The risk and use of derivatives.
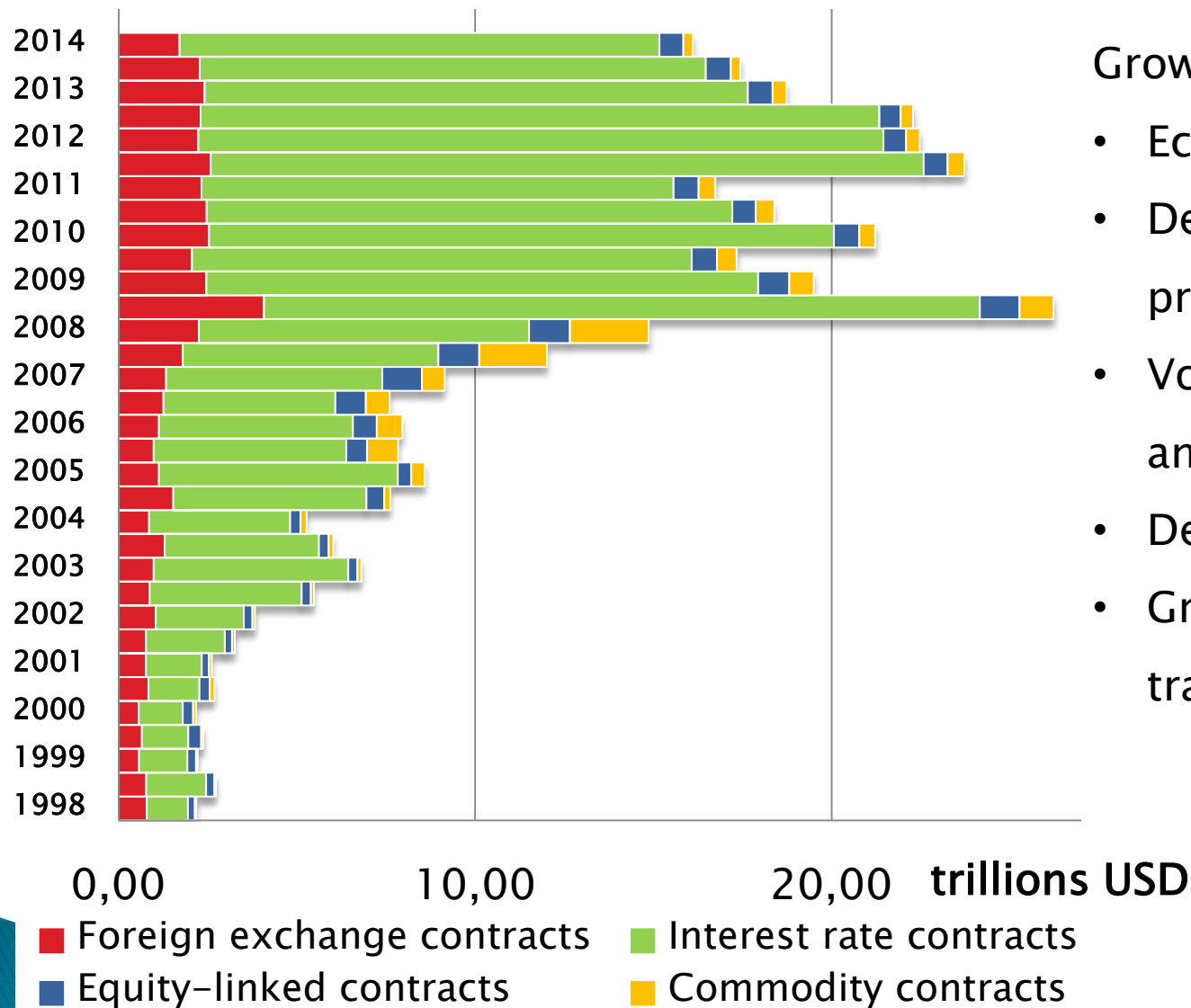
EVIDENCE FROM EUROPEAN BANKING SECTOR.

