

THE SUBPRIME CRISIS: AN ACID TEST FOR MARKETS, MODELS AND STRATEGIES

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AGENDA

- INTRODUCTION
 - THE THREE SISTERS OF SUBPRIME: LOSS, LEVERAGE AND LIQUIDITY
 - THE IMPACT ON THE LIQUIDITY SITUATION
 - A SEISMOGRAPH FOR INTERBANK TRUST
 - SINGLE *B* RATING FOR THE BANKING SECTOR
 - 11- σ EVENTS AND THE LIMITS OF HISTORICAL ANALYSIS
 - CHALLENGES FOR VALUATION MODELS
 - CONSEQUENCES FOR MARKET PARTICIPANTS
-

INTRODUCTION



INTRODUCTION

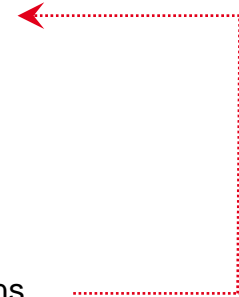
How the subprime market works

- Home buyer with a blemished credit history gets a mortgage from a subprime lender
- The subprime lender sells the loan to an investment bank and uses the proceeds to make another loan
- Investment banks package loans into mortgage backed securities (MBS) and slice it into tranches of different risk return characteristics
- Rating agencies assign ratings according to the risk profile of the different tranches (e.g. AAA, ... -> C)
- Investors, like funds, pension funds, banks, insurance companies and hedge funds, buy the MBS structures or individual tranches according to their risk appetite
- The investments are sometimes kept in special investment vehicles (SIVs) that are funded via short-term instruments like commercial paper

INTRODUCTION

Why the subprime market fell apart

- Subprime borrowers fall behind with their payments (e.g., due to step-up triggers)
- Losses in MBS mount and become higher than expected
- Rating agencies downgrade MBS structures
- SIVs fail to raise funding as the CP market dries up
- New MBS structures can no longer be placed
- Lenders are no longer able to sell subprime mortgages
- Falling house prices trigger margin calls from banks and cause more “non-performing” loans



INTRODUCTION

Subprime

- The American Dialect Society (an 118-year old organisation) voted **subprime** to the overall word of the year in 2007
- Past selections include:
 - **WMD** Weapons of Mass Destruction, word of the year in 2002
 - **9-11**, word of the year in 2001
 - **Y2K**, word of the year in 1999

INTRODUCTION

- In the wake of the subprime crisis, there are a number of defaults, restructuring and bailouts at:
 - Banks
 - Hedge Funds
 - Mortgage Lenders

INTRODUCTION

Banks

■ General

Carnation Banc
Freemont General
Bear Stearns
Northern Rock PLC
Coast Bank
Weserbank* (closed by BaFin on 8 April 2008)

■ FDIC Failed Banks

First Integrity Bank
ANB Financial
Hume Bank of Hume, Mo.
Douglas National Bank
Miami Valley Bank
NetBank
Metropolitan Savings Bank

■ Failed Credit Unions

St.Luke Babtist Federal Credit Union
Huron River Credit Union
Green Tree Federal Credit Union
Sharebuilders Federal Credit Union

■ Credit Union Conservatorships

Communities United Credit Union
Huron River Area Credit Union
Obelisk Federal Credit Union
Peoples First Choice Federal Credit Union
CAL State 9 Credit Union
Norlaco Credit Union
Zion United Community Credit Union

INTRODUCTION

Hedge Funds

45. Endeavour Capital
44. Old Lane Partners (Citigroup)
43. Rumson Capital [1]
42. Russell Investments
41. Cornerstone Quantitative Investment Group [2]
40. North American Equity Opportunities (Goldman Sachs) [1]
39. Pentagon Capital Management [1]
38. Absolute Capital Group [3]
37. Drake Management - Global Opportunities [3]
36. ASAT Finance (Citigroup) [3]
35. MAT Finance (Citigroup) [3]
34. Blue River Asset Management [1]
33. Carlyle Capital Corporation [1]
32. Tequesta Mortgage Fund [1]
31. Focus Capital [1]
30. Peloton ABS Master Fund, Multi-Strategy Fund [2]
29. Falcon Strategies (Citigroup) [2]
28. CSO Partners (Citigroup) [1]
27. Sailfish Capital Partners [1]
26. Polar Capital - Lotus, Tech. Absolute Funds [2]
25. Standard Chartered - Whistlejacket SIV [1]
24. Deephaven Event Fund [1]
23. Rhinebridge Plc (IKB) [1]
22. Niederhoffer Matador Fund [1]
21. Absolute Capital Management Holdings [7]
20. Cooper Hill Partners [3]
19. Pirate Capital (Activist Funds) [2]
18. Synapse High Grade ABS Fund [1]
17. Cheyne Finance LLC (Cheyne Capital Management) [1]
16. Geronimo Multi-Strategy, Sector Opportunity, and Option & Income [3]
15. Basis Capital Fund Management, Ltd. - Basis Yield Alpha [1]
14. Solent Capital Partners LLP, Mainsail II [1]
13. Sentinel Management Group [1]
12. Sachsen LB: Ormond Quay conduit fund [1]
11. Parvest Dynamic ABS, BNP Paribas ABS Euribor and BNP Paribas ABS Eonia (BNP Paribas) [3]
10. Union Investment Asset Management Holding AG [1]
9. Oddo: Cash Titrisation; Cash Arbitrages; and Court Terme Dynamique [3]
8. Sowood Capital Management [2]
7. Galena Street Fund [1]
6. United Capital Markets Holdings Inc.: Horizon Strategy [4]
5. Caliber Global Investment [1]
4. Lake Shore Asset Management [1]
3. Ritchie Capital Management [2]
2. Bear Stearns: High Grade Structured Credit Strategies Enhanced Leveraged Fund; High Grade Structured Credit Strategies Fund [2]
1. Dillon Reed Capital Management (UBS) [1]

INTRODUCTION

Ailing Hedge Funds

31. Lydia Capital [1]
30. Clinton Group Multi-Strategy Fund [1]
29. AQR Capital Management [3]
28. Polygon [1]
27. Plexus Partners [1]
26. Pardus Capital Management [1]
25. Tisbury Capital [1]
24. Platinum Grove Asset Mgmt. [1]
23. Global Alpha and Global Equity Opportunities(Goldman Sachs) [2]
22. Carrington Capital Management [1]
21. MKA Capital Advisors [1]
20. Alcentra European Credit [1]
19. Pursuit Capital Partners [1]
18. GPS Partners [1]
17. JWM Partners LLC - Relative Value Opportunity fund [1]
16. ING Diversified Yield, Regular Income [2]
15. GO Capital Global Opportunities Fund [1]
14. Highland Capital Management [2]
13. Ellington Capital Mgmt. (certain funds) [2]
12. Golden Key Ltd. [1]
11. Queen's Walk Investment, Ltd. (Cheyne Capital Management) [1]
10. Capital Fund Management [1]
9. John W. Henry & Co. [7]
8. Campbell & Co. [1]
7. Tykhe Capital, LLC [2]
6. Black Mesa fund [1]
5. Second Curve Capital (various funds) [4]
4. Axa IM [2]
3. Macquarie Fortress Investments Ltd. [1]
2. Frankfurt Trust [1]
1. Mariner Bridge [1]

