Transmission of Financial Stress in Europe:

Global, Regional and Idiosyncratic Risk Factors

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Disclaimer: The views in this presentation are those of the Authors and do not necessarily represent those of the IMF or IMF policy.

Outline

- Motivation
- Identifying Global, Pan-European and Idiosyncratic Risks
- Methodology: data and model design
- Results
- Conclusions and policy implications

Motivation

- A key lesson from recent financial crises is that the transmission of financial stress can rapidly transform idiosyncratic events into systemic crises.
- From a policy perspective, macro-prudential policy should be designed to limit the effects of contagion and spillover risks during periods of stress.

The Approach of this Paper

- This paper takes a different approach from others that have empirically examined the transmission of financial stress.
  - It uses a stochastic volatility technique to decompose the various global, regional and idiosyncratic risk factors.
    - The decomposition modeling of risk uses Credit Default Swaps spreads (CDS) and measures of global market conditions, jointly with a stochastic volatility model.

Transmission of Stress

- The existence of contagion is now hardly disputed.
  - Several techniques exist to identify and quantify contagion (see empirical survey chapter 2 in Dungey, Fry, Gonzalez-Hermosillo, Martin, 2011).
  - But the actual venues and market mechanisms for contagion are less understood.

- Contagion can materialize through several channels observable through asset prices or returns, or through their volatility.
  - Of course, not all changes in asset prices or volatility are associated with contagion, as some portion of these movements may correspond to an idiosyncratic component.

