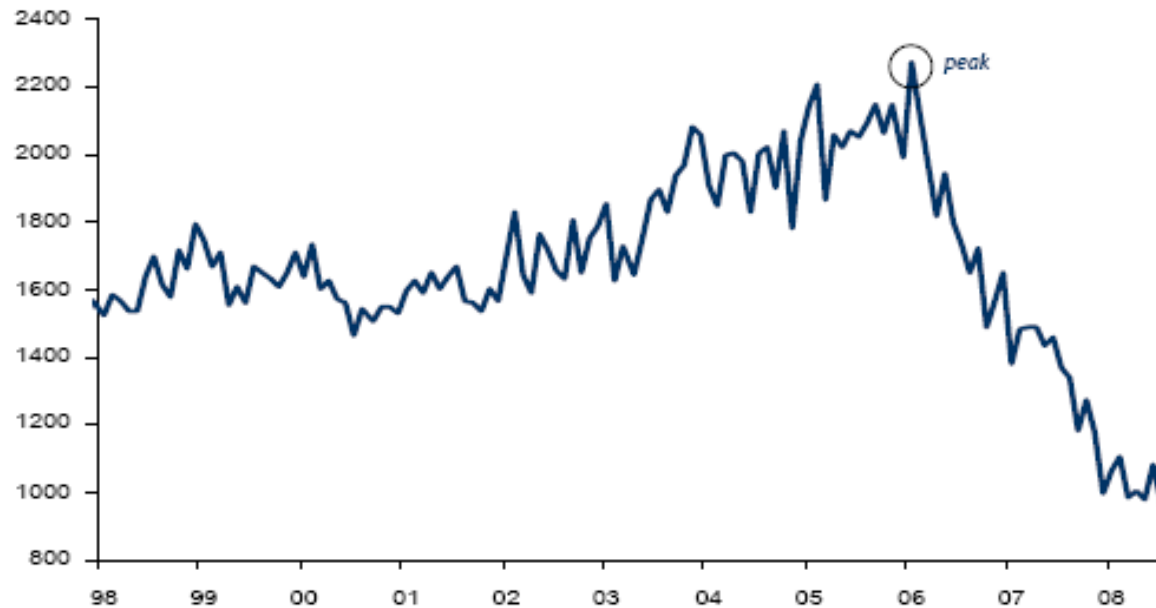
# Economic Cycles-The USA History



Source: Bureau of Economic Analysis; National Bureau of Economic Research

# The Recent Crisis

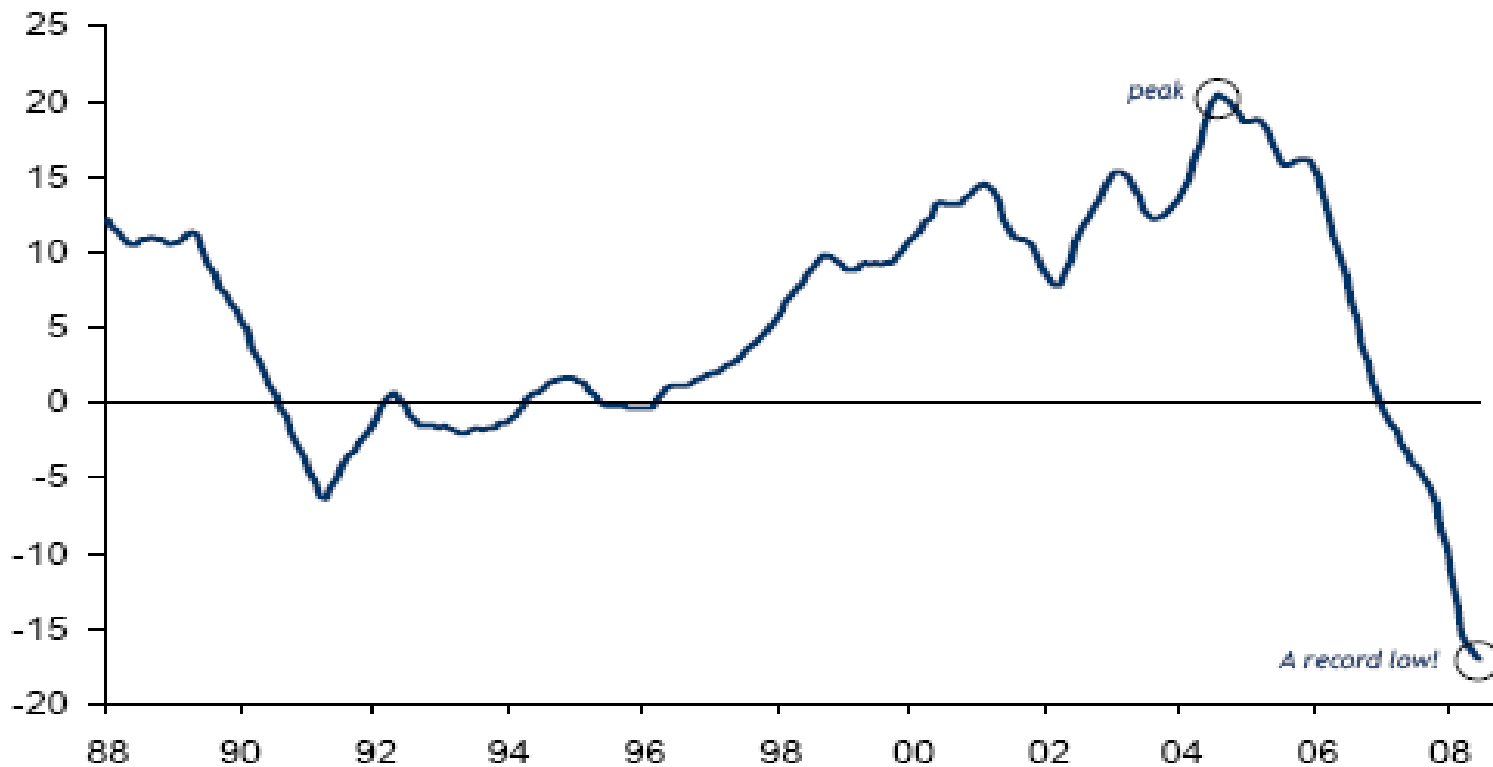
Housing Starts  
(thousands)