INTRODUCTION

Top Mortgage Lender

262. Accredited Home Lenders, Home Funds Direct

261. Assured Lending Corp. - Wholesale

260. Homewide Lending Corporation

259. Vanguard Mortgage & Title, Inc.

258. Chase Home Equity - Wholesale

257. Chase Subprime - Wholesale

256. Evergreen Investment & Carnation Banc

255. Casa Blanca Mortgage/Shearson - Wholesale

254. Guaranty Bank - Correspondent

253. Citi Residential Lending

252. Montgomery Mortgage Capital Company

251. E*Trade Wholesale Lending

250. Shearson Financial Network, Inc.

249. American Bank Mortgage Group - Wholesale

248. AmeriBanc Corp.

247. Washington Mutual - Wholesale

246. Century Bank, F.S.B. - Wholesale

245. Diversified Mortgage, Inc.

244. National Wholesale Funding

243. Centennial Mortgage and Funding, Inc./Award Mortgage

242. Fidelity Home Mortgage Corp. - Wholesale

241. LMI Funding, Inc.

240. Millennium Mortgage - Wholesale

239. Origen Financial, Inc. (Correspondent)

238. CitiMortgage - Home Equity Wholesale

237. Bear Stearns Residential Mortgage

236. East West Mortgage Co. of VA

235. New Vision Residential Lending

234. Washington Savings Bank, F.S.B. - Wholesale

233. Macquarie Mortgages USA Inc.

232. Global Mortgage, Inc.

231. Unique Mortgage Solutions (UMS, LLC)

230. First Franklin - Merrill Lynch

229. First National Mortgage Sources

228. Resource Mortgage (Wholesale)

227. KH Financial

226. Lydian Mortgage

225. OMG Wholesale Lending

224. Saxon Mortgage (Wholesale)

223. Beazer Mortgage Corp.

222. E-Loan (Wholesale)

221. Allpointe Mortgage (Broker Program)

220. Popular Warehouse Lending

219. Allied Lending Corp. (Wholesale)

218. BF Saul Wholesale Lending

217. Community Resource Mortgage

216. Lehman/Aurora Loan Services

215. Residential Mortgage Capital

214. Maverick Residential Mortgage

213. Countrywide Financial Corp.

212. First NLC Financial Services

211. First American Bank (Wholesale)

210. Soma Financial

209. National City Corp. (Wholesale)

208. Heartland Wholesale Funding

207. Homefront Mortgage Inc.

206. PNC Bank H.E.

205. Family First Mortgage Corp.

204. First Fidelity Financial

203. BSM Financial

202. 1st Choice Mortgage

201. Wescom Credit Union

200. Coast Financial Holdings/Coast Bank

199. WaMu (Subprime)

198. First Madison Mortgage

197. Southern Star Mortgage

196. TransLand Financial

195. Secured Bankers Mortgage Company (SBMC)

194. ComUnity Lending

193. Delta Financial Corp

192. BayRock Mortgage

191. Empire Bancorp

190. Option One - H&R Block

189. Citigroup - FCS Warehouse

188. Charter One (Wholesale)

187. Wells Fargo - Home Equity

186. Paul Financial, LLC

185. Webster Bank (Wholesale)

184. Fieldstone Mortgage Company

183. Tribeca Lending Corp. (Wholesale)

182. WAMU Comm. Correspondent

181. Mariin Mortgage Company

180. Countrywide Specialty Lending

179. UBS Home Finance

178. MortgageIT-DB (Retail)

177. Edgewater Lending Group

176. ResMAE Mortgage Corp.

175. Citimortgage Correspondent (2nds)

174. AMC Lending

173. Liberty American Mortgage

172. Exchange Financial (Wholesale)

171. FirstBank Mortgage

170. Bank of America (Wholesale)

169. Diablo Funding Group Inc.

168. Honor State Bank

167. Spectrum Financial Group

166. Priority Funding Mortgage Bankers

165. BrooksAmerica Mortgage Corp.

164. Valley Vista Mortgage

163. New State Mortgage Company

162. Summit Mortgage Company

161. WMC

160. Paragon Home Lending

159. First Mariner Wholesale

158. The Lending Connection

157. Foxtons, Inc.

156. SCME Mortgage Bankers

155. Aapex Mortgage (Apex Financial Group)

154. Wells Fargo (various Correspondent and Non-prime divisions)

153. Nationstar Mortgage
152. Decision One (HSBC)
151. Impact Lending Group
150. Long Beach (WaMu Warehouse/Correspondent)
149. Expanded Mortgage Credit Wholesale
148. The Mortgage Store Financial
147. C & G Financial
146. CFC Home Mortgage
145. All Fund Mortgage
144. LowHome Financial
143. Sea Breeze Financial Services
142. Castle Point Mortgage
141. Premium Funding Corp
140. Group One Lending
139. Allstate Home Loans / Allstate Funding
138. Home Loan Specialists (HLS)
137. Transnational Finance Wholesale
136. CIT Home Lending
135. Capital Star Funding
134. Mortgage Investors Group (MIG) - Wholesale
133. Amstar Mortgage Corp
132. Quality Home Loans
131. BNC Mortgage (Lutman)
130. First National Bank of Arizona
129. Chevy Chase Bank Correspondent
128. GreenPoint Mortgage - Capital One Wholesale
127. NovaStar, Homeview Lending
126. Quick Loan Funding
125. Calusa Investments
124. Mercantile Mortgage
123. First Magnus
122. First Indiana Wholesale
121. GEM Loans / Pacific American Mortgage (PAMCO)
120. Kirkwood Financial Corporation
119. Lexington Lending
118. Express Capital Lending
117. Deutsche Bank Correspondent Lending Group (CLG)
116. MLSG
115. Trump Mortgage
114. HomeBanc Mortgage Corporation
113. Mylor Financial
112. Agilis
111. Alternative Financing Corp (AFC) Wholesale
110. Winstar Mortgage
109. American Home Mortgage / American Brokers
108. Optima Funding
107. Equity Funding Group
106. Sunset Mortgage
105. Nations Home Lending
104. Entrust Mortgage
103. Alera Financial (Wholesale)
102. Flick Mortgage/Mortgage Simple
101. Dollar Mortgage Corporation
100. Alliance Bancorp
99. Choice Capital Funding
98. Premier Mortgage Funding
97. Stone Creek Funding
96. FlexPoint Funding (Wholesale & Retail)
95. Starpointe Mortgage
94. Unlimited Loan Resources (ULR)
93. Firestand Financial
92. Steward Financial
91. Bridge Capital Corporation
90. Atlas Financial
89. ACT Mortgage
88. Alliance Mortgage Banking Corp (AMBC)
87. Concord Mortgage Wholesale
86. Heartwell Mortgage
85. Oak Street Mortgage
84. The Mortgage Warehouse
83. First Street Financial
82. Right-Away Mortgage
81. Heritage Plaza Mortgage
80. Horizon Bank Wholesale Lending Group
79. Lancaster Mortgage Bank (LMB)
78. Bryco (Wholesale)
77. No Red Tape Mortgage
76. The Lending Group (TLG)
75. Pro 90 Funding
74. NetBank Funding, Market Street Mortgage
73. Columbia Home Loans, LLC
72. Mortgage Tree Lending
71. Homeland Capital Group
70. Nation One Mortgage
69. Dana Capital Group
68. Millennium Funding Group
67. MILA
66. Home Equity of America

65. Optimum (Wholesale, Conduit)
64. Innovative Mortgage Capital
63. Home Capital, Inc.
62. Home 123 Mortgage
61. Homefield Financial
60. First Horizon Subprime, Equity Lending
59. Platinum Capital Group (Wholesale)
58. First Source Funding Group (FSFG)
57. Allena Mortgage
56. Solutions Funding
55. People's Mortgage
54. LoanWorthyPayment.com
53. Zone Funding
52. First Consolidated (Subprime Wholesale)
51. EquiFirst
50. SouthStar Funding
49. Warehouse USA
48. H&R Block Mortgage
47. Madison Equity Loans
46. HSBC Mortgage Services (correspondent div.)
45. Sunset Direct Lending
44. Kellner Mortgage Investments
43. LoanCity
42. CoreStar Financial Group
41. Ameriquest, ACC Wholesale
40. Investaid Corp.
39. People's Choice Financial Corp.
38. Master Financial
37. Marbella Mortgage
36. FHF Capital LLC
35. New Century Financial Corp.
34. Wachovia Mortgage (Correspondent div.)
33. Ameritrust Mortgage Company (Subprime Wholesale)
32. Trojan Lending (Wholesale)
31. Fremont General Corporation
30. DomesticBank (Wholesale Lending Division)
29. Ivanhoe Mortgage/Central Pacific Mortgage
28. Eagle First Mortgage
27. Coastal Capital
26. Silver State Mortgage
25. ECC Capital/Encore Credit
24. Lender's Direct Capital Corporation (wholesale division)
23. Concorde Acceptance
22. DeepGreen Financial
21. American Freedom Mortgage, Inc.
20. Millennium Bankshares (Mortgage Subsidiaries)
19. Summit Mortgage
18. Mandalay Mortgage
17. Rose Mortgage
16. EquiBanc
15. FundingAmerica
14. Popular Financial Holdings
13. Clear Choice Financial/Bay Capital
12. Origen Wholesale Lending
11. SecuredFunding
10. Preferred Advantage
9. MLN
8. Sovereign Bancorp (Wholesale Ops)
7. Harbourton Mortgage Investment Corporation
6. Owin Mortgage
5. Sebring Capital Partners
4. Axis Mortgage & Investments
3. Meritage Mortgage
2. Acoustic Home Loans
1. Merit Financial

INTRODUCTION

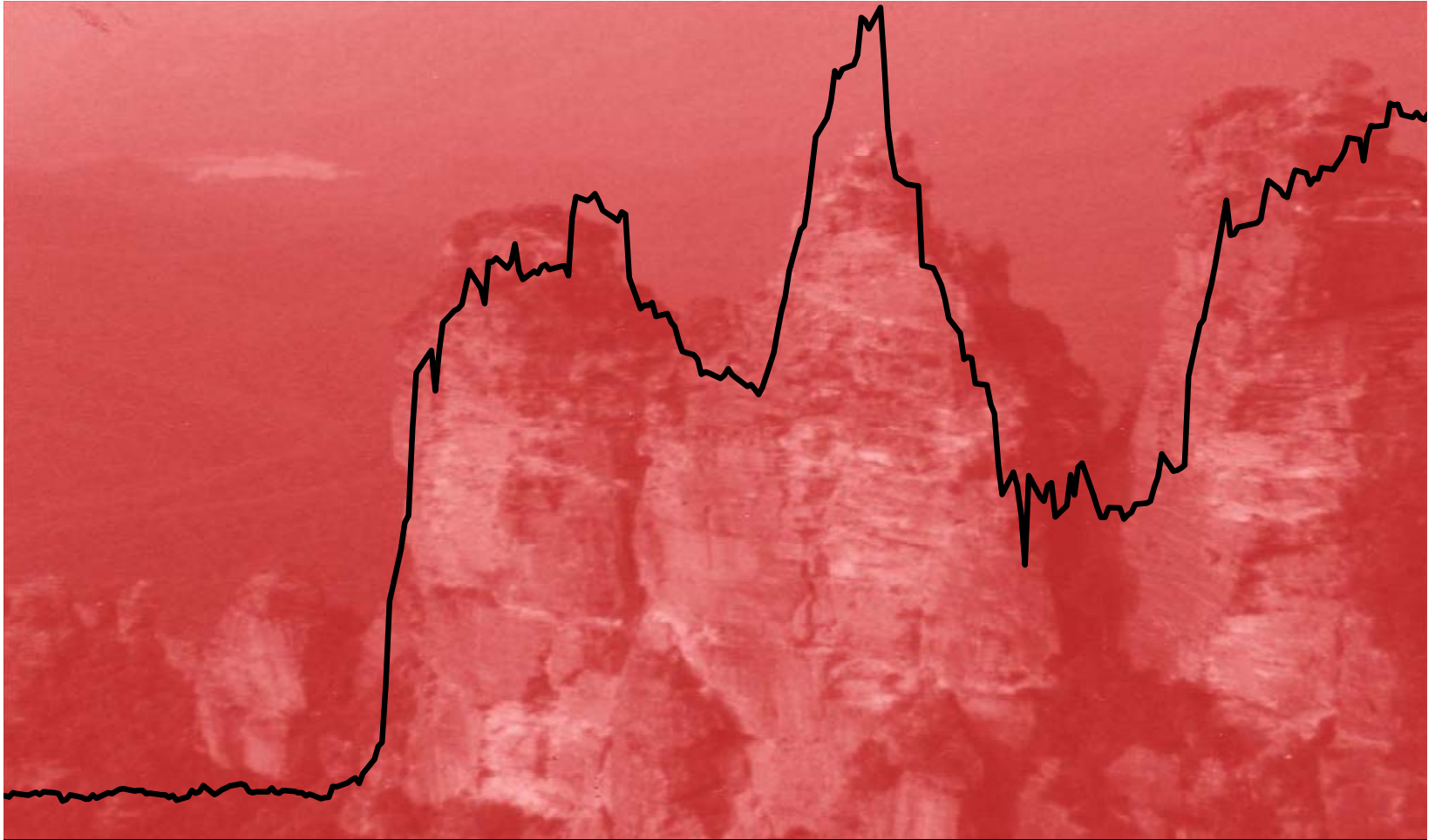
- The subprime crisis already triggered a number of job cuts at investment banks (see table "job cuts" source: German newspaper)
- A more recent update estimates about 65,000 jobs were already cut:
 - Citigroup 15,900
 - Royal Bank of Scotland 7,200
 - UBS 5,500
 - Morgan Stanley 3,000 (source: Bloomberg)
- Further huge cuts are expected with a total number of 200,000 job losses

