

# Stress VaR and Systemic Risk Indicators

Private Sector Applications of How to Measure Systemic Interconnectedness

IMF Conference On Operationalizing Systemic  
Risk Monitoring

**Richard Berner**

Chief U.S. Economist

Co-Head, Global Economics

May 28, 2010

Courtesy Morgan Stanley; © 2010 Morgan Stanley.

All references to this presentation and the author's comments should be properly attributed orally or in writing to Morgan Stanley

# Plan of Talk

- Stress VaR at Morgan Stanley
- Indicators of systemic risk

# Three Lessons for Regulators and Risk Managers

- Stress testing matters
  - VaR only covers local price moves, not systemic interconnectedness
  - No two financial crises are alike
  - Even stress testing has its limits, as it is based on most recent historical events
- Liquidity matters
  - VaR does not differentiate the liquidity of market risk factors
  - Lack of liquidity for certain products caused significant losses
- Disentangling market and credit risk is challenging or impossible
  - Evolution of Credit Derivatives conflates the two
  - Significant losses driven by markdowns prior to or without default

# What is Stress-VaR?

- Stress VaR (S-VaR) is a **forward-looking** measure of portfolio risk that attempts to quantify **extreme tail risk** calculated over a **long time horizon** (1 year).
- Step 1: Perform Monte Carlo simulations of *systematic risk factors* and add specific risks, including jumps, gaps and severe discontinuities.
- Step 2: Pick the **99% confidence level expected tail loss** from the resulting total P&L distribution.
- The result: A VaR-like, **reverse stress test measure**. **Instead of specifying the stress scenarios, the process selects the most adverse outcomes and then identifies the scenarios that produce them.**
- S-VaR aims to provide a comprehensive perspective of risks: Market, credit, and gap risks, illiquidity horizons and jumps-to-default.

# Proposed Stress VaR Limit (Liquidity Scaling Factor)

We apply a different scaling factor to risks according to their liquidity, degree of crowdedness and potential for recurring losses of short-term risk.

	Risk Factor	Liquid	Liquidity Scaling Factor →		Illiquid
Equities	S&P 500 index	x			
	\$100MM GE stock	x			
	\$5BN Barclays stock				x
Interest Rates	Swaps	x			
	Swaption volatility < 10 years		x		
	Swaption volatility > 20 years			x	
Credit	IG Index	x			
	IG bond/CDS basis				x
	HY bond/CDS basis				x
	Single-name idiosyncratic				x
Commodities	Oil < 6 months	x			
	Nat Gas at 5 years			x	
	Oil at 5 years			x	
	Nat Gas at 8 years				x
Currencies	G20 currencies	x			
	RUB/USD		x		
	USD/JPY volatility		x		
	USD/BRL volatility			x	
Real Estate	ABX index			x	
	Subprime bonds				x
	Alt-A bonds				x
	European mortgages				x
	CMBX index			x	
	US single deal/loan				x
	European single deal/loan				x