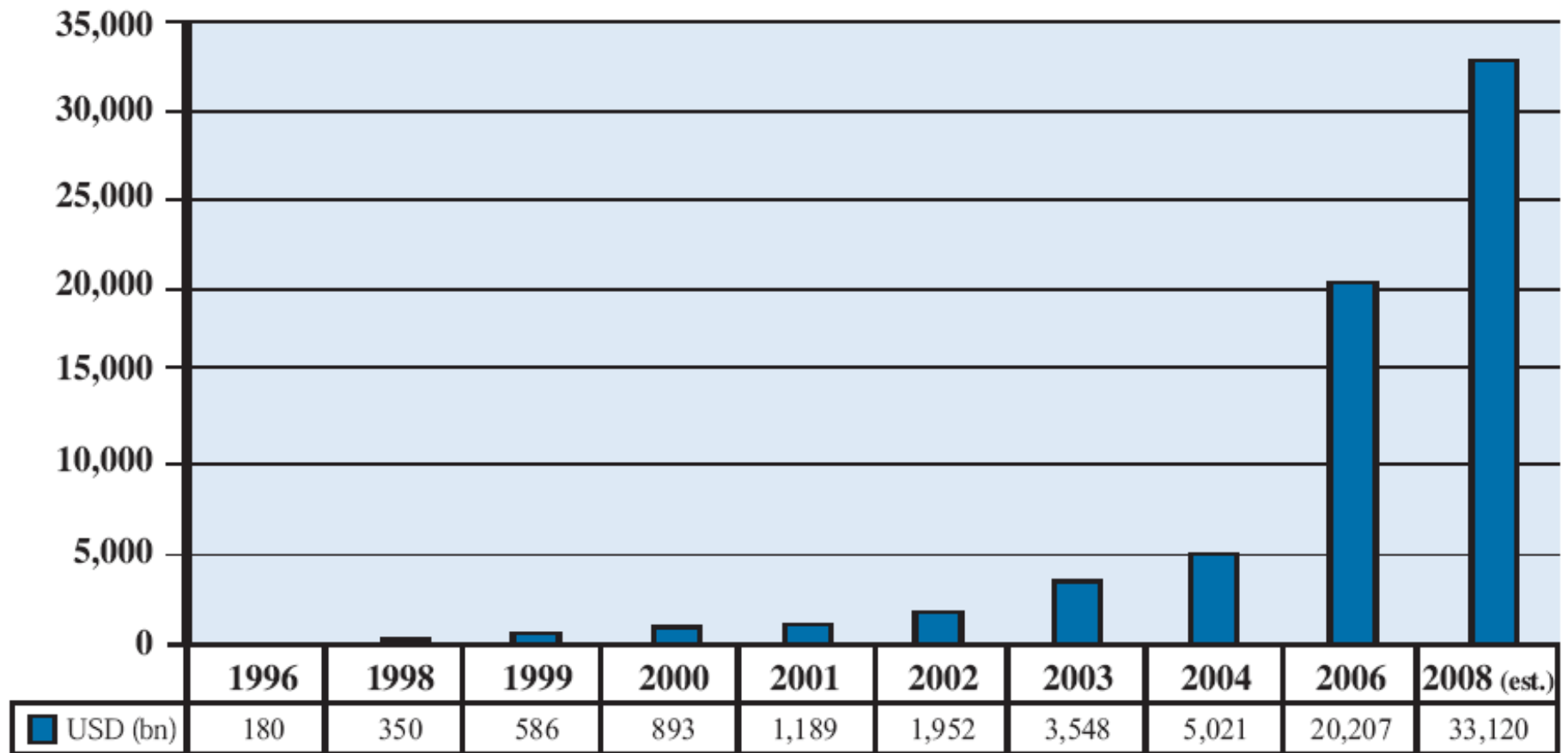
Source: Census Bureau, Merrill Lynch

# The Case-Shiller Home Price Index

Case Shiller Home Price Index (Composite 10)  
(year/year % change)