SUPERVISOR
Prof. Pierpaolo Benigno

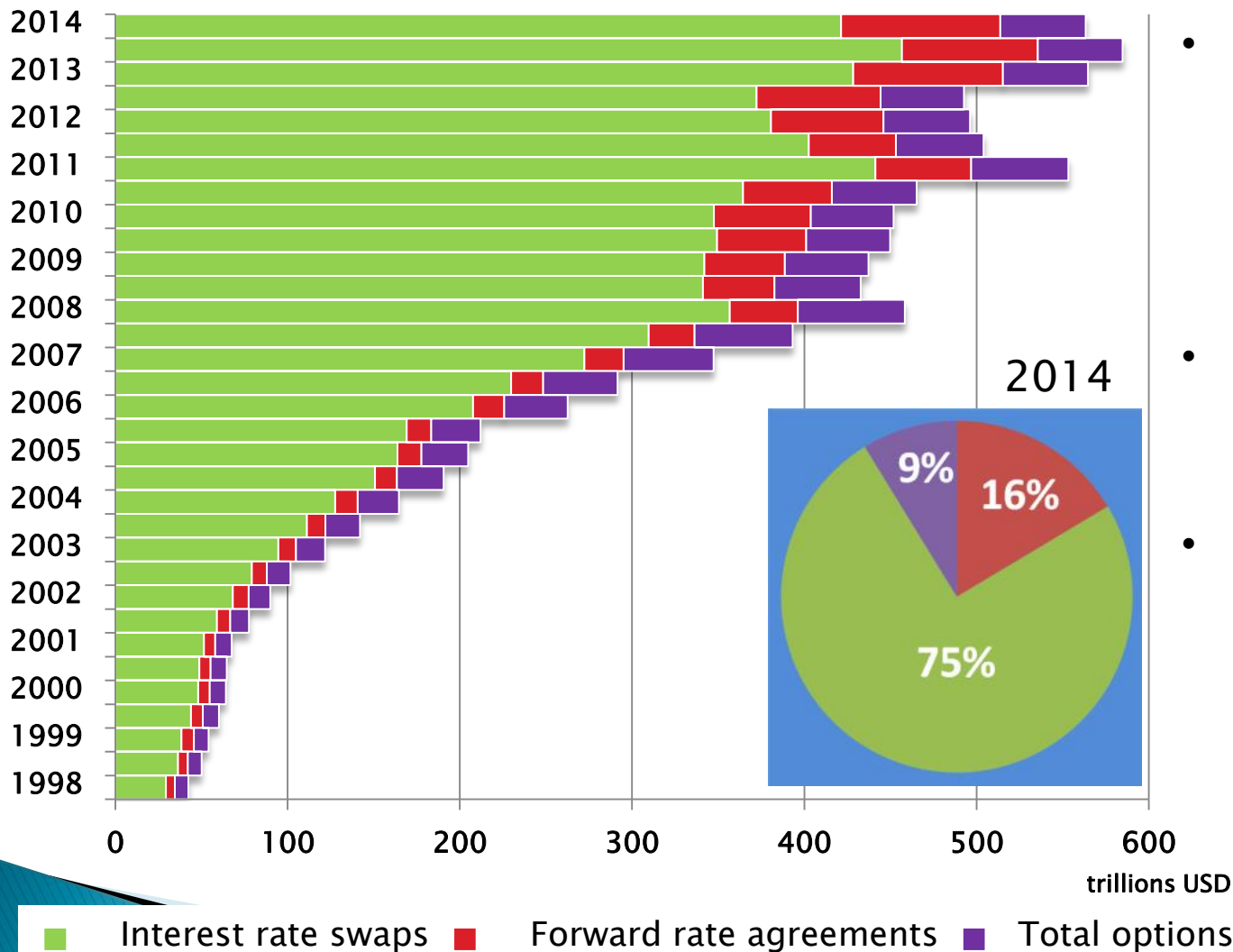CO-SUPERVISOR
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OTC Derivatives gross market

Growth determinants:
- Economic conditions
- Developments in pricing
- Volatility of interest and exchange rates
- Deregulation
- Growth of international trade

trillions USD

■ Foreign exchange contracts
■ Interest rate contracts
■ Equity–linked contracts
■ Commodity contracts