Gestrichene Stellen

Unternehmen	seit Juli 2007
Citigroup	6 200
Lehman Brothers	4 990
Bank of America	3 650
Morgan Stanley	2 940
Washington Mutual	2 600
Merrill Lynch	2 220
HSBC	1 650
Bear Stearns	1 550
WestLB	1 530
UBS	1 500
Goldman Sachs	1 500
National City	900
Credit Suisse	820
Royal Bank of Canada	500
Fortis	500
Wells Fargo	500
Wachovia	443
Deutsche Bank	370
JP Morgan Chase	100
gesamt	34 463

Handelsblatt | Quelle: Bloomberg

THE THREE SISTERS OF SUBPRIME: LOSS, LEVERAGE AND LIQUIDITY



THE THREE SISTERS OF SUBPRIME: LOSS, LEVERAGE AND LIQUIDITY

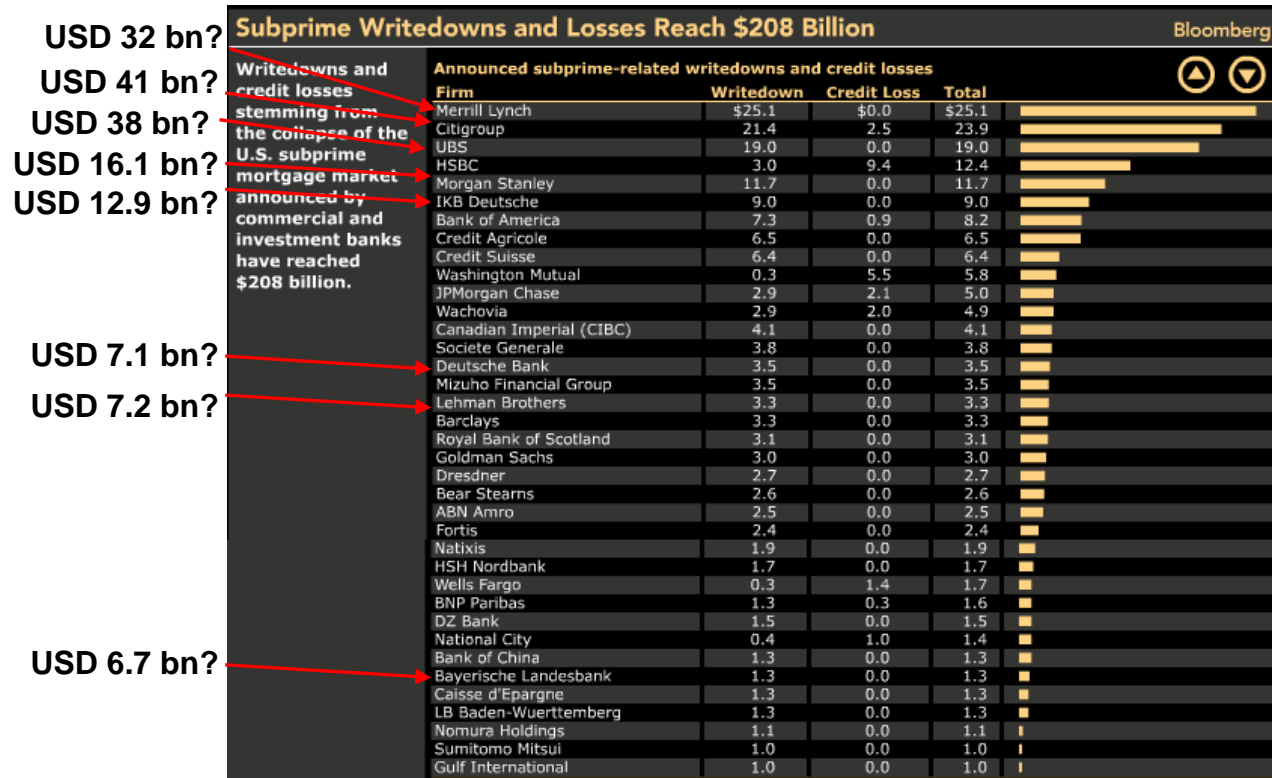
Losses due to non-performing loans



Percentage of non-performing subprime loans of total residential subprime loans outstanding. Source: Bloomberg

THE THREE SISTERS OF SUBPRIME: LOSS, LEVERAGE AND LIQUIDITY

Losses at banks and security firms (latest estimate: USD 389 bn)



- Total losses estimated by IMF: USD 1,000 bn
- Citigroup is rumoured to plan selling assets in the value of USD 400 bn
- Banks raised at least USD 100 bn in fresh money (Citi 44 bn, UBS 28.2 bn, Merrill Lynch 18 bn)

THE THREE SISTERS OF SUBPRIME: LOSS, LEVERAGE AND LIQUIDITY

Deleverage in commercial paper



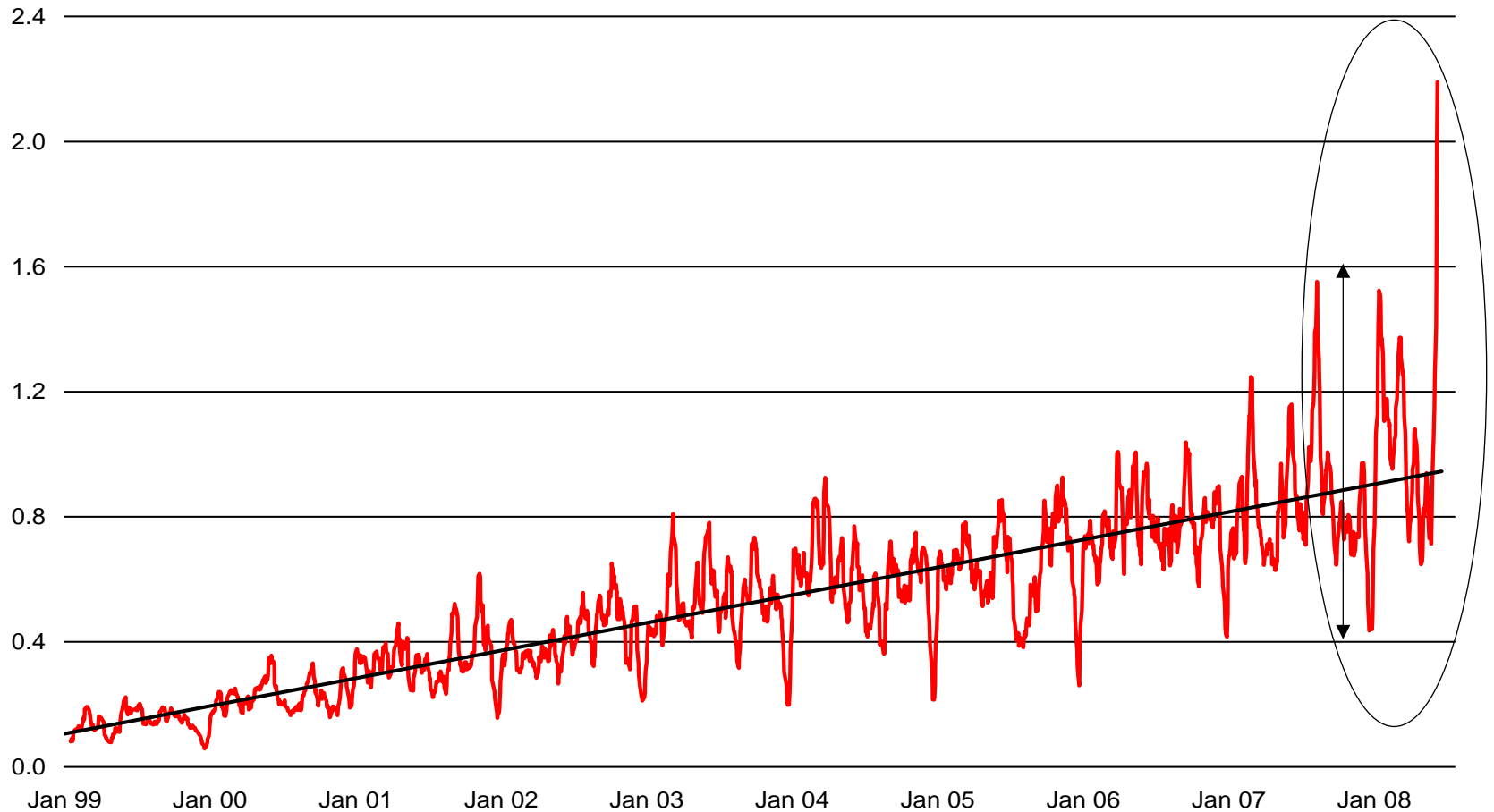
Amount outstanding in USD billions of commercial papers for ABS (till 11 June 2008). Source: Bloomberg

THE IMPACT ON THE LIQUIDITY SITUATION

- The onset of the subprime crisis triggered a huge disruption in the liquidity situation:
 - Volume and
 - Open Interest of Money Market Futures (3-month EURIBOR Future) dropped dramatically!