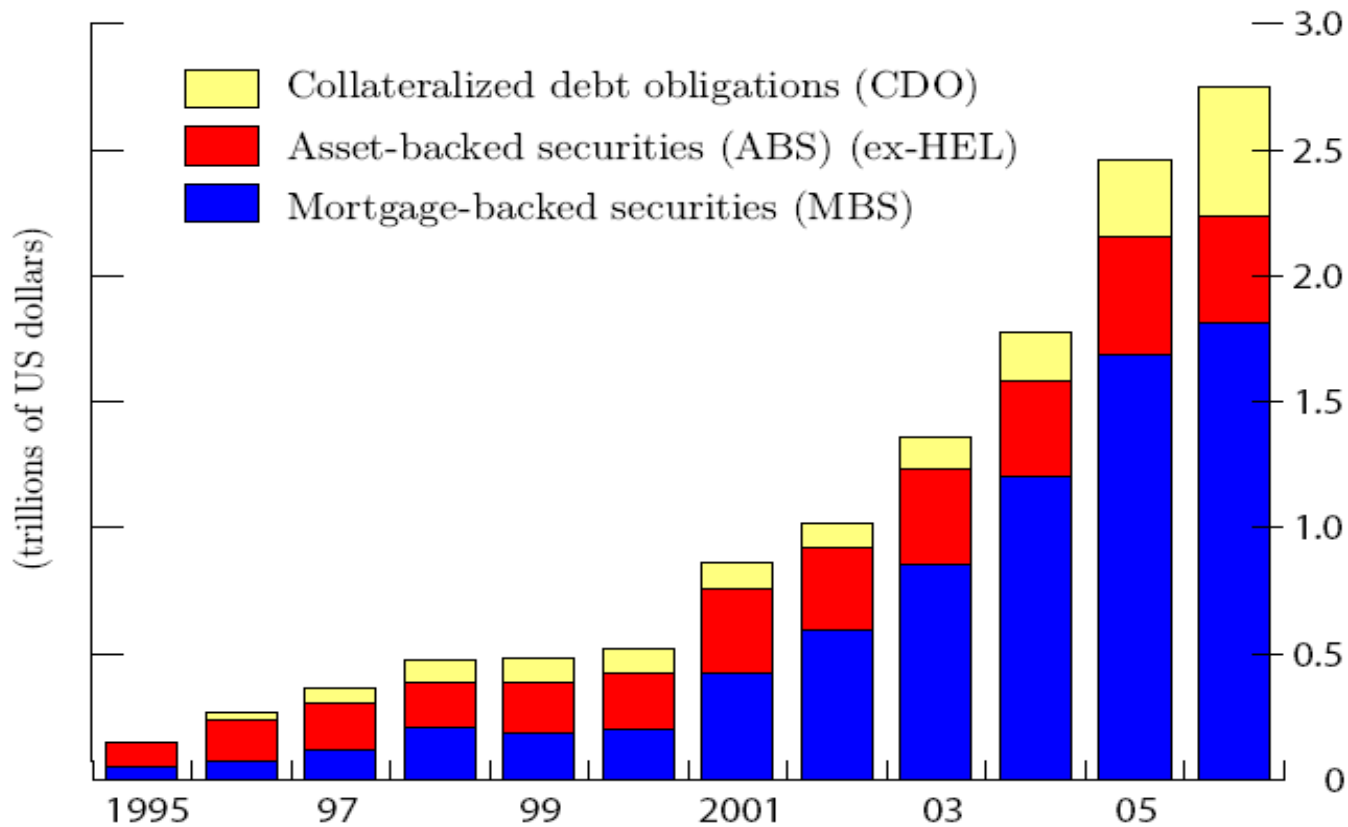


# The Recent Crisis



**Global Credit Derivatives Market \$bn**

# The Recent Crisis







# The Recent Crisis-2007

---

- **Interest rates are on the rise since 2005**
- **Real estate market halted in 2006**
- **Re-pricing of many loans in 2007**
- **Bankruptcies in the sub-prime market increased**
- **Baer Stearns went bust while trying to save its hedge funds**
- **Risk premium went up sharply**
- **Bank losses within 12 months amounted to \$500 billion and to close to a trillion dollars by year end**