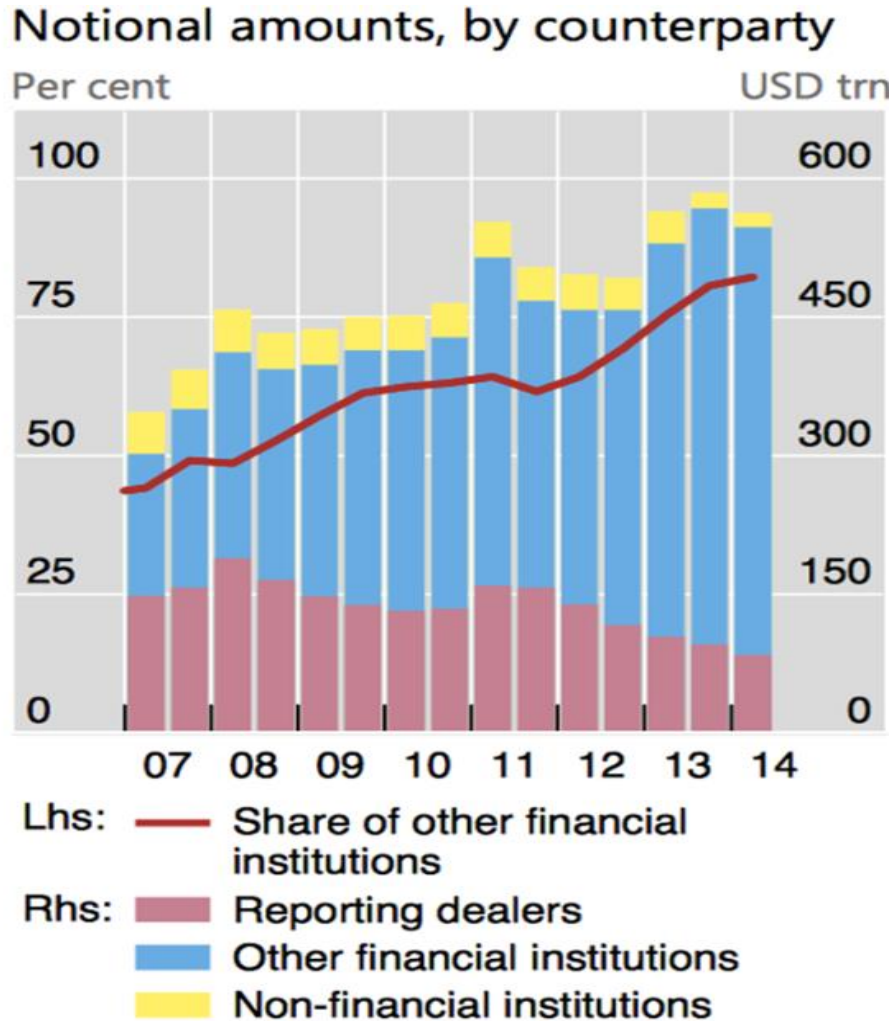# Interest rate derivatives by instrument, nominal values 1998 – 2014

- The interest rate derivatives constitute the majority of the contracts
- Interest rate swap is the most used instrument.
- Notional values continued to increase despite the financial crisis

Legend: Interest rate swaps ■ Forward rate agreements ■ Total options

Regional split for OTC derivatives, notional amount outstanding

Derivatives [1]

Market share	Not. amount outstanding € trillions
Europe 44%	200
North america 39%	181
Asia 13%	58
4% Rest of the world	18
	457