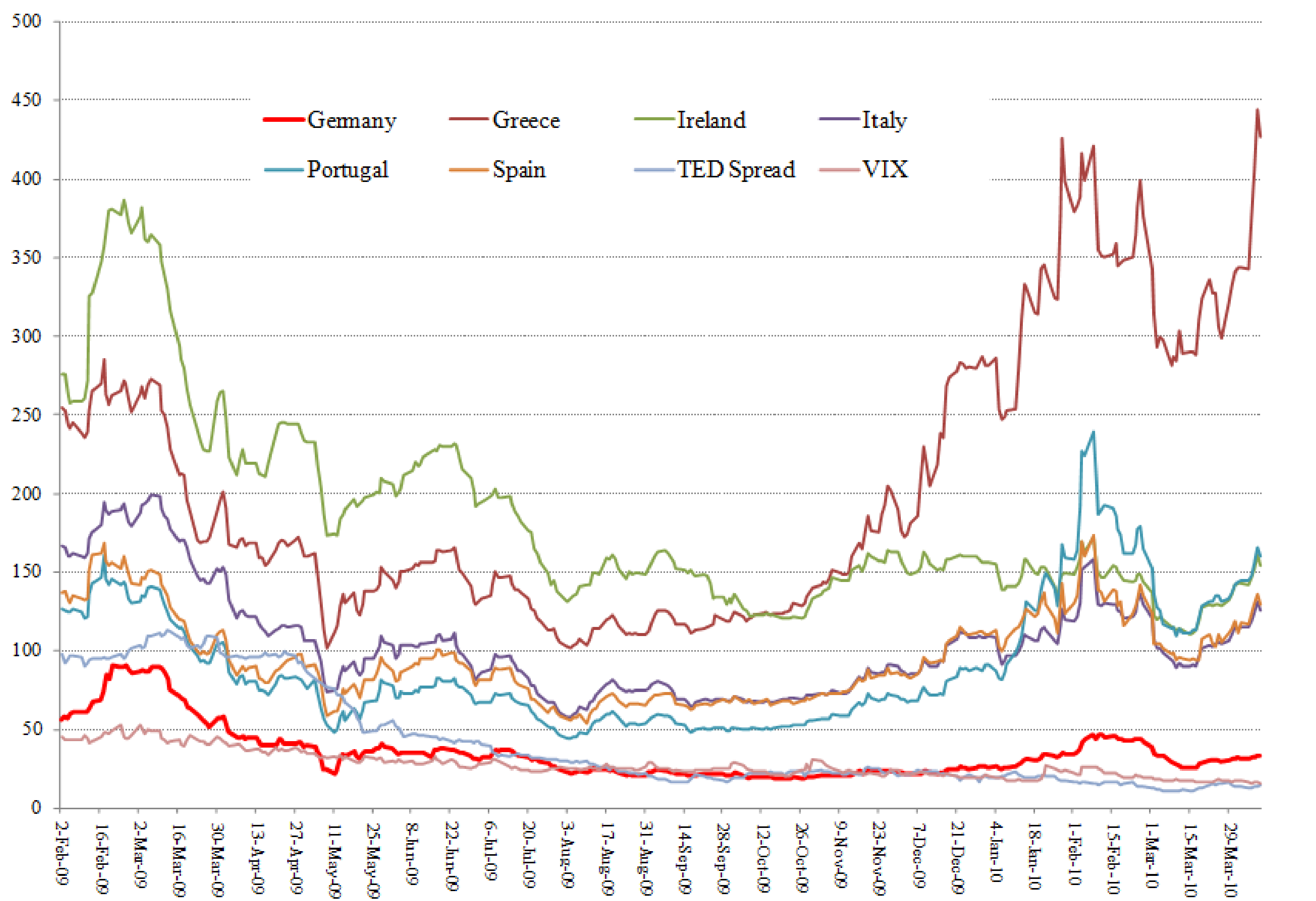
The Approach of this Paper

- Decompose actual volatility:

  - From the total observed volatility, part of it is originated exogenously and determined by some common factors (global or regional).

  - On the other hand, internal conditions define idiosyncratic risk.

Data: CDS, VIX, TED (Feb 02/2009 to April 9/2010)



Model Design

- Granger-causality tests suggest that the global variables TED and VIX directly affect the German CDS.
- Granger-causality tests indicate that the statistical causality would come from TED, VIX, and all the other countries CDS spreads to the German CDS. This result is robust if we consider the CDS levels or in first differences.
  - This conclusion seems intuitive as German banks have invested or lent importantly to the GIIPS.
- **Based on the Granger causality analysis, we proceed to model the German CDS, using the TED, VIX and also the GIIPS' CDS as explanatory variables.**

Models (appendix for details)

1. GARCH $\sigma_t^2 = \omega + \rho\sigma_{t-1}^2 + \vartheta\varepsilon_{t-1}^2$
2. Stochastic Volatility Model (measurement and state equations)

$$y_t = \gamma \prod_{j=1}^{J} x_{jt}^{\beta_j} \sigma_t \varepsilon_t \qquad \varepsilon_t \xrightarrow{iid} N(0,1)$$

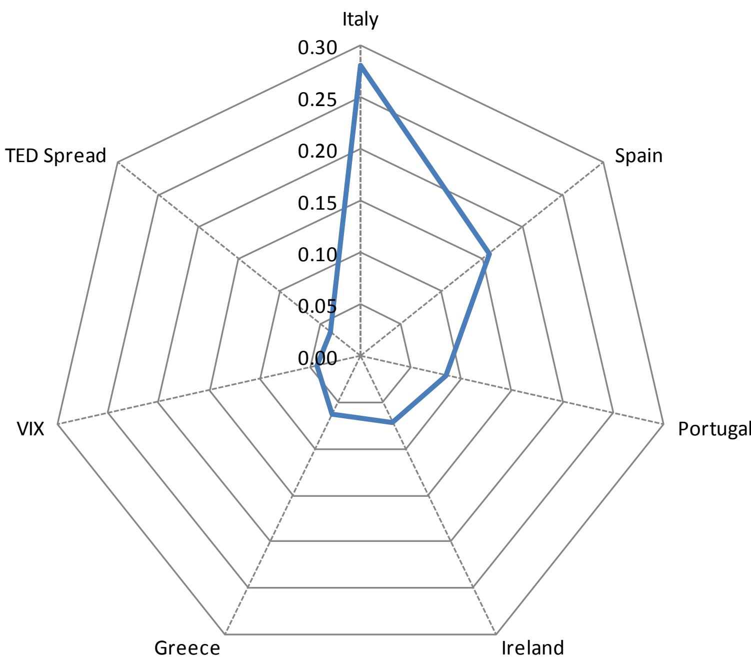
$$\ln y_t^2 = \mu + \sum_{j=1}^{J} \beta_j \ln x_{jt}^2 + \ln \sigma_t^2 + \xi_t$$

$$\ln \sigma_t^2 = \omega + \rho \ln \sigma_{t-1}^2 + \eta_t \qquad \eta_t \xrightarrow{iid} N\left(0, \sigma_\eta^2\right)$$