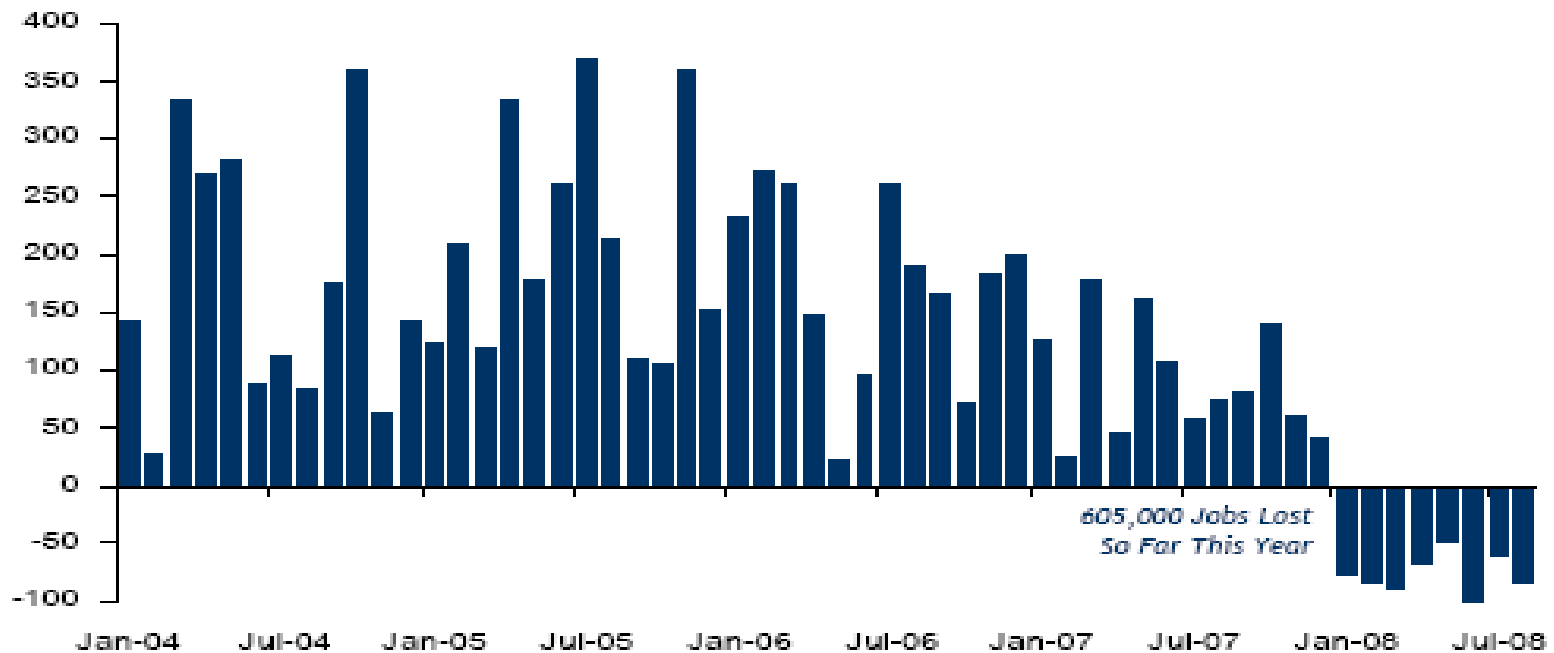
# The Recent Crisis-2008

---

- **Interest rates went to zero**
- **Real estate market is in deep crisis**
- **Loans market froze**
- **Bankruptcy rates are on the rise**
- **Lehman Brothers was allowed to go under**
- **Risk premiums went even higher in Sep. 2008**
- **Banks are getting financial support from the government (nationalization?)**
- **Realization that the US economy is in recession**