- Europe is key role player by market share
- Derivatives market have become an important part of the European financial services sector
- The use of derivatives by non-financial firms is very significant
- Non-financial companies use derivatives mainly for hedging
- To manage financial distress, variability of earnings and reduce exchange rate exposures
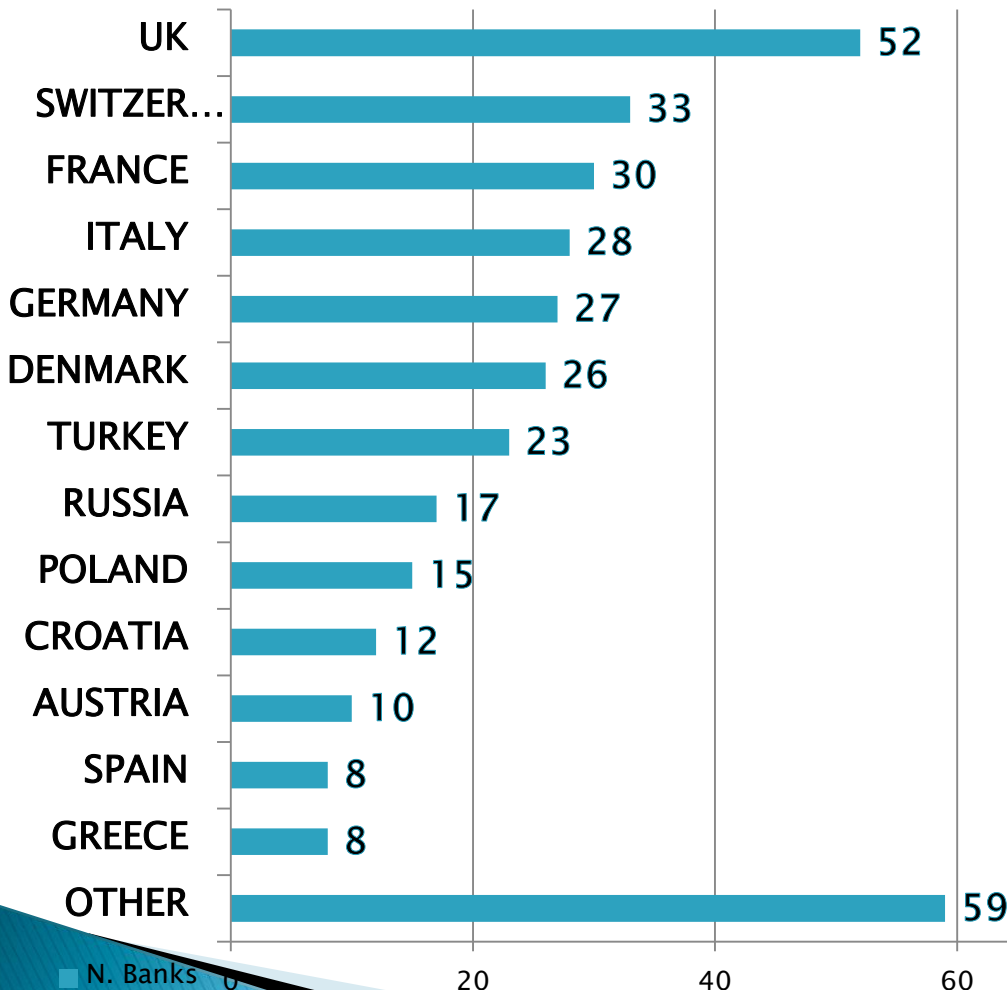
Interest rate derivatives 2007-2014

Notional amounts, by counterparty

Per cent | USD trn

- The major users of interest rate derivatives are financial institutions
- Non-financial companies constitute only a minor part

- Financial instruments now form an important share of total assets at most of the banks
- Participation in these markets had accounted for increasing share of bank revenues

Lhs: —— Share of other financial institutions

Rhs: Reporting dealers
Other financial institutions
Non-financial institutions

Research method

Sample: Number of banks by country

Country	N. Banks
UK	52
SWITZER…	33
FRANCE	30
ITALY	28
GERMANY	27
DENMARK	26
TURKEY	23
RUSSIA	17
POLAND	15
CROATIA	12
AUSTRIA	10
SPAIN	8
GREECE	8
OTHER	59

Systematic risk is measured by bank's beta

DataStream- reference index:
- STOXX Europe 600 Index
- STOXX Europe 50
- Multi-index approach

Bureau van Dijk's Bankscope database:
- Balance sheet data 261 banks
- Years 2000-2013

The multivariate regression model

$$\beta_x = \alpha_0 + \alpha_1 DERIVMV_i + \alpha_2 LNMVASSET_i + \alpha_3 PB_i + \alpha_4 NIM_i$$
$$+ \alpha_5 LLRGR_i + \alpha_6 LTCD_i + \alpha_7 DE_i + \alpha_8 DIVP_i + \varepsilon_i$$