Parameters	I	II	III	IV	V
γ	-1.8781	-1.7619	-1.6444	-1.5614	2.5951
Std. Error	0.1921	0.2160	0.1520	0.1610	1.8610
Test	-9.7789	-8.1583	-10.8204	-9.7011	1.3944
P-Value	0.0000	0.0000	0.0000	0.0000	0.1665
Portugal	0.0886	0.0914	0.0882	0.0930	0.0849
Std. Error	0.0638	0.0635	0.0462	0.0465	0.0670
Test	1.3876	1.4390	1.9064	2.0019	1.2685
P-Value	0.1685	0.1535	0.0597	0.0482	0.2078
Ireland	0.0936	0.0905	0.0754	0.0757	0.0717
Std. Error	0.0636	0.0631	0.0403	0.0403	0.0480
Test	1.4716	1.4348	1.8697	1.8765	1.4945
P-Value	0.1445	0.1547	0.0646	0.0637	0.1384
Italy	0.3195	0.3158	0.3003	0.2939	0.2810
Std. Error	0.0821	0.0820	0.0519	0.0519	0.0710
Test	3.8908	3.8494	5.7890	5.6661	3.9552
P-Value	0.0002	0.0002	0.0000	0.0000	0.0001
Greece	0.0187	0.0198	0.0438	0.0469	0.0631
Std. Error	0.0645	0.0644	0.0463	0.0462	0.0597
Test	0.2896	0.3078	0.9461	1.0153	1.0573
P-Value	0.7727	0.7589	0.3465	0.3126	0.2931
Spain	0.1585	0.1520	0.1524	0.1534	0.1592
Std. Error	0.0774	0.0778	0.0548	0.0547	0.0715
Test	2.0475	1.9540	2.7813	2.8041	2.2258
P-Value	0.0434	0.0537	0.0065	0.0061	0.0284
VIX		0.0714		0.0474	0.0429
Std. Error		0.0655		0.0419	0.0488
Test		1.0903		1.1306	0.8794
P-Value		0.2784		0.2611	0.3814
TED Spread		0.0350		0.0255	0.0367
Std. Error		0.0464		0.0546	0.0438
Test		0.7542		0.4674	0.8386
P-Value		0.4526		0.6413	0.4038
			Volatility		
Unconditional Volatility*	2.1700	2.1569	1.9351	1.9607	1.6090
ω	0.0648	0.0592	0.0277	0.0266	-0.8158
Std. Error	0.1466	0.1505	0.0623	0.0744	0.7771
Test	0.4422	0.3934	0.4451	0.3570	-1.0499
P-Value	0.6594	0.6949	0.6573	0.7219	0.2965
ρ	0.9862	0.9873	0.9926	0.9931	0.7380
Std. Error	0.0250	0.0262	0.0121	0.0146	0.1391
Test	39.424	37.701	82.250	68.001	5.3071
P-Value	0.0000	0.0000	0.0000	0.0000	0.0000
σ_ν					0.6704
Std. Error					0.2308
Test					2.9052
P-Value					0.0046
DoF T-Distr.			5.2252	5.2919	
Std. Error			1.2640	1.2742	
Test			4.1337	4.1530	
P-Value			0.0001	0.0001	
Log-Likelihoog	-708.83	-707.69	-689.42	-688.58	-704.09
Test LR Test		2.2900		1.6782	7.1895
P-Value		0.1302		0.1952	0.0073
Testing Models		I - II		III - IV	II - V

*:The unconditional volatility for the SV model is the sum of the stochastic volatility and the deterministic variance.

Results



Conclusions

- Using CDS spreads for Greece, Ireland, Italy, Portugal and Spain, as well as TED spreads and the VIX index as proxies for different aspects of global market conditions, we are able to assess the dynamics in the German CDS market.

- For Germany, the results based on daily data (Feb 2009-April 2010) suggest that:

  - Most of the total measured volatility comes from idiosyncratic risks.

  - The second source of volatility originated from European market conditions, coming mainly from Italy and Spain.

  - Remarkably, financial disturbances from other European countries such as Ireland, Portugal or even Greece were not significant in explaining Germany's CDS spreads.