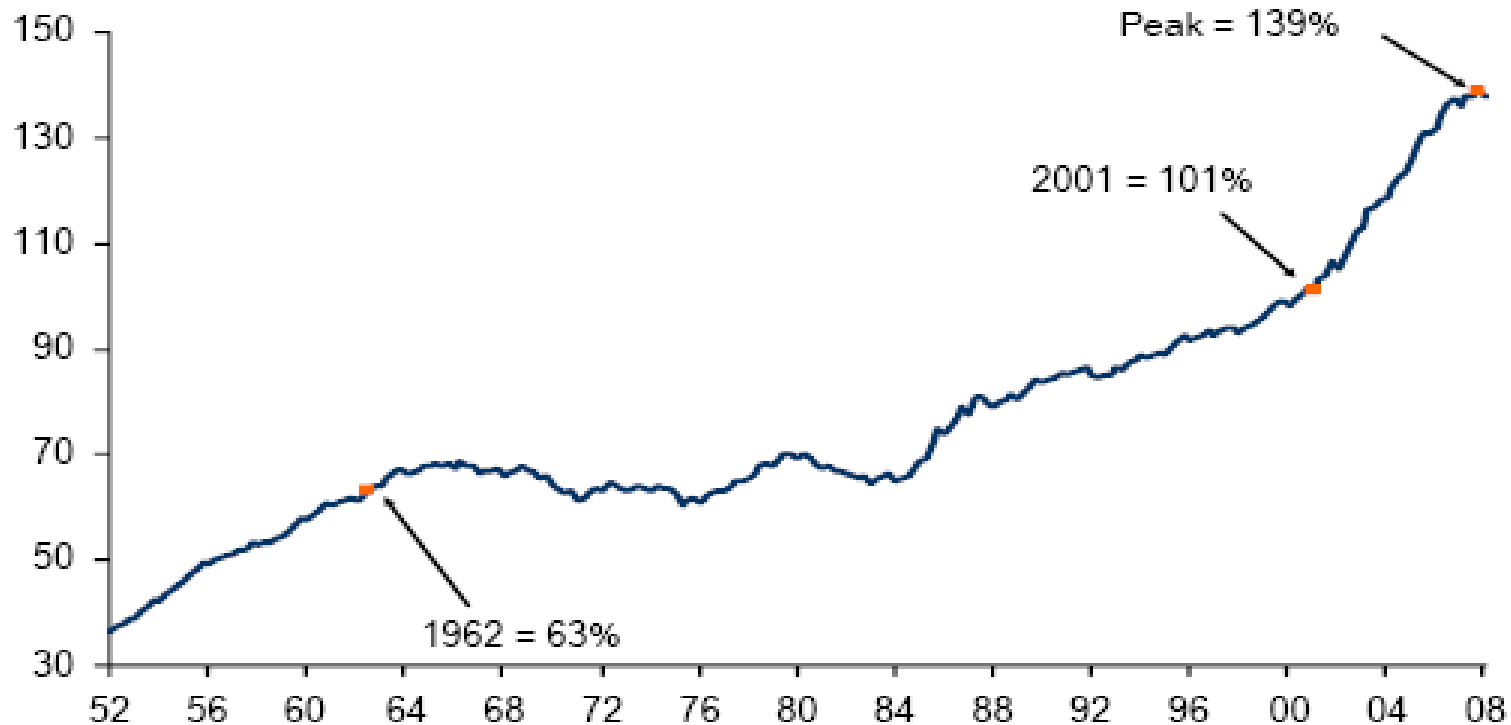
# Number Employed

## Total Nonfarm Payrolls Month-to-month Change (thousands)

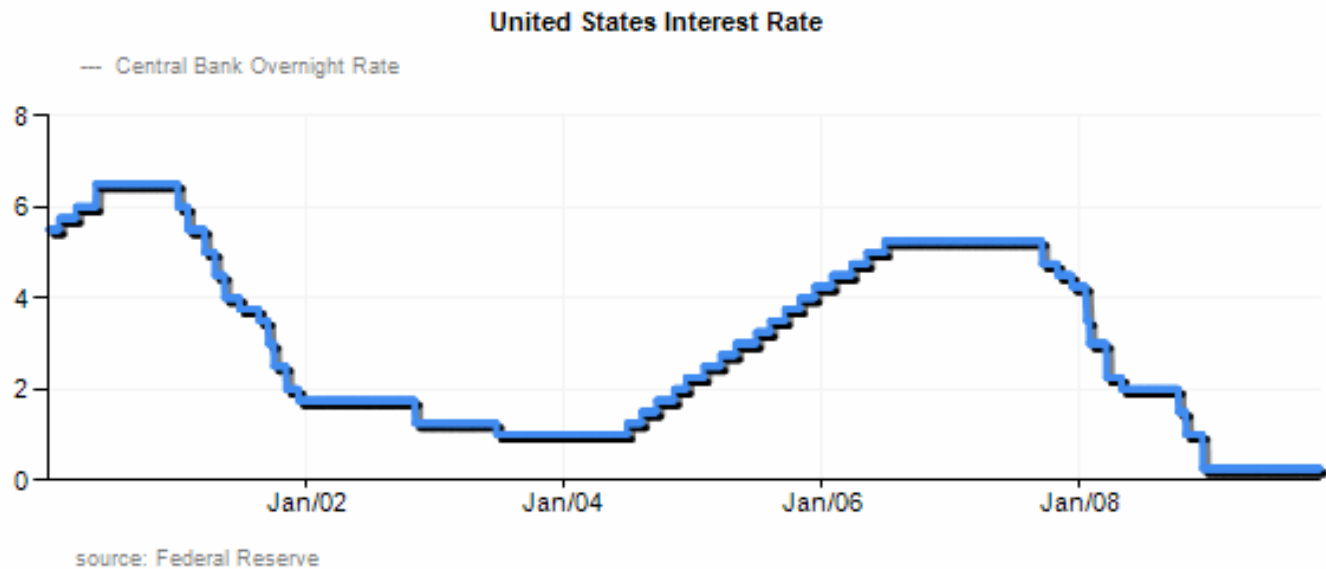


# The Next Crisis- Household Debt

Household Debt-to-Income Ratio  
(percent)