DERIVMV	$$\frac{Total\ derivatives}{Market\ value\ of\ assets}$$
LNMVASSET	the natural logarithm of a bank's market value of total assets to control for the effect of size;
LLRGR	Loan loss reserves to gross loans;
LTCD	Loans to total customer deposits;
DE	debt–to–equity ratio;
NIM	Net interest margin;
PB	Price–to–book ratio;
DIVP	Dividend payout ratio

Dependent variable	Beta (β) DJSTOXX	Beta (β) LocIndex
Intercept	−1.0676 (−8.89)	−.9523 (−10.28)
DERIVMV	**.6168 (3.67)**	**.5572 (4.13)**
LNMVAssets	.1291 (16.50)	.1220 (19.42)
PriceBook	.0480 (3.90)	−.0004 (−3.58)
NIM	1.0835 (4.34)	.9817 (4.91)
LLRGL	2.380 (6.36)	.6293 (2.12)
LTCD	−.0509 (−3.17)	−.1051 (−8.32)
DebtEquity	−.00951 (−4.64)	−.0053 (−3.30)
DIVP	−.00025 (−3.77)	−.0002 (−4.29)
Observations	1953	1950
R^2	0.1941	0.2647

Ordinary Least Squares (OLS)

- DERIMV is statistically significant using even different reference indexes
- The highest explanatory power ($R^2 = 26,46\%$) was obtained using multi−index approach

Limitations:

- The simple OLS estimation method does not take advantage of the panel structure of the data, but each observation is considered as independent

Summary of regression results. Pooled OLS versus FE and RE

	POLS	FE	RE	POLS	FE	RE
Dependent variable	Beta (β) LocIndex	–	–	Beta (β) DJSTOXX	–	–
DERIVMV	.5572 (4.13)	.8951 (4.83)	.8365 (5.01)	.5598 (3.34)	.9157 (3.87)	.8170 (3.86)
Observations	1950	1950	1950	1953	1953	1953
R^2 within	–	0.0669	0.0646	–	0.0784	0.0755
R^2 between	–	0.2097	0.2486	–	0.0784	0.2006
R^2 overall	0.2647	0.1979	0.2339	0.2022	0.1698	0.1782

$$DERIVTA_{it} = \alpha_0 + \alpha_1 LNASSET_{it} + \alpha_2 DE_{it} + \alpha_3 LIQUID_{it} + \alpha_4 LTA_{it} + \varepsilon_{it}$$

Labels	Description	Proxy for	References	Exp. Sign
DERIVTA	Notional amount of derivatives divided by total assets	Derivatives usage	Sinkey and Carter (2000)	
LNASSET	Natural logarithm of total assets	Bank size	Adkins, Carter, Simpson (2007) Sinkey and Carter (2000) Shiu, Moles, Shin (2008)	(+)
DE	debt-to-equity ratio	Leverage risk	Sinkey and Carter (2000)	(+)
LIQUID	Liquid assets to total assets	Liquidity risk	Ashraf ,Goddard, Yener (2005) Li and Marinc (2013) Sinkey and Carter (2000)	(−)
LTA	Loans to total assets	Diversification	Khasawneh and Hassan(2009) Shiu, Moles, Shin (2008)	(−)

Summary of regression results.
Pooled OLS, FE and Random Effects

	POLS	p-value	FE	p-value	RE	p-value
Dep. variable	DERIVTA		DERIVTA		DERIVTA	
Intercept	−.1454 (−12.22)	0,000	.0300 (1.18)	0.239	−.0692 (−3.51)	0.000
LNASSET	.01403 (20.14)	0.000	.00367 (2.30)	0.022	.0102 (8.60)	0.000
LTA	−.1116 (−14.27)	0.000	−.06946 (−6.02)	0.000	−.0836 (−8.19)	0.000
DebtEquity	.00263 (12.64)	0.000	.00083 (4.56)	0.000	.00104 (5.80)	0.000
LIQUID	−.0038 (−0.37)	0.714	−.0800 (−8.44)	0.000	−.0655 (−7.14)	0.000
Observations	2708		2708		2708	
R^2 overall	0.3373		0.2329		0.3052	

Thank You
For your attention