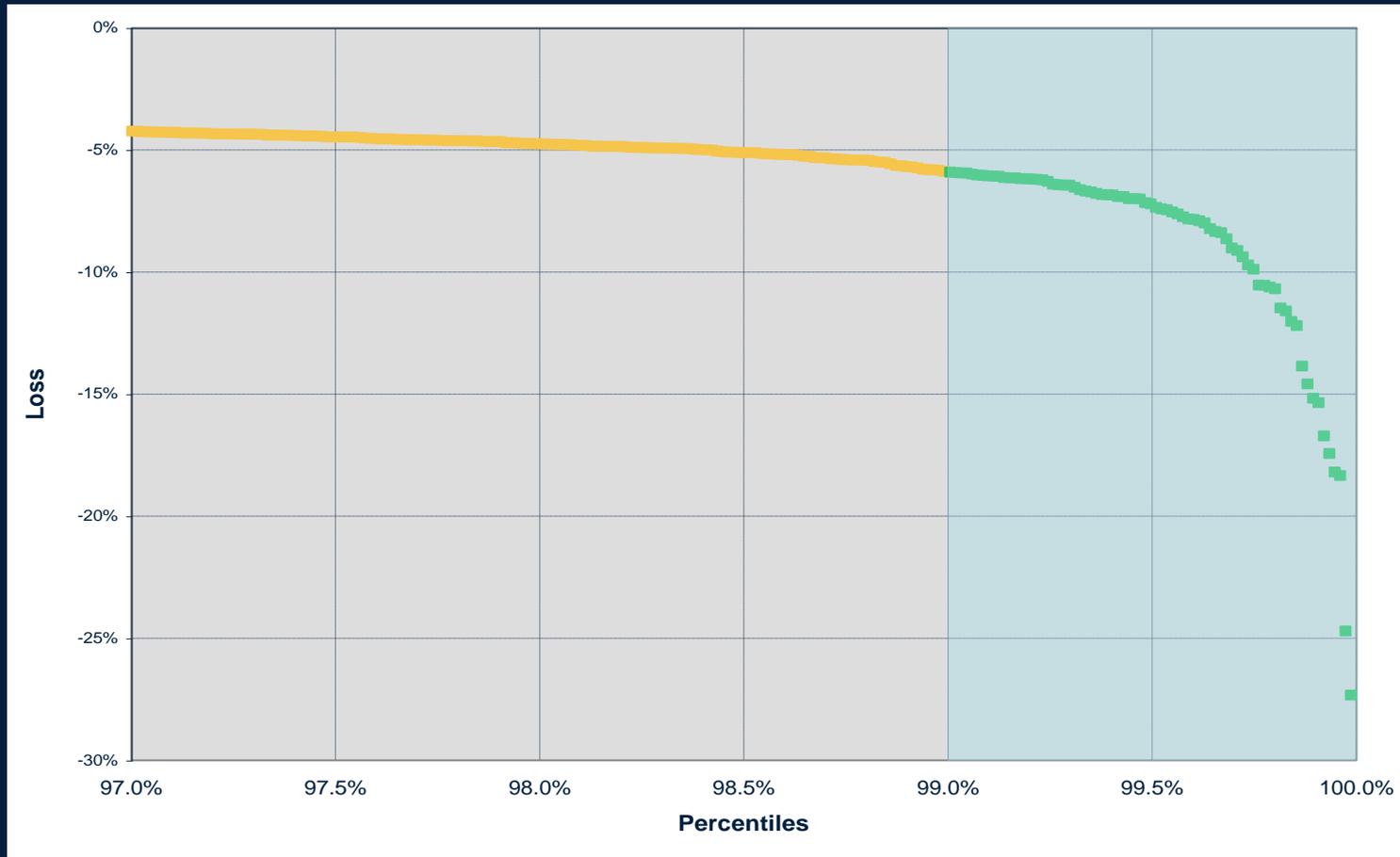
# Key Differences Between VaR and S-VaR

Feature	VaR	Stress VaR
<b>Time horizon</b>	1 day / 10 day	1 year
<b>Liquidity Consideration</b>	N / A	Included
<b>Time Series</b>	Recent	25 years
<b>Volatility Correlation</b>	Static	Stochastic
<b>JTD Risk</b>	Not included	Included

# Average Tail Loss

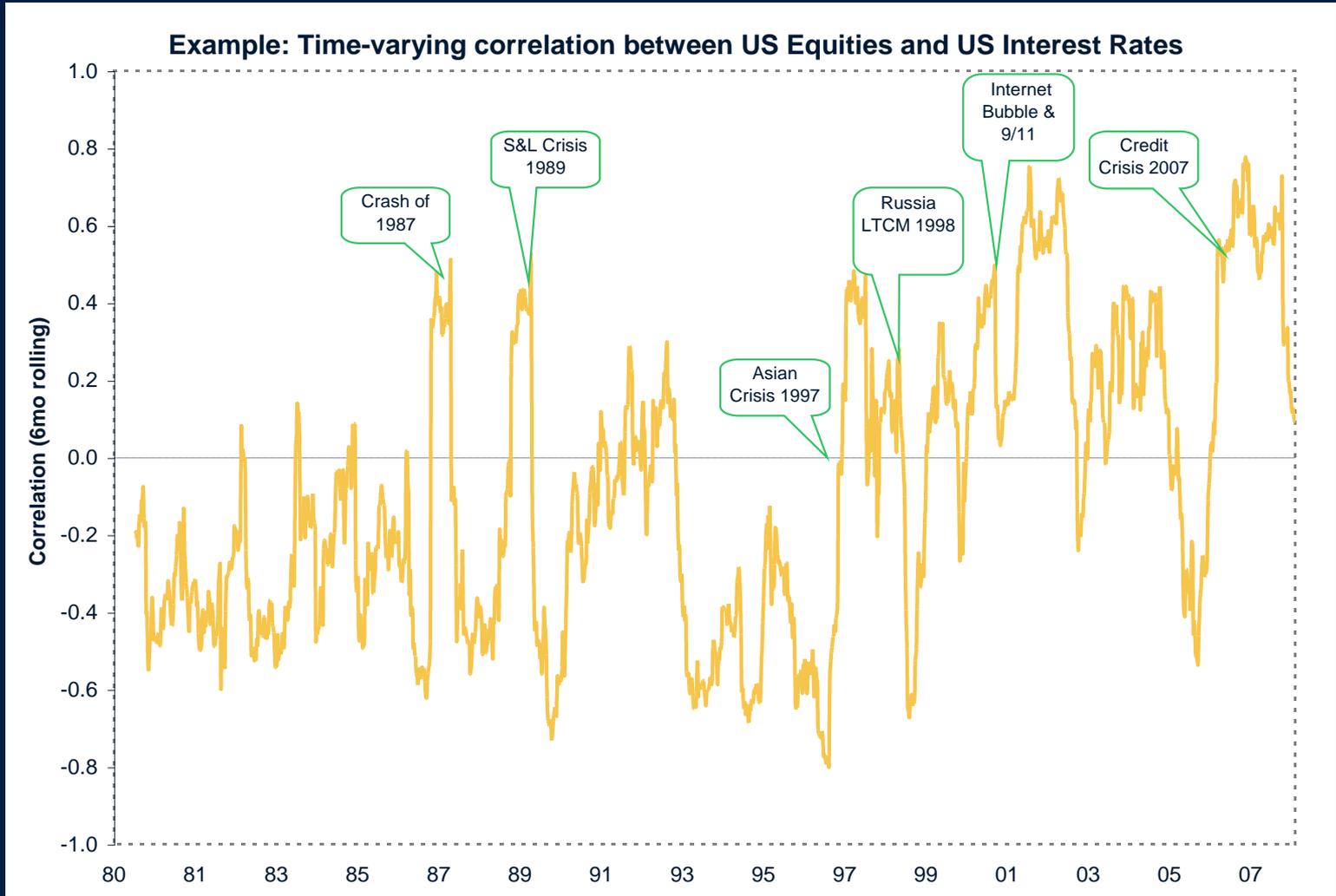
Average tail loss captures the distribution of tail events beyond a certain confidence level.

Example of S&P 500 Price Move (Weekly)



# 25 Year History and the Correlation Pattern in Crisis

- During crisis period, correlation between Equity and Interest Rates tends to increase.
- S-VaR tries to capture systematic pattern of correlation changes and volatilities.