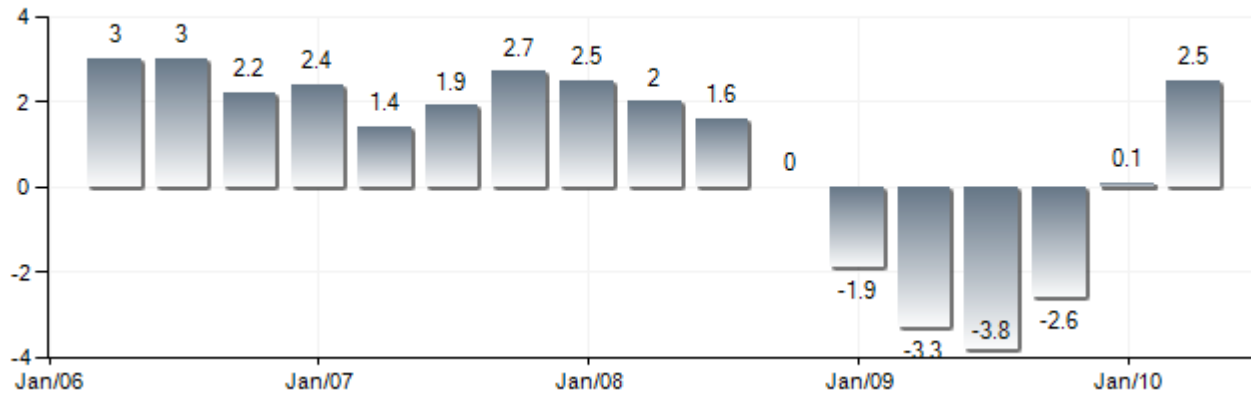


# Interest rates set by the Fed



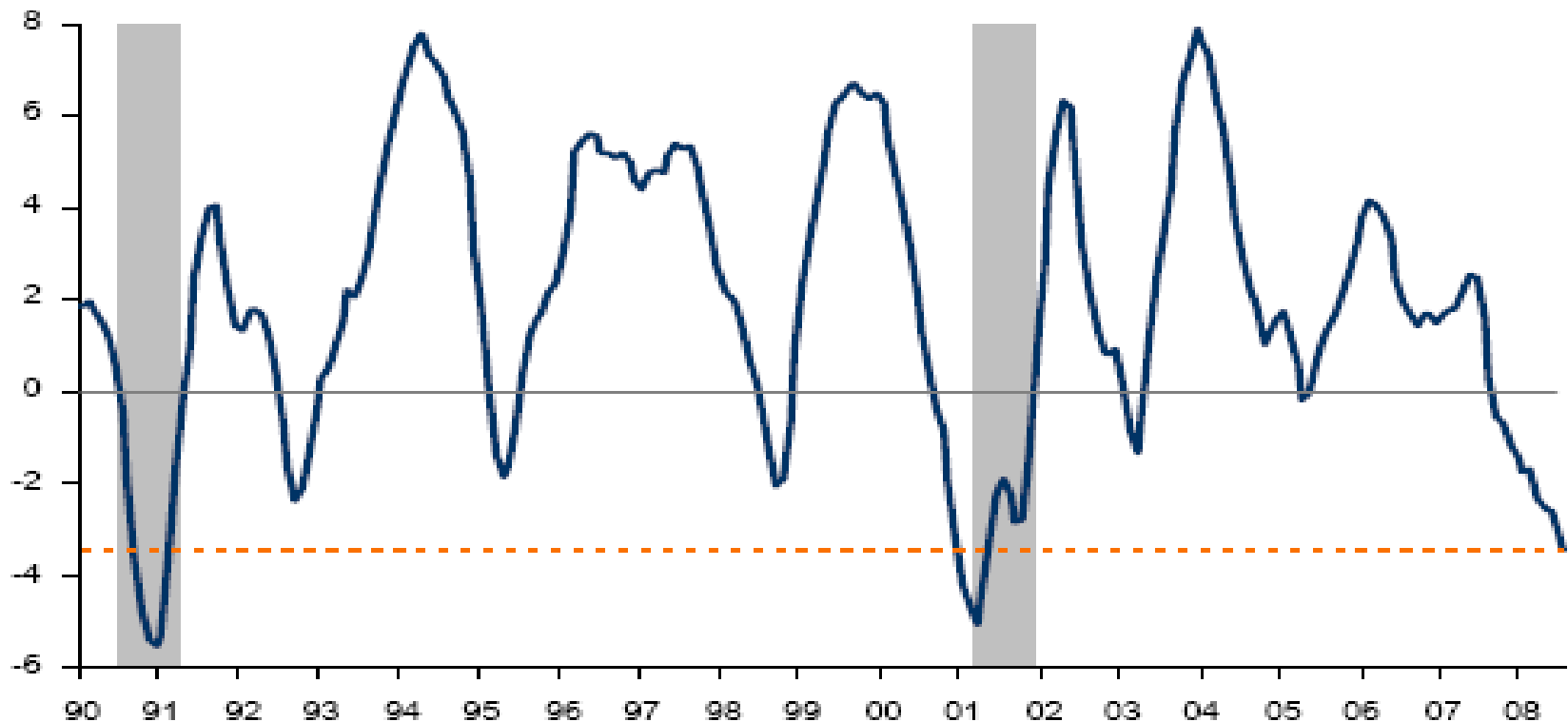
# GDP

United States GDP Annual Growth Rate



# Leading Indicators-OECD

OECD Composite Leading Indicators  
(6-month % change annualized)



Shaded region represents period of US recession  
Source: Datastream, Merrill Lynch



# The “Fear Index”-VIX

---

- It is an excellent measure of the sentiments in the financial markets.
- The VIX index, proposed initially in 1993 by Brenner and Galai, is based on implied volatilities of options on S&P 100.
- It is the major factor in determining the price of insuring against market declines.



# The “Fear Index”-VIX



# Cboe Daily Chart of VIX





# The Obama's Economic Plan

---

- The “plan” to spend \$787 billion is too broadly defined.
- About 1/3 for tax cuts.
- Over \$100 billion to local states and cities.
- Substantial amount for renewable energies and CleanTec
- Substantial amount to support mortgage loans
- Over \$300 billion to help financial institutions.
- **Too much so far is based on improvisations**



# USA and China

---

- The Sumo wrestlers:
  - China buying US bonds
  - US buying Chinese products



# A Systematic Approach to Risk Measurement

---

**Theoretical background**

**Defining risks**

**Relationships among risks**



# Risk Management in time of Crisis

---

- **Risk management is even more important in time of crisis.**
- **Risk management is based on models**
- **All models are developed under normal conditions**
- **All models are based on assumptions**
- **Risk management by “silos”**



# Regulatory requirements

---

- **The regulatory requirements must be simple and general**
- **The requirements are for specific risks**
- **The requirements do not address some important risks such as business risk or reputation risk.**
- **The requirements may lead to steps to satisfy the regulator**