THE IMPACT ON THE LIQUIDITY SITUATION

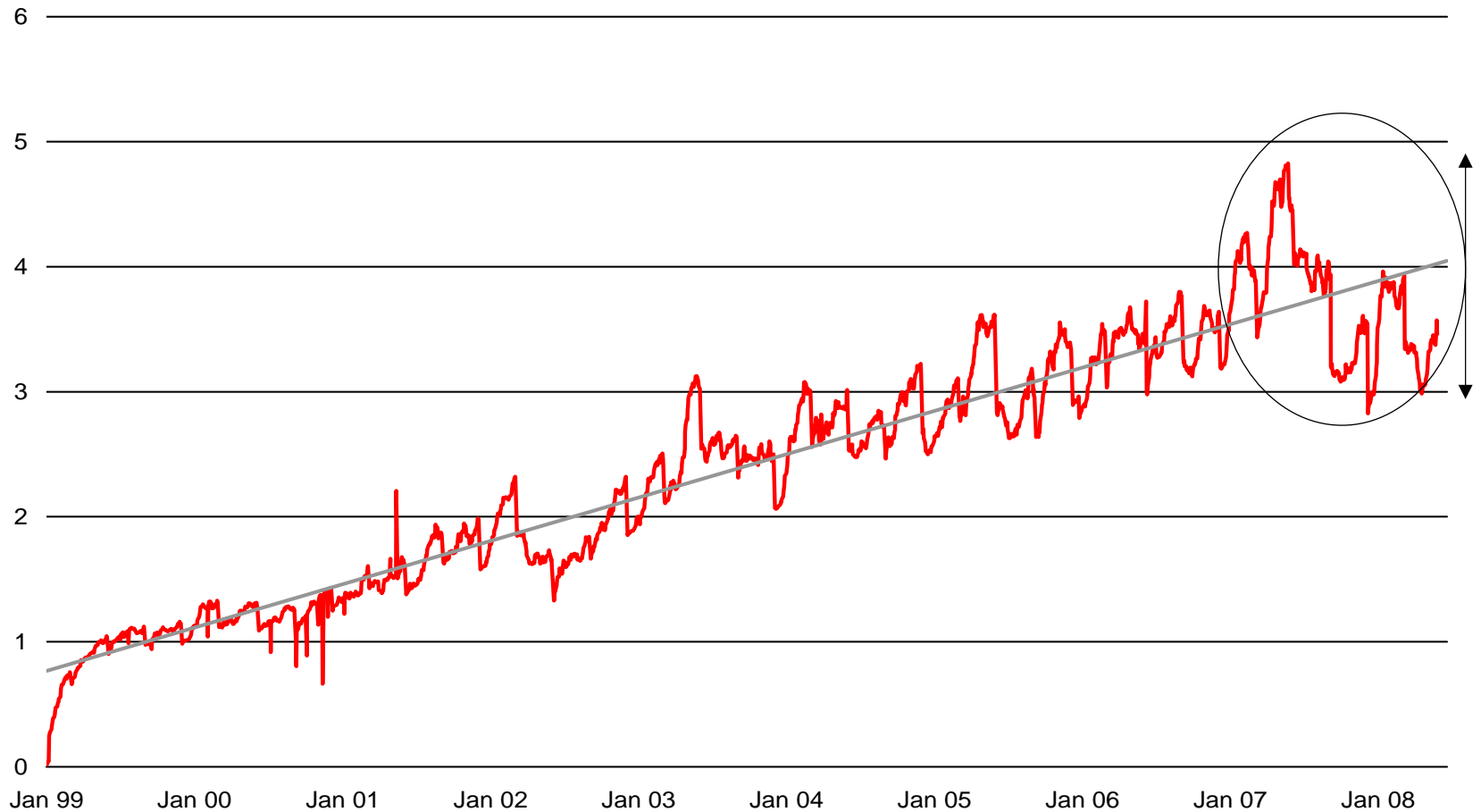
10-day moving average of daily trading volume in mn contracts of 3-month EURIBOR Futures



Source: Bloomberg, UniCredit Global Research

THE IMPACT ON THE LIQUIDITY SITUATION

Open Interest in mn contracts of 3-month EURIBOR Future dropped dramatically!



Source: Bloomberg, UniCredit Global Research

A SEISMOGRAPH FOR THE INTERBANK TRUST

LIBOR

London InterBank Offered Rate

Daily reference rate based on the interest rates at which banks **are willing to** offer to lend **unsecured** funds to other banks in the London "interbank" money market

The LIBOR is:

- Published by the British Bankers Association (BBA)
- Fixed shortly after 11:00 each day, London time
- Filtered average of interbank deposit rates offered by designated contributor banks
- The actual rate at which banks will lend to one another may vary throughout the day
- There are LIBOR rates in **GBP, USD, CHF, JPY, EUR** etc.
- The Libor market is a **360 Trillion** USD derivatives market

A SEISMOGRAPH FOR THE INTERBANK TRUST

EURIBOR

EURo InterBank Offered Rate

Daily reference rate based on the interest rates at which banks **are willing to** offer to lend **unsecured** funds to other banks in the euro interbank money market.

The EURIBOR is:

- Published by the European Banking Federation (EBF)
- Fixed at about 11:00 each day, Central European Time
- Filtered average of interbank deposit rates offered by a large panel of designated contributor banks (currently 47)
- The actual rate at which banks will lend to one another may vary throughout the day
- EURIBOR rates are spot rates, i.e. for a start two working days after measurement day
- First published on 30 December 1998 for value 4 January 1999
- There are rates for 1, 2, 3 weeks and 1 – 12 months (T+2, act/360)
- 3-month EURIBOR is considered to be the benchmark

EURIBOR is the most important reference rate for interest rate derivatives and floating rate notes in Euro-land!

A SEISMOGRAPH FOR THE INTERBANK TRUST

EONIA

Euro OverNight Index Average

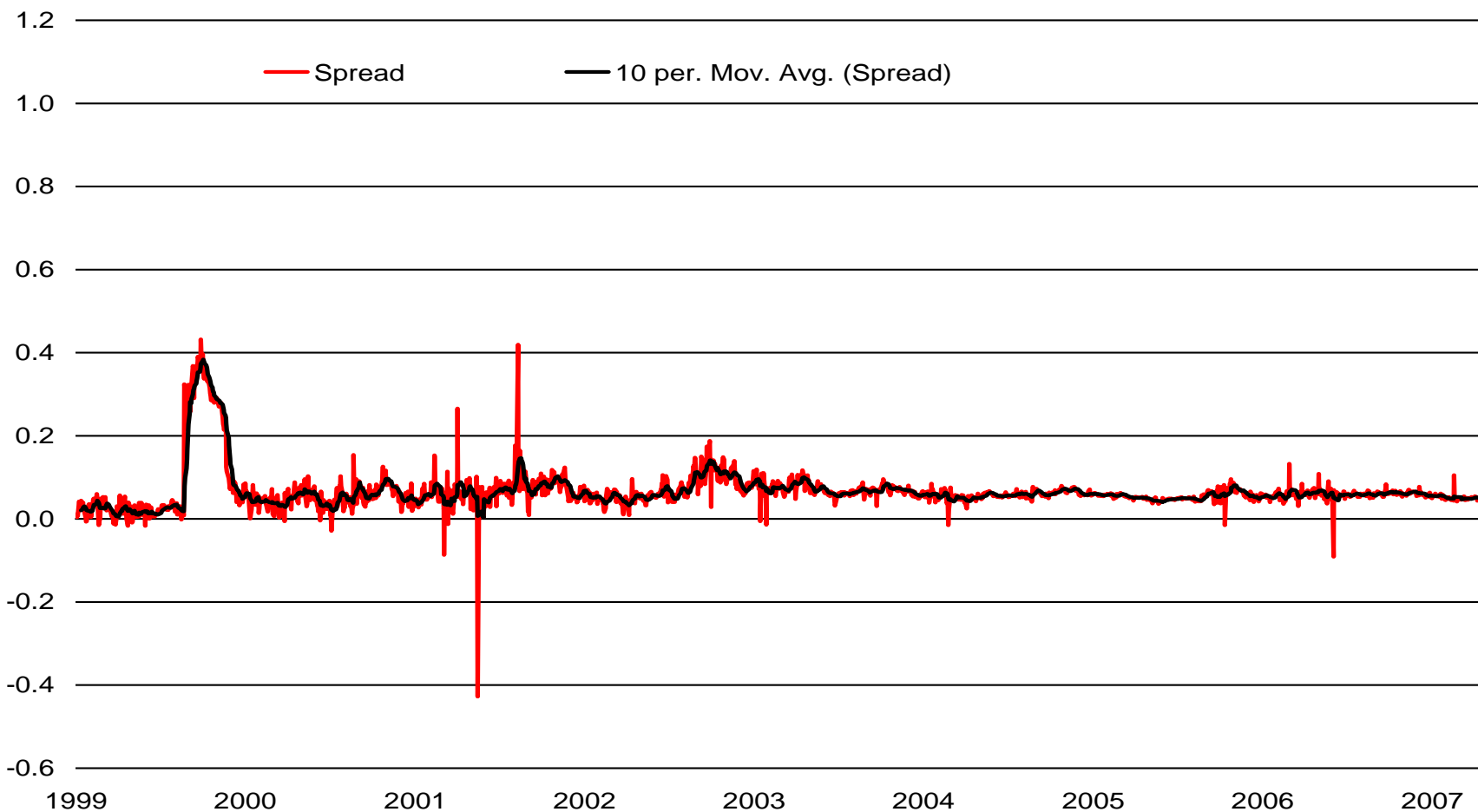
Daily reference **overnight** rate based on the interest rates at which banks lend **unsecured** funds to other banks in the euro interbank money market.

The EONIA is:

- Published by the European Banking Federation (EBF)
- Fixed between 6:45 and 7:00 pm on the day of submission (CET)
- EONIA is **the notional weighted average of all interbank transactions** for unsecured overnight lending
- Same set of panel banks as for EURIBOR
- Panel banks submit **EONIA swap rates** for the same maturities as for the EURIBOR rate. Here, the buyer of a 3-month EONIA Payer Swap pays fixed rate and receives the average daily EONIA rate including compounding.
- 3-month EURIBOR and EONIA swap rates are almost the same. They only differ by the usually small credit risk, e.g., of a 3-month loan versus a 3-month swap (netting).