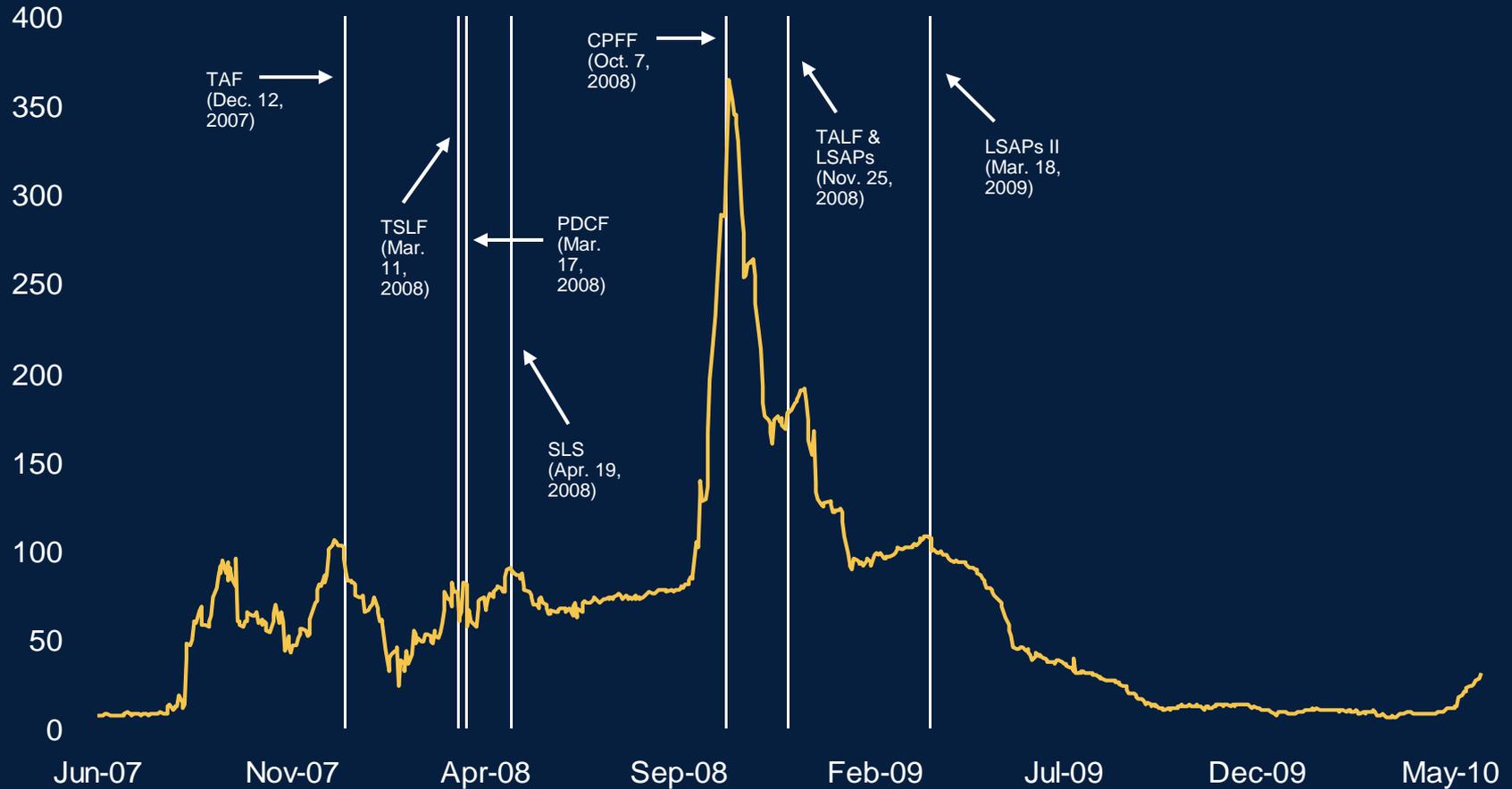


# Indicators of Systemic Risk

- Unsecured interbank lending rates: LIBOR/OIS
- Bid-ask spreads and haircuts across asset classes
- Tail-risk indicators across asset classes: Volatility and Skew

# LIBOR Spread Re-Widening: Euro Stress and Regulation

Spread of 3-Month LIBOR over expected average fed funds rate over the next three months (based on 3-month OIS)