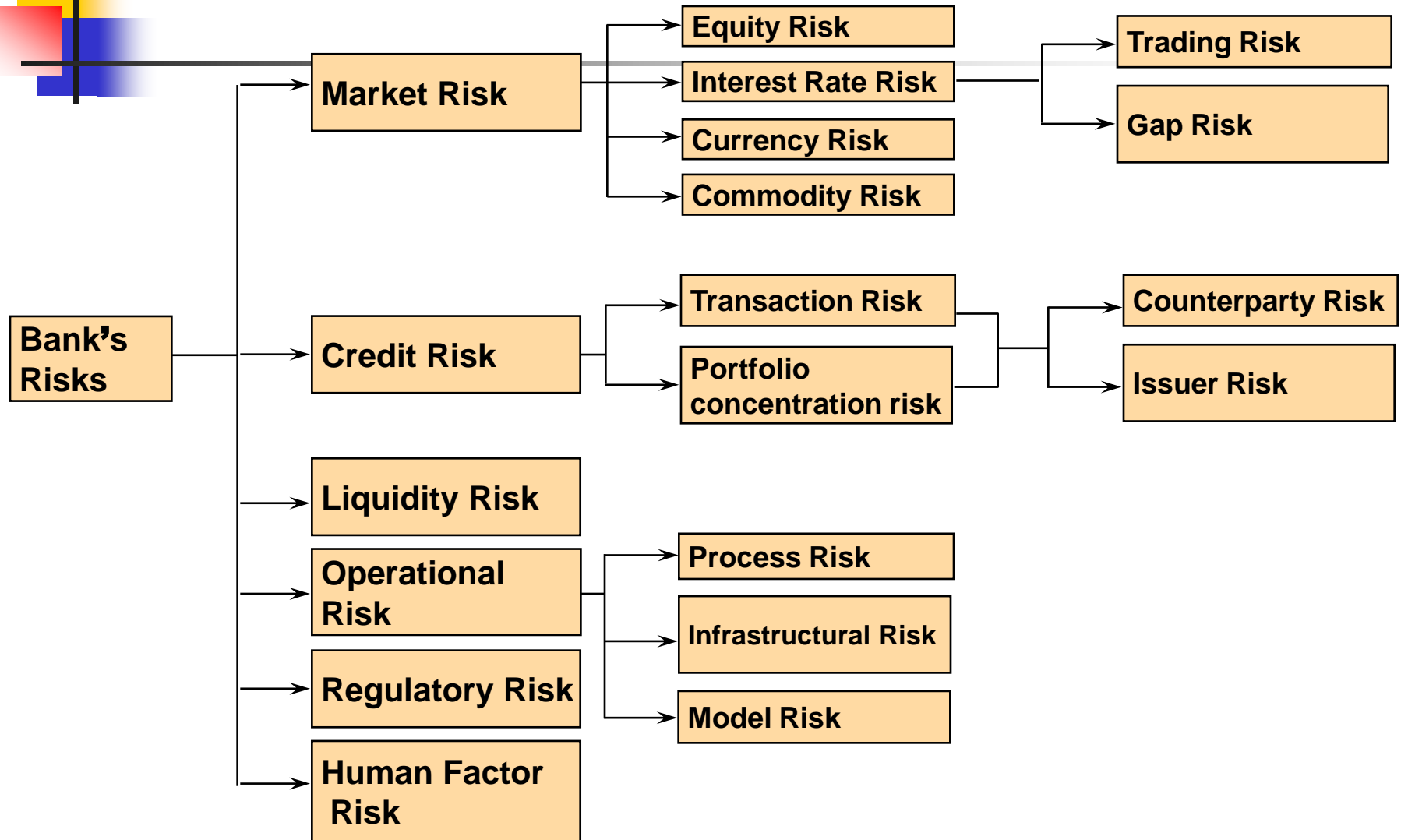
# Roles of Exchanges

---

- **The roles of risk diversification and insuring against risks have moved from the governments and central banks to markets and financial institutions.**
- **The financial markets provide a meeting place for buyers and sellers of risks.**
- **Financial markets are transparent and provide information.**
- **Prices for trading and transferring risks are determined**