A SEISMOGRAPH FOR THE INTERBANK TRUST

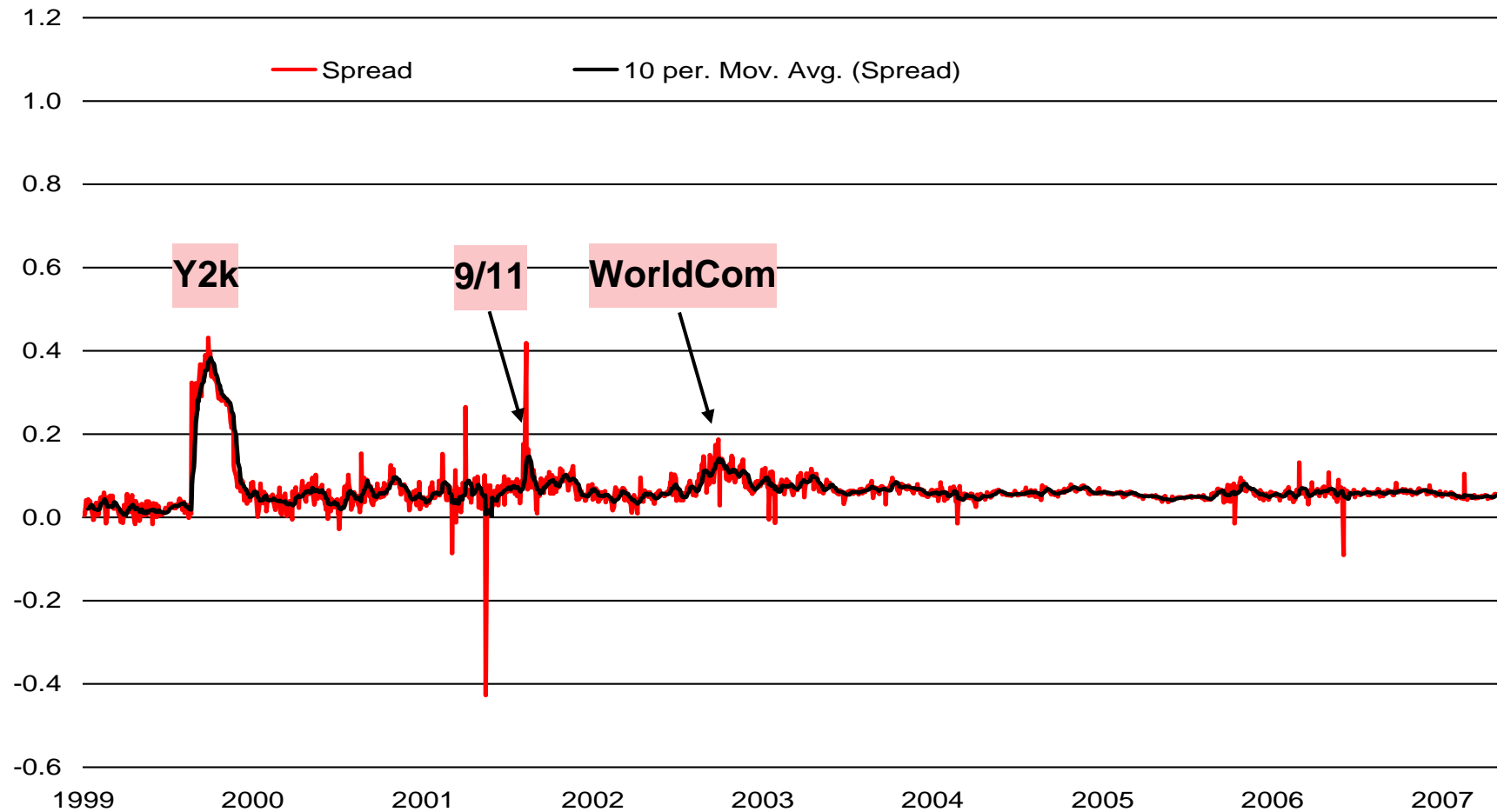
The 3-month EURIBOR-EONIA spread



Source: Bloomberg, UniCredit Global Research

A SEISMOGRAPH FOR THE INTERBANK TRUST

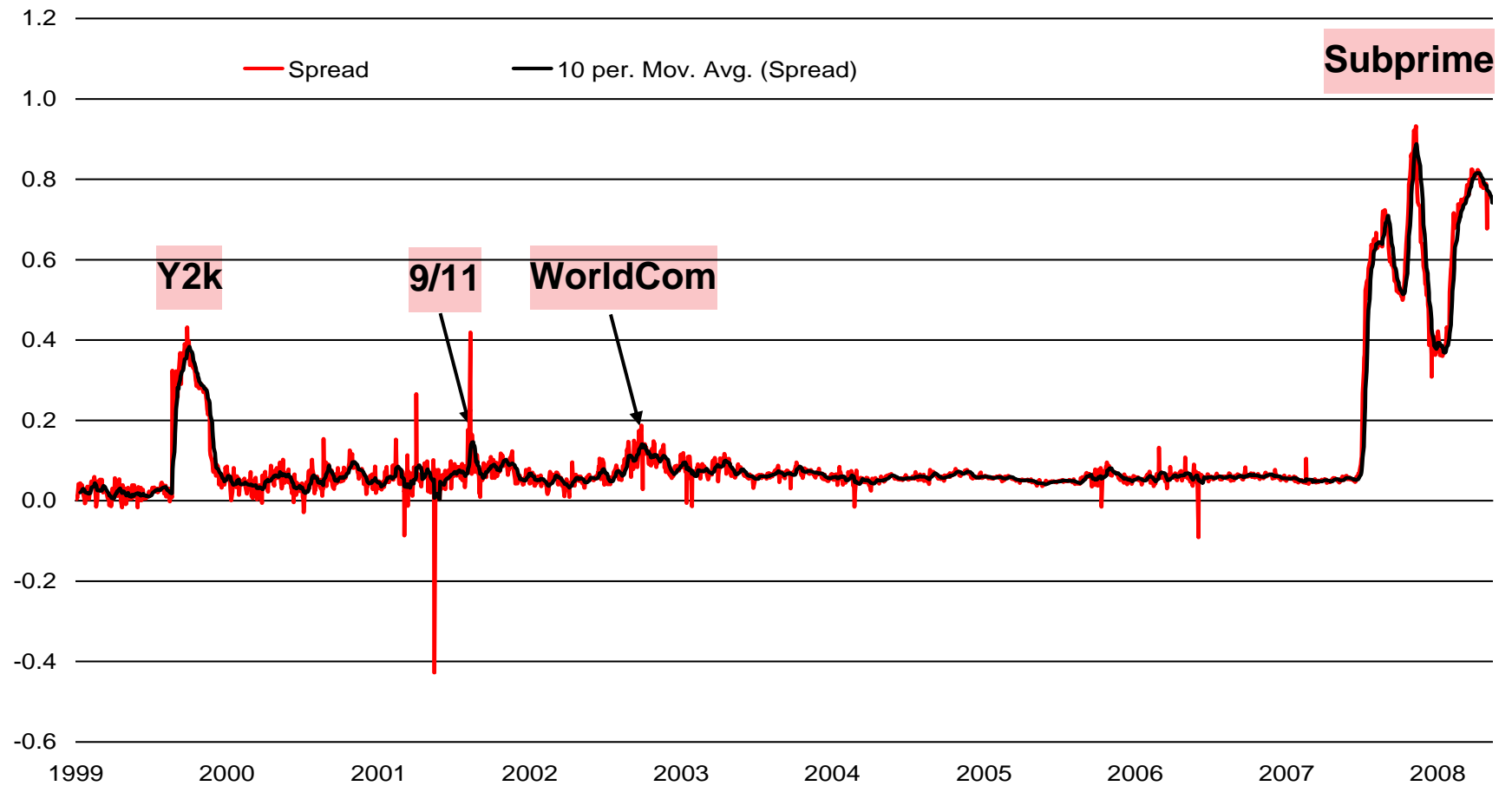
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Source: Bloomberg, UniCredit Global Research