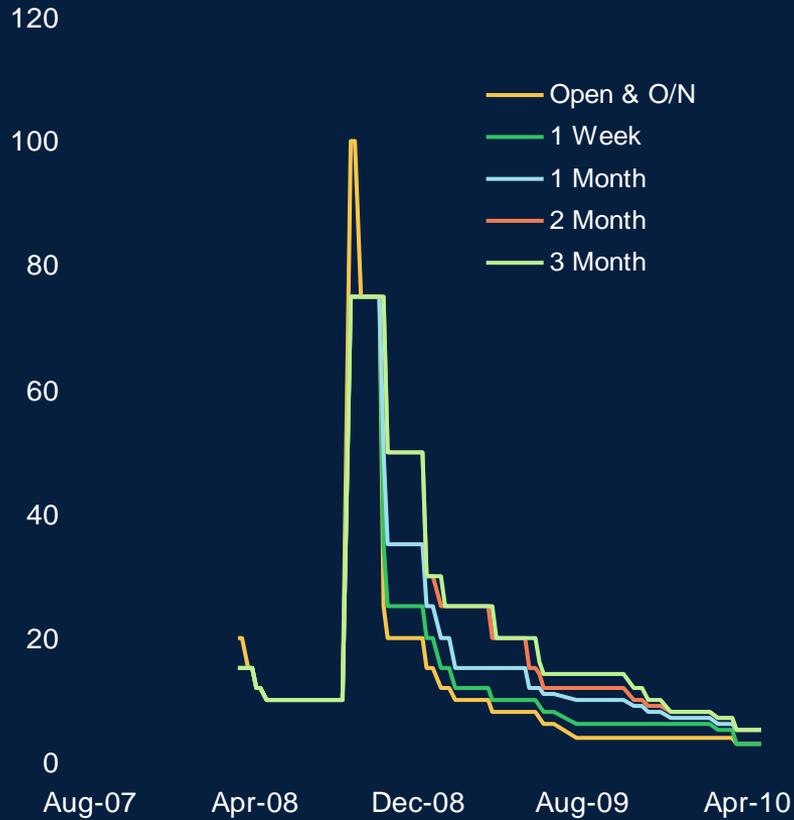


Source: Bloomberg

# Stress Indicators: Agency CMOs

## Bid/Ask Spread

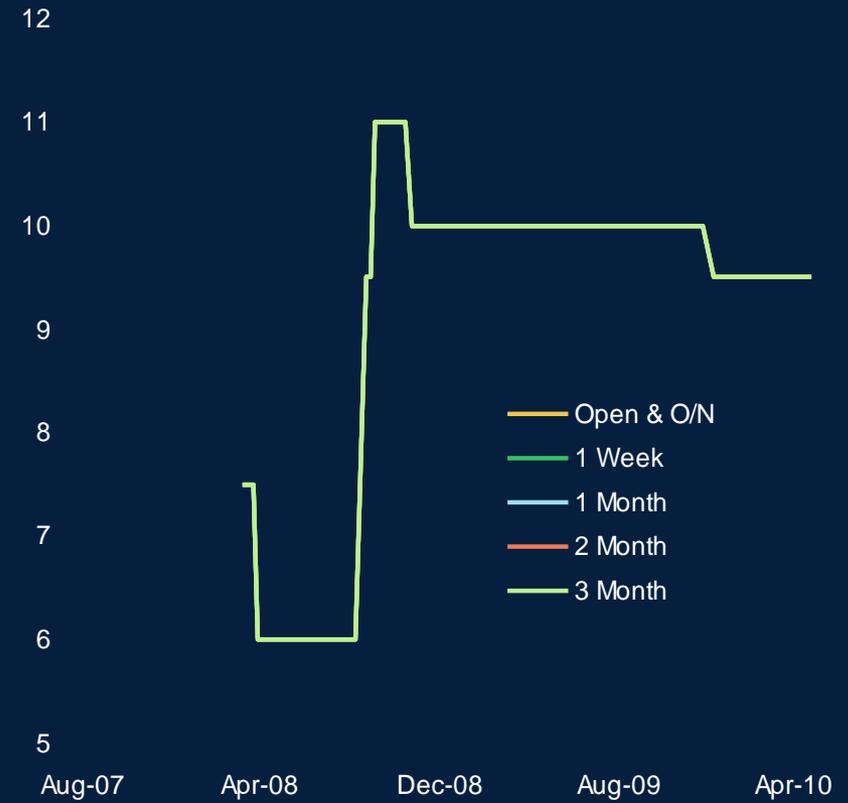
Basis Points



Source: Morgan Stanley Research

## Collateral Haircut

Percent

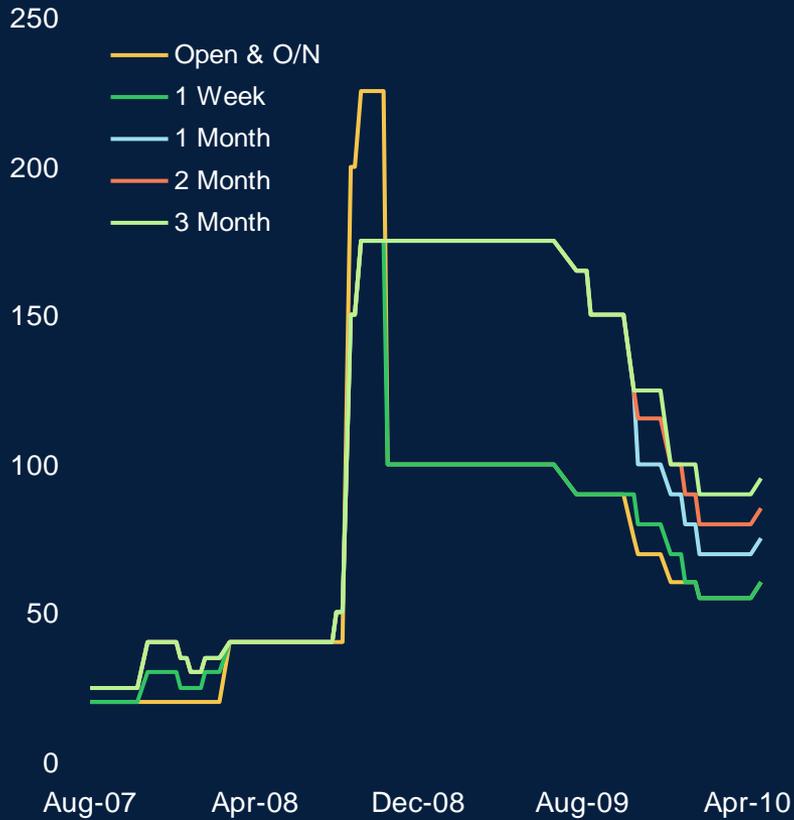


Source: Morgan Stanley Research

# Stress Indicators: Alt-A MBS

## Bid/Ask Spread

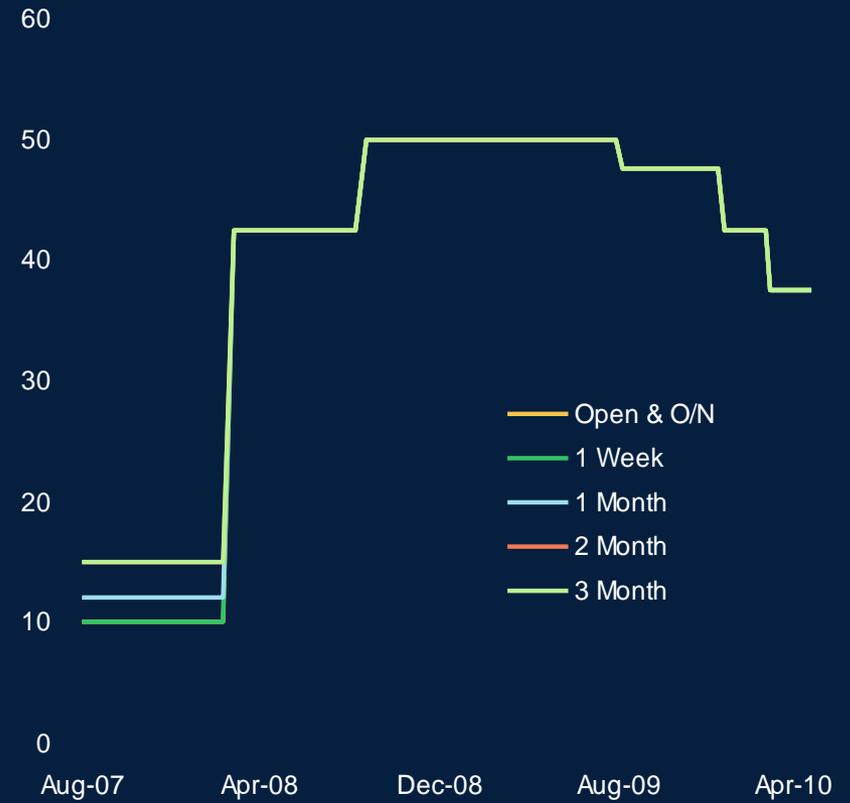
Basis Points



Source: Morgan Stanley Research

## Collateral Haircut

Percent

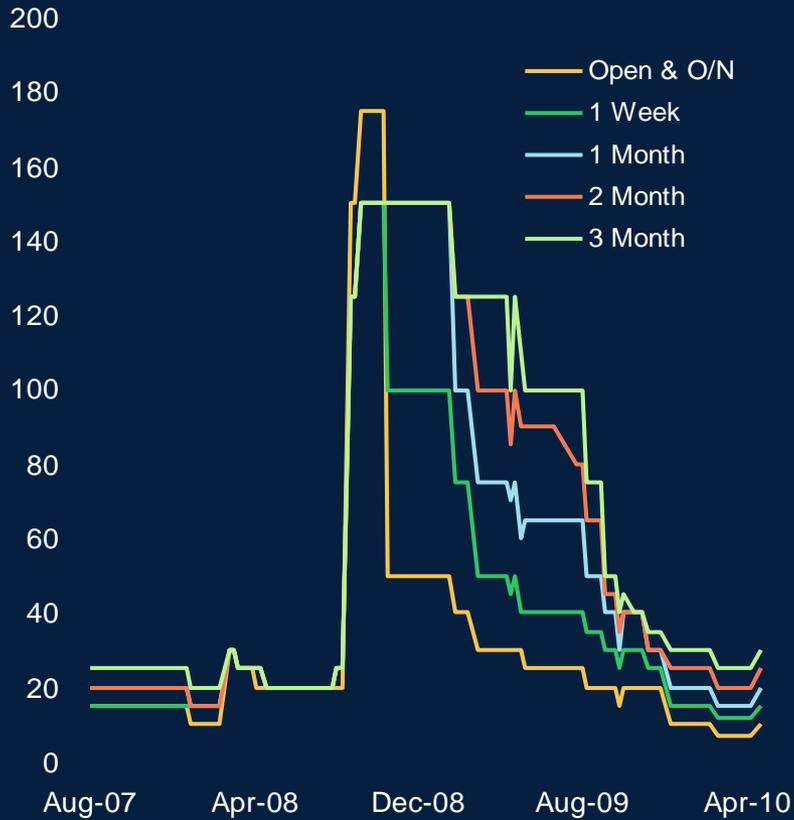


Source: Morgan Stanley Research

# Stress Indicators: High Grade Corporate Debt

## Bid/Ask Spread

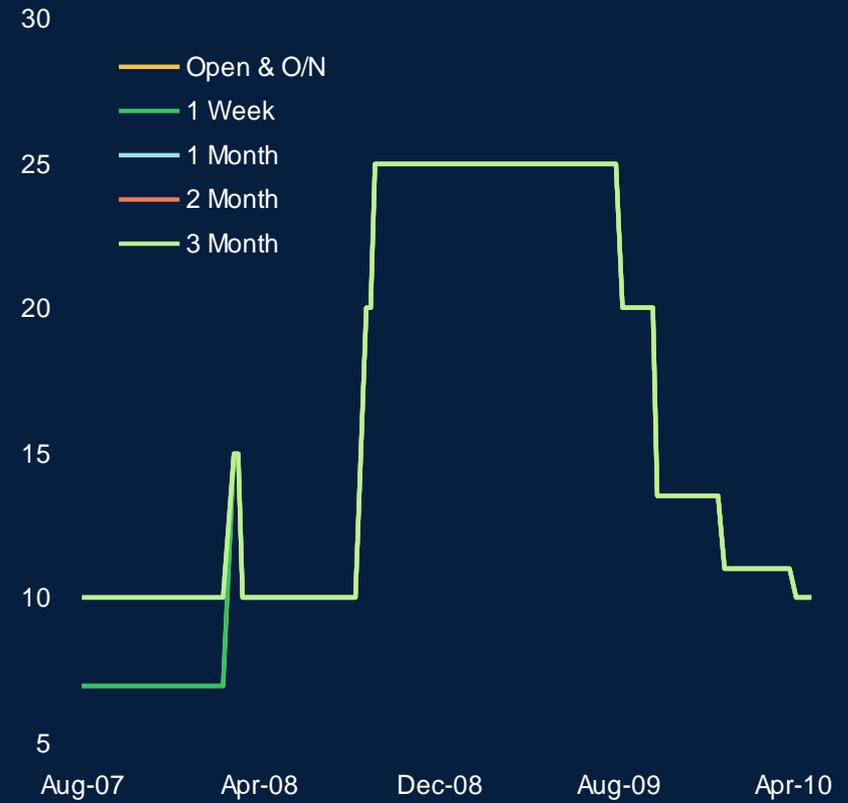
Basis Points



Source: Morgan Stanley Research

## Collateral Haircut

Percent

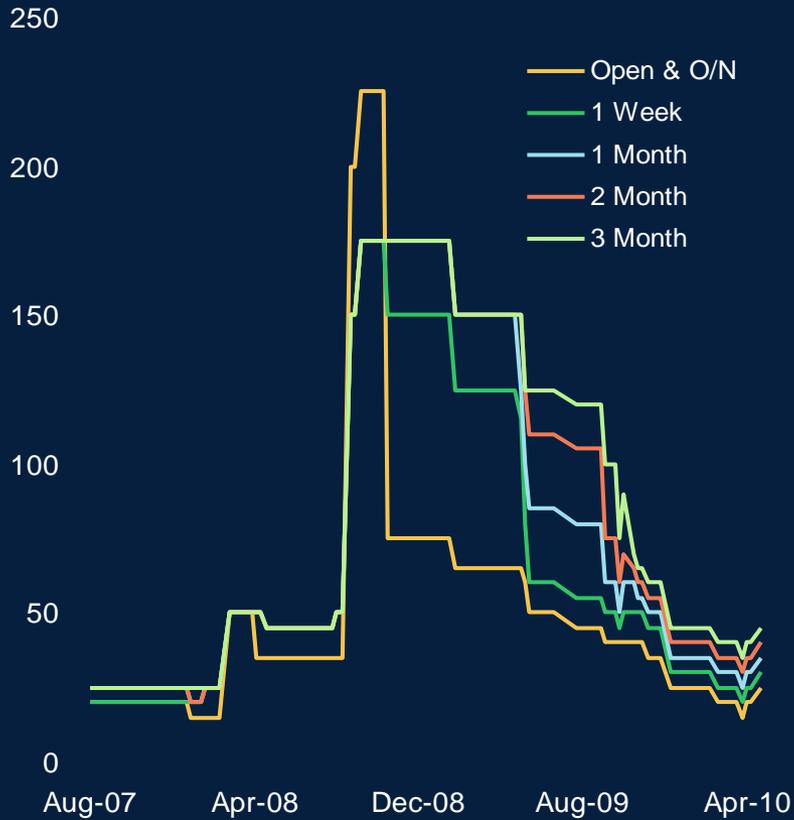


Source: Morgan Stanley Research

# Stress Indicators: High Yield Corporate Debt

## Bid/Ask Spread

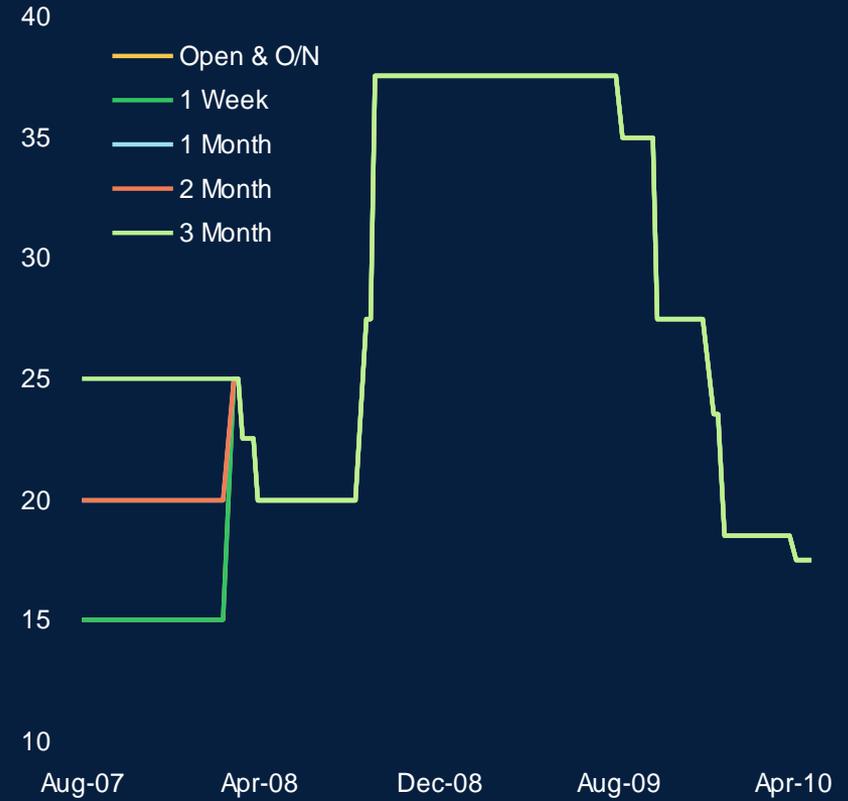
Basis Points



Source: Morgan Stanley Research

## Collateral Haircut

Percent



Source: Morgan Stanley Research