# Schematic presentation, by categories, of the risk exposure of a bank

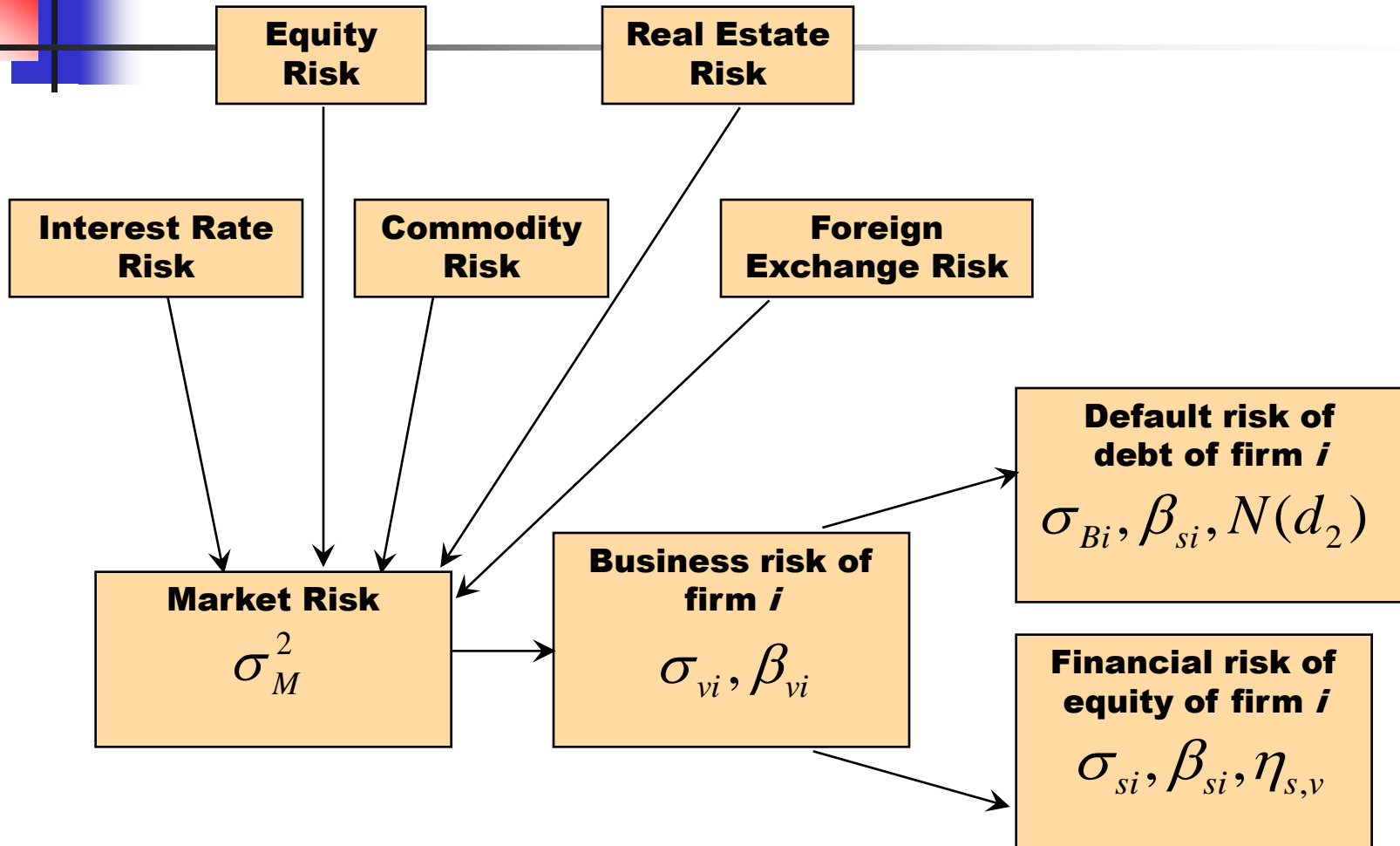




# Theory of Risk Measurement

Researcher	Theory	Risk Measurement
Markowitz (1951)	Portfolio Selection	$\sigma_p^2$
Modingliani-Miller (1958)	Business risk/ Financial Risk	$\bar{r}_s = r_f + (\bar{r}_v - r_f) \frac{v}{s}$
Sharpe (1964) Lintner (1965)	CAPM	$\beta$
Black-Scholes/ Merton (1973)	OPM	$\sigma_s = \sigma_v \cdot \frac{\partial s}{\partial v} \cdot \frac{v}{s}$
J.P. Morgan (1995) Bankers Trust (1987)	VaR, RAROC	

# Risk Relationships



# Did The Models Fail?

(LTCM, MetalGesaltschaft, Citi, Merrill Lynch etc.)

---

1. Is the role of models to forecast?
2. Is the role of models to reduce uncertainty?
3. Can we blame the models for failing the banks and the hedge funds?



# 1. IS THE ROLE OF MODELS TO FORECAST?

---

- **MODELS ARE BASED ON ASSUMPTIONS.**
- **ECONOMIC MODEL ARE BASED OF STATISTICAL PARAMETERS.**
- **MODELS USE PARAMETERS AS INPUTS AND DO NOT TELL US HOW TO ESTIMATE PARAMETERS.**
- **MODELS SHOULD TELL US HOW TO MAKE RATIONAL DECISIONS AT PRESENT TIME, FACING FUTURE UNCERTAINTY.**



## **2. IS THE ROLE OF MODELS TO REDUCE UNCERTAINTY?**

---

- **MODEL CANNOT CANCEL OUT UNCERTAINTY.**
- **UNCERTAINTY IS A FACT OF LIFE.**
- **ECONOMIC MODELS CAN BE USED TO DEFINE AND PRICE RISKS.**
- **MODELS CAN BE USED TO SET RATIONAL STRATEGY TO REDUCE RISKS OR SELL / BUY RISKS.**



### **3. CAN WE BLAME THE MODELS FOR FAILING THE BANKS & HEDGE FUNDS?**

---

- **HEDGE FUNDS ARE USUALLY LEVERED FUNDS WITH LONG AND SHORT POSITIONS IN MANY FINANCIAL INSTRUMENTS.**
- **NOT ALL POSITIONS IN HEDGED FUNDS ARE FULLY HEDGED.**
- **SOME POSITIONS ARE HEDGED VIA CORRELATIONS.**
- **SOME POSITIONS ARE IN ILIQUID, NONTRADED INSTRUMENTS.**
- **ALL MODELS ARE BASED ON THE ASSUMPTION OF PERFECT CAPITAL MARKETS.**
- **SOME PARAMETERS (ESPECIALLY CORRELATIONS) WERE WRONGLY ESTIMATED.**



### **•3. CAN WE BLAME THE MODELS FOR FAILING THE BANKS & HEDGE FUNDS?**

---

- **Banks in recent years were highly levered effectively thorough securitization and structured products.**
- **Banks were left often with the residual credit risk.**
- **Banks failed to tell their clients about the risks inherent in some instruments, e.g. Auction Rates.**
- **Investment banks were not regulated by Basel requirements.**





# A Few recommendations for Risk Management

---

- **Pay attention to assumptions and estimation procedures.**
- **Define the “Risk Appetite” of the organization and its willingness to take risks.**
- **Understand that for higher average yield the organization must assume greater risks in general.**
- **Avoid complicated financial instruments or schemes, that you don’t comprehend**



# A Few recommendations for Risk Management-Cont.

---

- **Always remember-you cannot create something from nothing; check always against the benchmark**
- **During economic crisis the importance of risk management increases**
- **The importance of transparency**

# Conclusion



- **Derivatives pricing models require a compromise between realism and tractability**
- **Try to locate where model inaccuracies may lead to the biggest losses**
- **Stress test the model structure, and not only the parameter values**
- **Control model drift**
- **IT system is a necessary condition to all risk management.**