A SEISMOGRAPH FOR THE INTERBANK TRUST

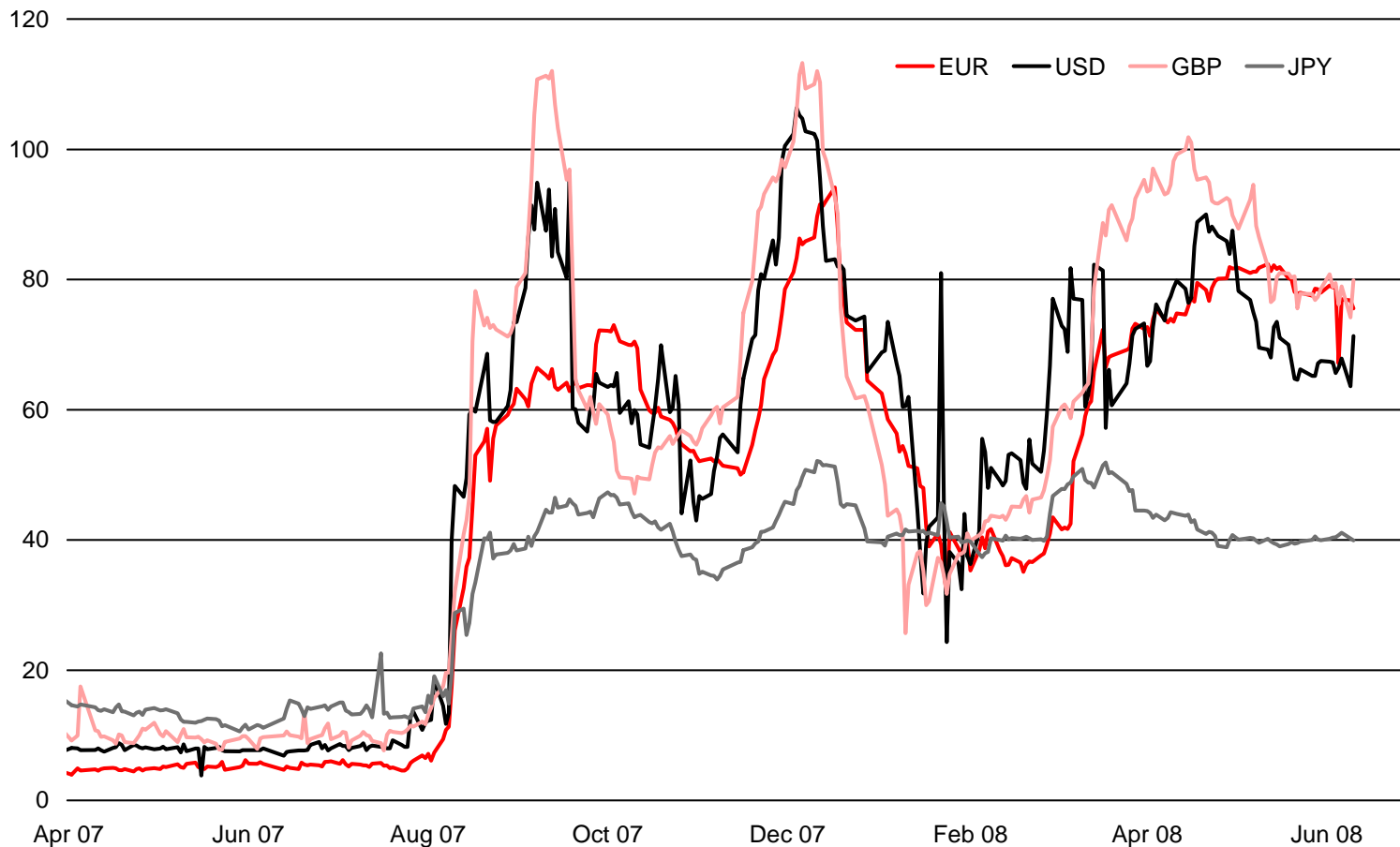
The 3-month EURIBOR-EONIA spread



Source: Bloomberg, UniCredit Global Research

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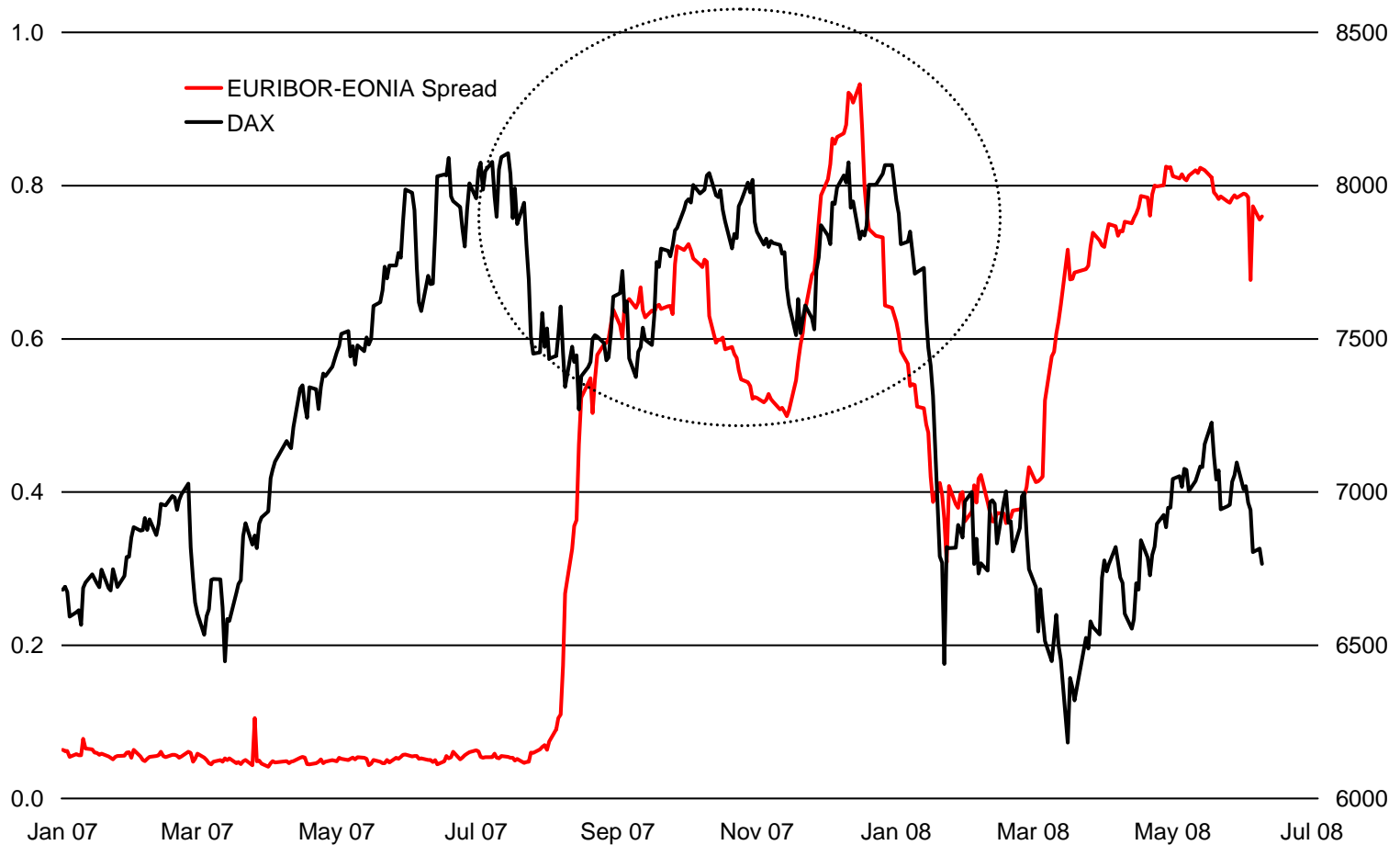
Similar situation in other markets (spread in bps)



Source: Bloomberg, UniCredit Global Research

A SEISMOGRAPH FOR THE INTERBANK TRUST

There existed a parallel-universe between money markets and equity markets in the second half of 2007



Source: Bloomberg, UniCredit Global Research

SINGLE B RATING FOR THE BANKING SECTOR

Crude assumptions and a back-of-the-envelope calculation

- 3-month EURIBOR-EONIA spread is a credit spread
- Assume spread of 60 bps corresponding to an expected 3-month loss of 0.006
- Assume loss given default of 60% (lgd = 0.6, recovery rate 0.4)

expected loss = default probability * loss given default

- Three month default probability:

$$pd(3m) = \frac{0.006}{0.6} = 1\%$$

- One year default probability:

$$pd(1y) = 1 - (1 - pd(3m))^4 = 3.94\%$$

- This corresponds roughly to a single **B+** rating!
 - **The result illustrates the dysfunction of the interbank market. It is in strong contrast to CDS levels!**
 - Due to the marginal lending facility of the European Central Bank, EURIBOR-EONIA spread levels are expected to be capped at 100 bps.
-

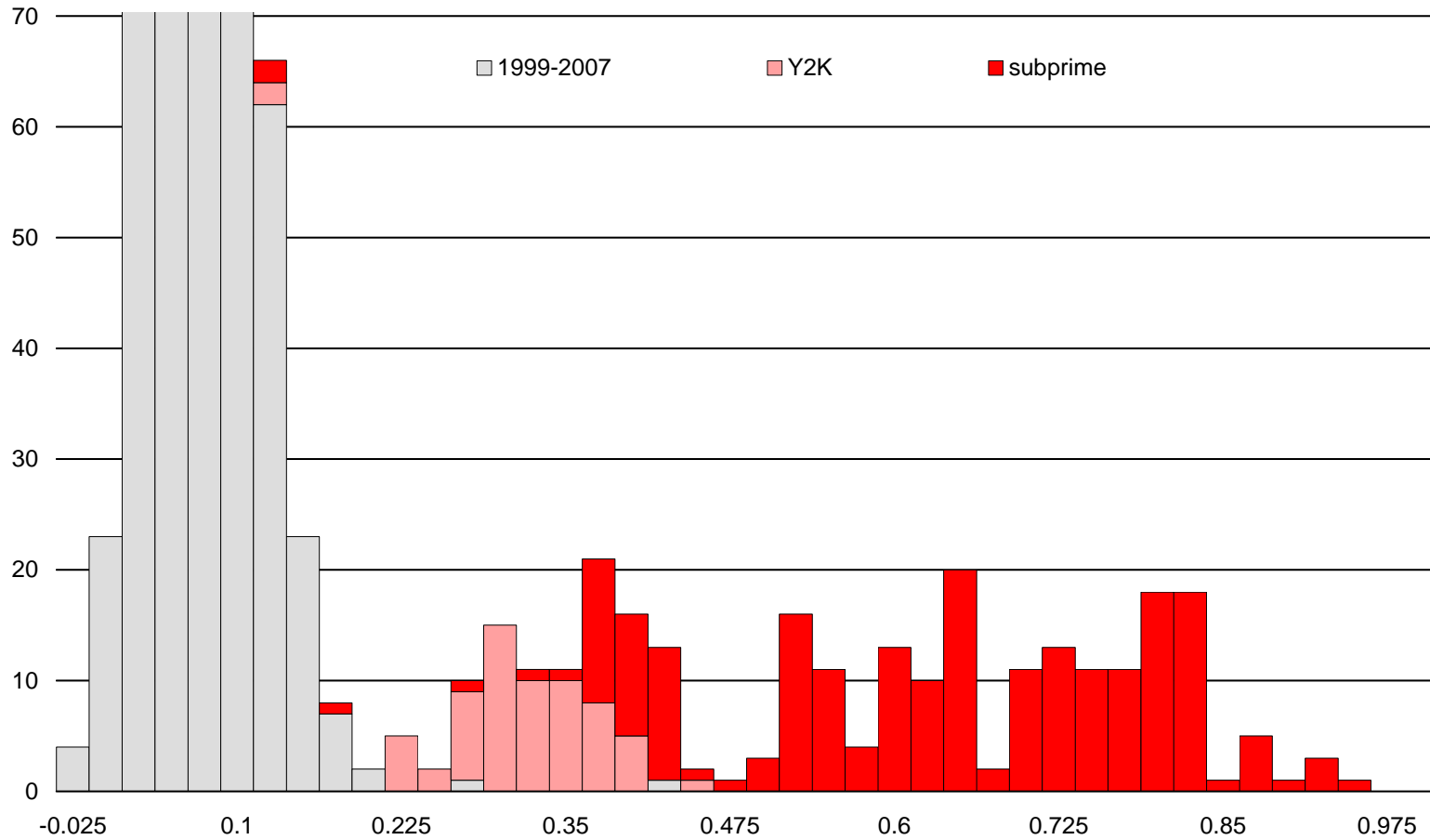
11- σ EVENTS AND THE LIMITS OF HISTORICAL ANALYSIS

Pitfalls of normal distribution assumptions

- Spread levels observed since the start of the subprime crisis have taken us into uncharted territory
- The only event prior to the subprime crisis causing spreads to widen was Y2K
- Y2K may be considered as a unique event!