# Vol and Yield Curves: Systemic Risk Indicators?

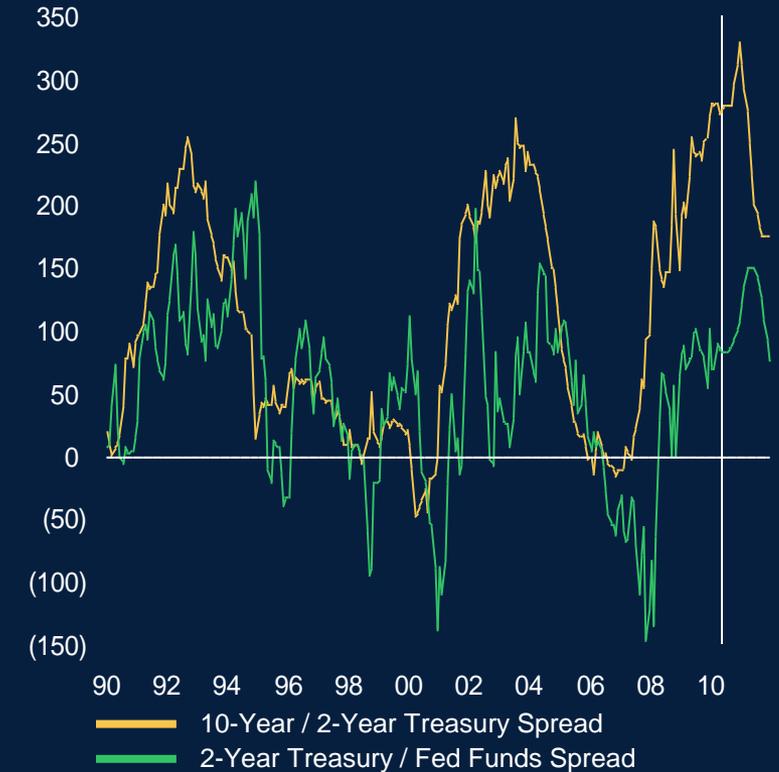
## Higher Volatility Here to Stay



Source: CBOE

## Curve Will Flatten Bearishly Next Year

Basis Points



Note: May 2010 – December 2011 values represent Morgan Stanley Research estimates.

Source: Federal Reserve, Morgan Stanley Research

# Beyond Volatility: Look to Skew For Tail Risks; Highest In Equities and Credit, Lowest in Rates

- **Complete market reset:** European sovereign stresses, fears of a potential global economic slowdown and an unwind of “risk on” trades has completely repriced most asset classes.
- **Volatility relationships experience a complete reversal:** Volatility has risen the most in equities, credit and EUR/USD today. Volatility is slightly cheaper in oil and gold, and it is cheapest now in USD rates markets.
- **Tail risks jump:** Skew, or the relative pricing of OTM options indicates much downside fear in equities, credit and EUR/USD. Skew is more muted in oil and gold, but in USD rates, there is little incremental tail risk priced in.
- **How to hedge today?** Extreme skew can serve to balance high levels of volatility, providing an opportunity to sell large tail scenarios to fund smaller ones. We favor selling tail risks in equities, commodities and currencies. In credit, we prefer to sell OTM calls to fund hedges, and we look to buy tail risks in USD rates.

Asset Class	Asset	Current Vol Level	2006-2007 Average*	Change in 3m Implied Vol since Apr 9	6m Percentile	Change in Skew since Apr 9	6m Percentile	Change in Spread / Price since Apr 9
Rates	US 10y Swap Rates	120 bps	67 bps	18 bps	72%	-13 bps	3%	-56 bps
FX	EUR/USD	16.5%	7%	5.7%	99%	1.7%	100%	-7.5%
	AUD/USD	20.7%	8%	9.4%	100%	4.2%	100%	-12.4%
Equities	SPX	34.2%	13%	18.2%	99%	5.2%	99%	-10.3%
	SX5E	37.3%	15%	18.3%	99%	7.2%	100%	-14.2%
	KOSPI	25.6%	19%	8.2%	99%	4.5%	100%	-7.9%
Credit	CDX IG	85%	NA	37.5%	98%	4.1%	96%	36.6 bps
	iTraxx Main	107%	NA	41.8%	99%	3.4%	96%	49.5 bps
Commodities	Oil	39.6%	29%	10.1%	77%	0.9%	97%	-16.2%
	Gold	24.5%	19%	1.6%	70%	1.7%	44%	1.7%

\* Pre-Crisis Average is the average level from 7/1/06 through 6/30/07

Note: Rate volatility is in normalized basis points, credit volatility is volatility of spreads, and all others are price return volatility

Source: Morgan Stanley Research, Morgan Stanley Quantitative and Derivative Strategies, Bloomberg

# Disclosures

The information and opinions in Morgan Stanley Research were prepared by Morgan Stanley & Co. Incorporated, and/or Morgan Stanley C.T.V.M. S.A. and their affiliates (collectively, "Morgan Stanley").

For important disclosures, stock price charts and rating histories regarding companies that are the subject of this report, please see the Morgan Stanley Research Disclosure Website at [www.morganstanley.com/researchdisclosures](http://www.morganstanley.com/researchdisclosures), or contact your investment representative or Morgan Stanley Research at 1585 Broadway, (Attention: Equity Research Management), New York, NY, 10036 USA.

## **Global Research Conflict Management Policy**

Morgan Stanley Research observes our conflict management policy, available at [www.morganstanley.com/institutional/research/conflictolicies](http://www.morganstanley.com/institutional/research/conflictolicies).