11- σ EVENTS AND THE LIMITS OF HISTORICAL ANALYSIS

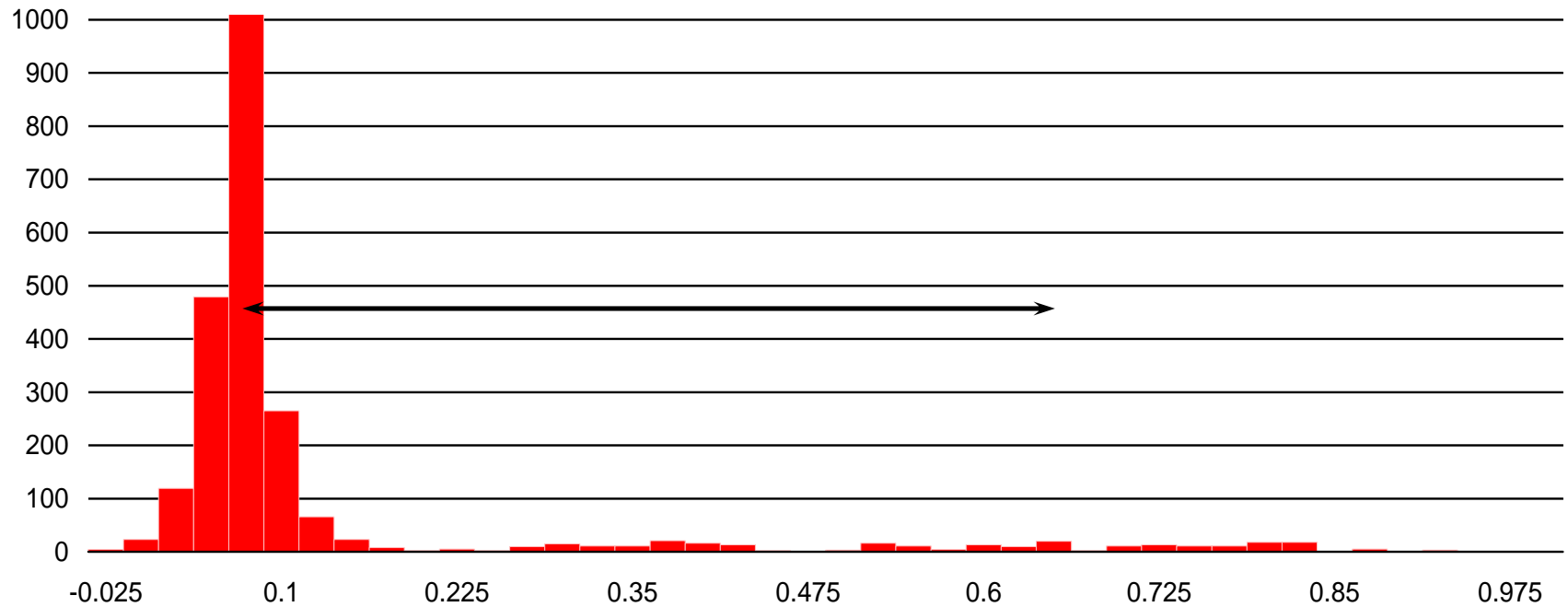
Historical spread distribution



Source: Bloomberg, UniCredit Global Research

11- σ EVENTS AND THE LIMITS OF HISTORICAL ANALYSIS

Historical spread distribution



Source: Bloomberg, UniCredit Global Research

11- σ EVENTS AND THE LIMITS OF HISTORICAL ANALYSIS

Pitfalls of normal distribution assumptions

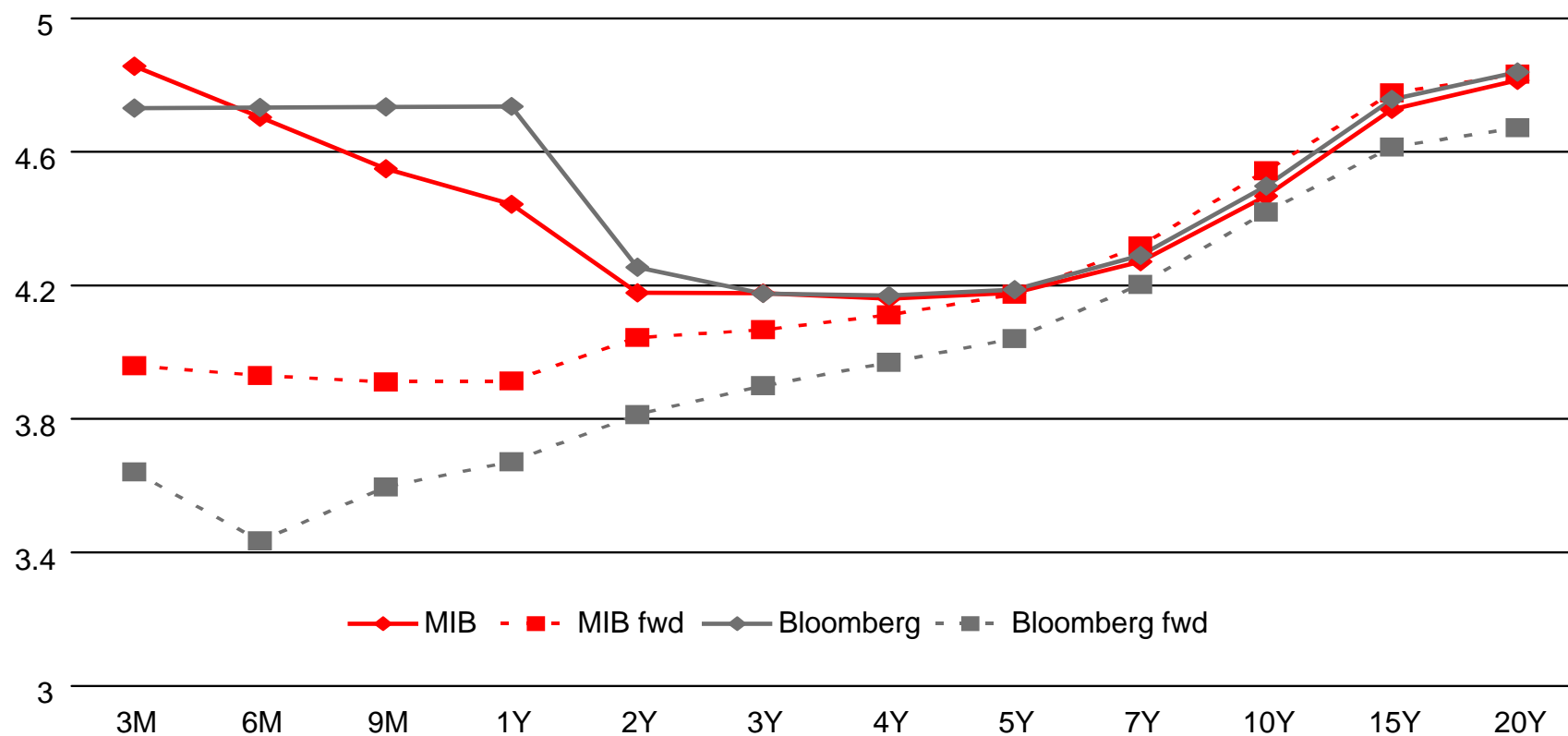
- Based on a normal distribution, the observed spread movement corresponds to a 10.8 σ event
- Comparison of similar events and 3 σ events are:

Event	Probability
11 σ event	1.9 exp -28
Being struck by lightning 5 times (independently) in a year	5.8 exp -28
Winning lotto (6 of 49) 4 times in a row	2.6 exp -29
Probability of decay of an individual proton within a year	1 exp -32
3 σ event	0.00135

- In the every day (bank) live we are more conditioned to *rare* events in the range of 3 σ . This corresponds to a probability of 99.87% to miss such an event (approx. once every 3 years).
- Don't blame the trader, blame the risk manager!

CHALLENGES FOR VALUATION MODELS

- The subprime crisis has a dramatic impact on the shape of the interest rate term structure
- The outcome is very sensitive to the selection of the benchmark instruments and the calibration method
- Calibrating a useful yield curve for the valuation of financial instruments becomes more of an art than ever



CHALLENGES FOR VALUATION MODELS

The subprime crisis has also an impact on the dynamics of the term structure

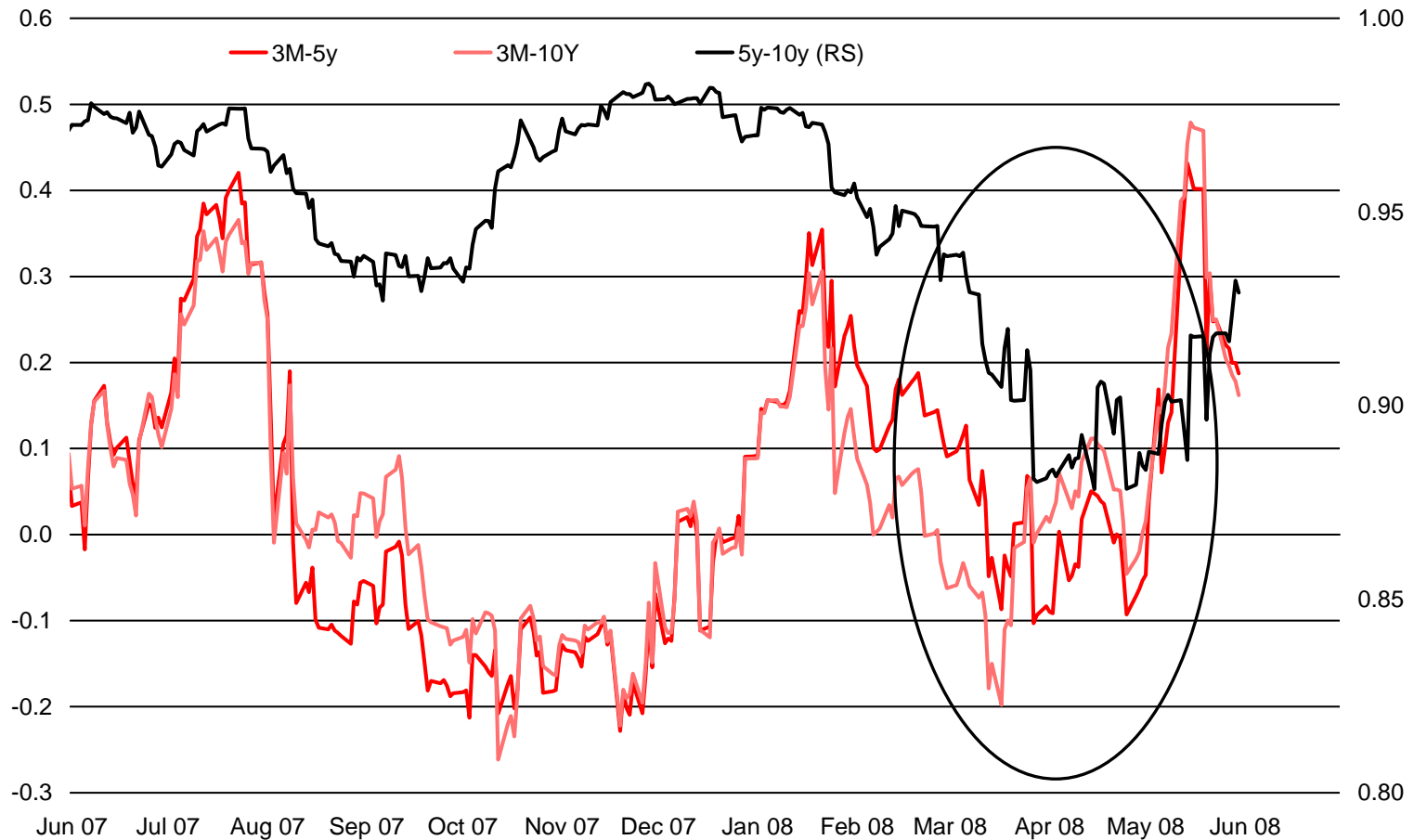
- High volatility on the short end (6-month EURIBOR, weekly changes) and ...