## **Important Disclosure for Morgan Stanley Smith Barney LLC Customers**

The subject matter in this Morgan Stanley report may also be covered in a similar report from Citigroup Global Markets Inc. Ask your Financial Advisor or use Research Center to view any reports in addition to this report.

## **Important Disclosures**

Morgan Stanley Research does not provide individually tailored investment advice. It has been prepared without regard to the circumstances and objectives of those who receive it. Morgan Stanley recommends that investors independently evaluate particular investments and strategies, and encourages them to seek a financial adviser's advice. The appropriateness of an investment or strategy will depend on an investor's circumstances and objectives. Morgan Stanley Research is not an offer to buy or sell any security or to participate in any trading strategy. The value of and income from your investments may vary because of changes in interest rates or foreign exchange rates, securities prices or market indexes, operational or financial conditions of companies or other factors. Past performance is not necessarily a guide to future performance. Estimates of future performance are based on assumptions that may not be realized.

With the exception of information regarding Morgan Stanley, research prepared by Morgan Stanley Research personnel is based on public information. Morgan Stanley makes every effort to use reliable, comprehensive information, but we do not represent that it is accurate or complete. We have no obligation to tell you when opinions or information in Morgan Stanley Research change apart from when we intend to discontinue research coverage of a company. Facts and views in Morgan Stanley Research have not been reviewed by, and may not reflect information known to, professionals in other Morgan Stanley business areas, including investment banking personnel.

To our readers in Taiwan: Morgan Stanley Research is distributed by Morgan Stanley Taiwan Limited; it may not be distributed to or quoted or used by the public media without the express written consent of Morgan Stanley. To our readers in Hong Kong: Information is distributed in Hong Kong by and on behalf of, and is attributable to, Morgan Stanley Asia Limited as part of its regulated activities in Hong Kong; if you have any queries concerning it, contact our Hong Kong sales representatives.

Morgan Stanley Research is disseminated in Japan by Morgan Stanley Japan Securities Co., Ltd.; in Canada by Morgan Stanley Canada Limited, which has approved of and takes responsibility for its contents in Canada; in Germany by Morgan Stanley Bank AG, Frankfurt am Main, regulated by Bundesanstalt fuer Finanzdienstleistungsaufsicht (BaFin); in Spain by Morgan Stanley, S.V., S.A., a Morgan Stanley group company, supervised by the Spanish Securities Markets Commission (CNMV), which states that it is written and distributed in accordance with rules of conduct for financial research under Spanish regulations; in the US by Morgan Stanley & Co. Incorporated, which accepts responsibility for its contents. Morgan Stanley & Co. International plc, authorized and regulated by Financial Services Authority, disseminates in the UK research it has prepared, and approves solely for purposes of section 21 of the Financial Services and Markets Act 2000, research prepared by any affiliates. Private UK investors should obtain the advice of their Morgan Stanley & Co. International plc representative about the investments concerned. RMB Morgan Stanley (Proprietary) Limited is a member of the JSE Limited and regulated by the Financial Services Board in South Africa. RMB Morgan Stanley (Proprietary) Limited is a joint venture owned equally by Morgan Stanley International Holdings Inc. and RMB Investment Advisory (Proprietary) Limited, which is wholly owned by FirstRand Limited.

# Disclosures (continued)

Trademarks and service marks in Morgan Stanley Research are their owners' property. Third-party data providers make no warranties or representations of the accuracy, completeness, or timeliness of their data and shall not have liability for any damages relating to such data. The Global Industry Classification Standard (GICS) was developed by and is the exclusive property of MSCI and S&P. Morgan Stanley bases projections, opinions, forecasts and trading strategies regarding the MSCI Country Index Series solely on public information. MSCI has not reviewed, approved or endorsed these projections, opinions, forecasts and trading strategies. Morgan Stanley has no influence on or control over MSCI's index compilation decisions. Morgan Stanley Research or portions of it may not be reprinted, sold or redistributed without the written consent of Morgan Stanley. Morgan Stanley research is disseminated and available primarily electronically, and, in some cases, in printed form. Additional information on recommended securities/instruments is available on request. The information in Morgan Stanley Research is being communicated by Morgan Stanley & Co. International plc (DIFC Branch), regulated by the Dubai Financial Services Authority (the DFSA), and is directed at wholesale customers only, as defined by the DFSA. This research will only be made available to a wholesale customer who we are satisfied meets the regulatory criteria to be a client.

The information in Morgan Stanley Research is being communicated by Morgan Stanley & Co. International plc (QFC Branch), regulated by the Qatar Financial Centre Regulatory Authority (the QFCRA), and is directed at business customers and market counterparties only and is not intended for Retail Customers as defined by the QFCRA.

As required by the Capital Markets Board of Turkey, investment information, comments and recommendations stated here, are not within the scope of investment advisory activity. Investment advisory service is provided in accordance with a contract of engagement on investment advisory concluded between brokerage houses, portfolio management companies, non-deposit banks and clients. Comments and recommendations stated here rely on the individual opinions of the ones providing these comments and recommendations. These opinions may not fit to your financial status, risk and return preferences. For this reason, to make an investment decision by relying solely to this information stated here may not bring about outcomes that fit your expectations.

**The Americas**

1585 Broadway  
New York, NY 10036-8293

**United States**

Tel: +1 (1) 212 761 4000

**Europe**

20 Bank Street, Canary Wharf  
London E14 4AD

**United Kingdom**

Tel: +44 (0)20 7 425 8000

**Japan**

4-20-3 Ebisu, Shibuya-ku  
Tokyo 150-6008

**Japan**

Tel: +81 (0)3 5424 5000

**Asia/Pacific**

1 Austin Road West  
Kowloon

**Hong Kong**

Tel: +852 2848 5200