Weekly change of 6-month EURIBOR rates (red) and 10 weeks moving average (black), Source: Bloomberg, UniCredit Global Research

CHALLENGES FOR VALUATION MODELS

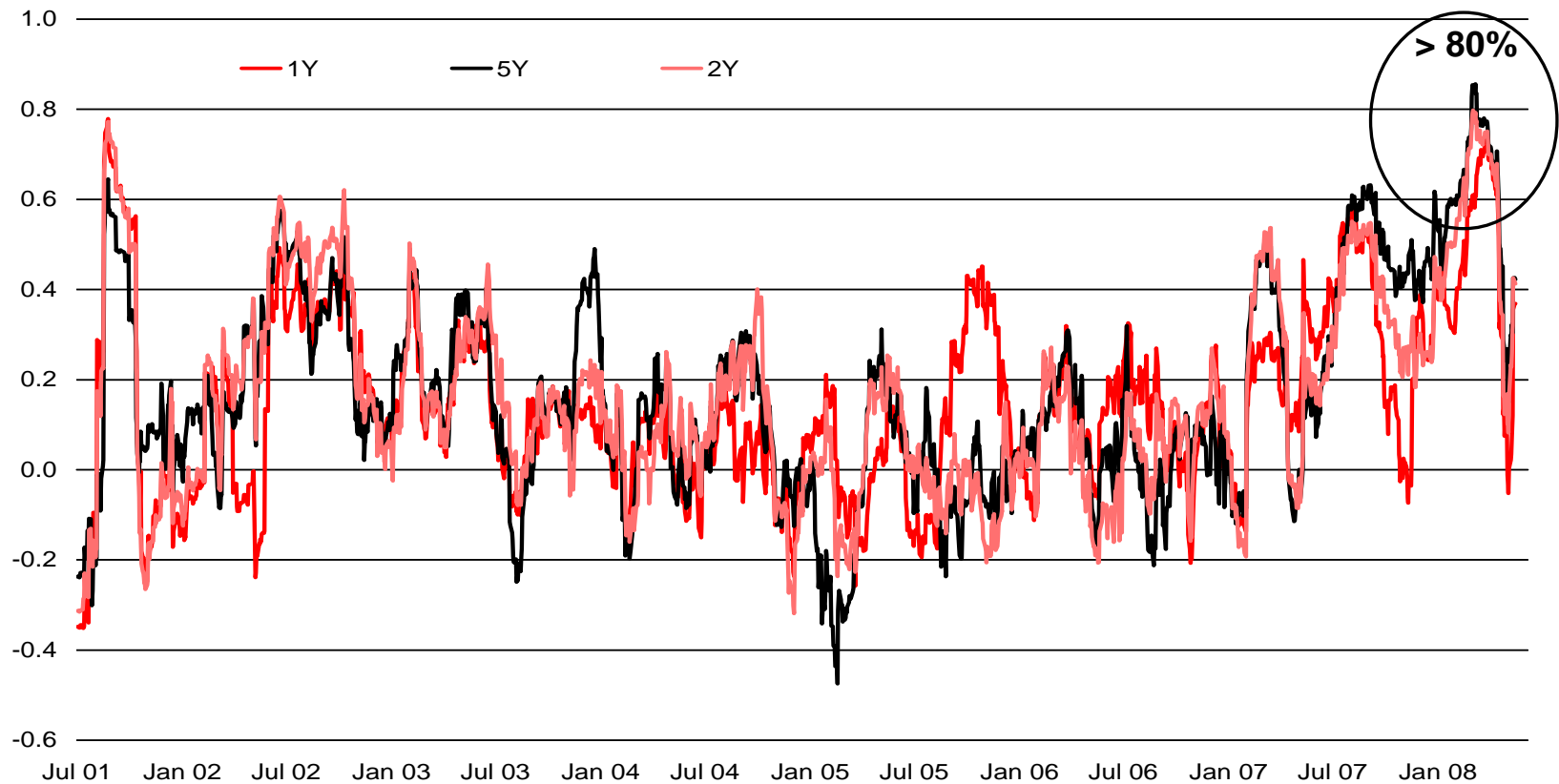
... low intra curve correlation challenges short rate term-structure models



Correlation between 3-month-5 years, 3-month-10 years (ls) and 5 years-10 years (rs) daily logreturns, Source: Bloomberg, UniCredit Global Research

CHALLENGES FOR VALUATION MODELS

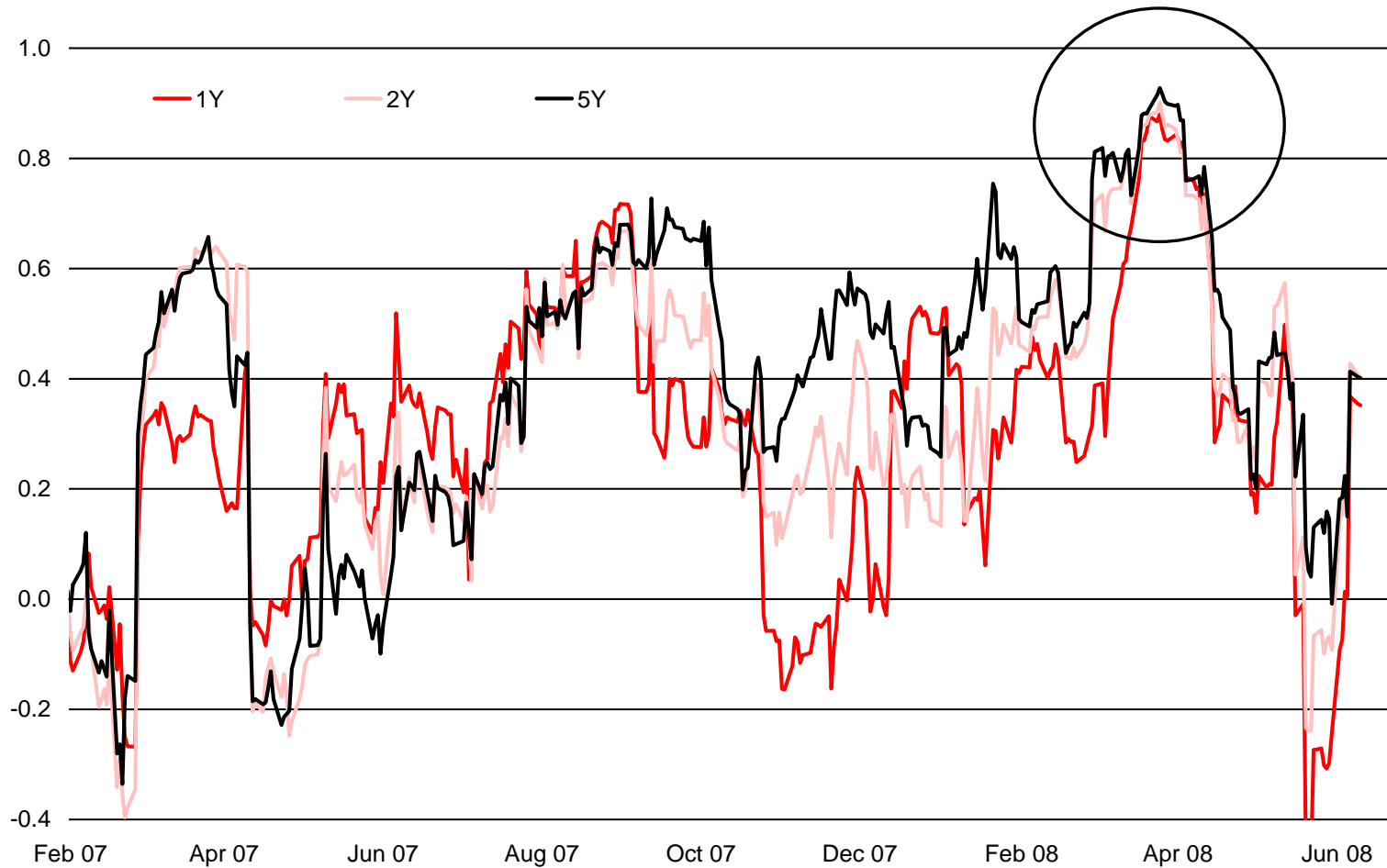
- In times of crisis, different asset classes tend to correlate or anti-correlation strongly (systemic risk)
- This is also true for the subprime crisis
- Correlation between logreturns of VDAX and implied cap volatility has never been so high!



Correlation between logreturns of 1 year, 2 year and 5 year atm implied cap vola and the VDAX. Correlation is estimated using a 40 day sliding window. May 2001 to 18 April 2008. Source: Bloomberg, UniCredit Global Research

CHALLENGES FOR VALUATION MODELS

... but peak in coupling has been reached.



Correlation between logreturns of 1 year, 2 year and 5 year atm implied cap vola and the VDAX. Correlation is estimated using a 20 day sliding window. May 2001 to 18 April 2008. Source: Bloomberg, UniCredit Global Research

CONSEQUENCES FOR MARKET PARTICIPANTS

- EURIBOR and LIBOR rates are **the** reference rates for a multi trillion EUR (Libor: 360 trillion USD) fixed income market. Floater, Swaps, Caps, Floors, and numerous other fixed income derivatives refer to these rates,
- **But:**
 - EURIBOR (www.euribor.org): and LIBOR rates are neither based on traded rates nor are they binding offers
 - They refer to unsecured lending
 - They carry the specific credit risk of the banking sector
 - They require a functioning and liquid interbank market
 - 'Lie'bor rates are alleged to be understated to avoid the impression the submitting bank is in trouble rising short term funds
 - BBA threatened to ban members submitting false rates (16 April 2008)

CONSEQUENCES FOR MARKET PARTICIPANTS

Other reference rates may be more appropriate as reference rates for derivatives:

- **EONIA** Swap rates (www.eoniaswap.org):
 - EONIA is based on volume weighted, traded rates
 - EONIA Swap rates are, like EURIOR rates, submitted rates of panel banks, but they carry only credit risk of Swaps (differential payments)
 - EONIA and EONIA Swaps require a functioning and liquid interbank market
 - **EUREPO** (www.eurepo.org):
 - EUREPO is reference rate for secured lending (Collateralised)
 - EUREPO rates are, like EURIOR rates, submitted rates of panel banks
 - Carry no credit risk
 - Require a functioning and liquid interbank market
 - **NYFR** (ICAP) launched on 11 June 2008
 - a survey amongst 40 NY based panel banks
 - submit anonymously market mid rates for 1 and 3-month rates for "likely" unsecured interbank lending
 - **LIBOR** revised procedure:
 - increase number of panel banks
 - add a second daily survey
-

RELATED PUBLICATIONS ON THIS TOPIC

- [1] D. Dersch, The impact of the subprime crisis on the European interbank market, FX/FI Special, 10 October 2007, Quantitative Cross Asset Research, UniCredit Markets & Investment Banking.
- [2] D. Dersch, The ongoing impact of the subprime crisis on the interbank market – an update, FX/FI Special, 20 December 2007, Quantitative Cross Asset Research, UniCredit Markets & Investment Banking.
- [3] D. Dersch, 'Subprimed' in the money market or a hedge with an edge, FX/FI Special, 18 April 2008, Quantitative Cross Asset Research, UniCredit MIB
- [4] D. Dersch, The three sisters of subprime: New dynamic in a continuing crisis, FX/FI Special, 21 April 2008, Quantitative Cross Asset Research, UniCredit Markets & Investment Banking.

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