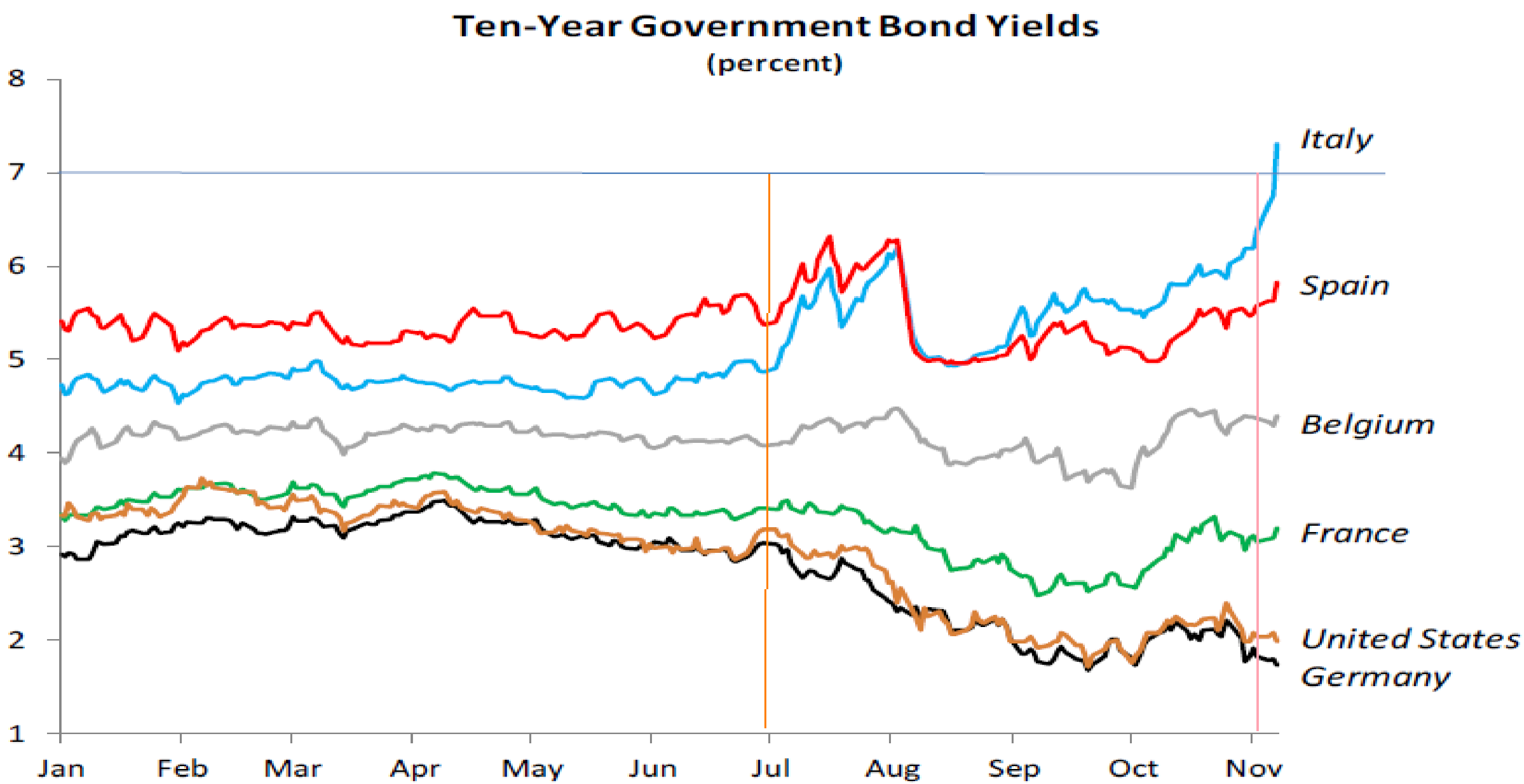
  - Global risk factors are statistically insignificant with no obvious contribution from the TED spread or the VIX index.

- In sum, Germany's CDS dynamics appear to be driven not only by idiosyncratic risk and its own macroeconomic and financial conditions, but also from market developments in Italy and Spain. These countries are some of the largest countries in Europe within our data sample which may explain their pivotal role in determining Germany's CDS spreads and, likely, the stability of the EU zone.

Extensions

- A run for safe/liquid heavens since July 2011 following the second Greek rescue and Portugal's program– lowering yields in US Treasuries and the Bund market.
  - Need to balance contagious pressures (generalized) vs. the run for safety that may actually help core centers.
- However, recent questions as to the stability of the core in Europe (and the Euro) with the weak Bund auction in November 24, 2011.
- Extensions to include a multivariate stochastic volatility model including volatility interactions among all the countries.

Run for Safe/Liquid Heavens
(Greek 2nd rescue and Portugal Prog. July 2011)



FINANCIAL TIMES

Thursday November 24 2011

UK £2.20; Channel Islands £2.30; Republic of Ireland €2.70

High time for plan C

The UK needs growth. Robert Skidelsky, Page 11

The corporate ethics of dressing little girls

Business Life, Page 12

World Business Newspaper

News Briefing

Tata chooses Mistry as successor

Cyrus Mistry, a construction tycoon, has been unexpectedly selected as successor to Ratan Tata, the patriarch of corporate India and head of the powerful Tata Group. **Page 15; Surprise choice, Page 21**

Dim view on bank stocks

Bank stocks are seen as a "dumb" place for investors to put their money, according to the head of part-nationalised Royal Bank of Scotland. **Page 4**

Energy bills to soar

Government policies will cause energy bills for business to rise by about a fifth by the end of the decade, its own analysis has revealed. **Page 4**

Jobs law shake-up

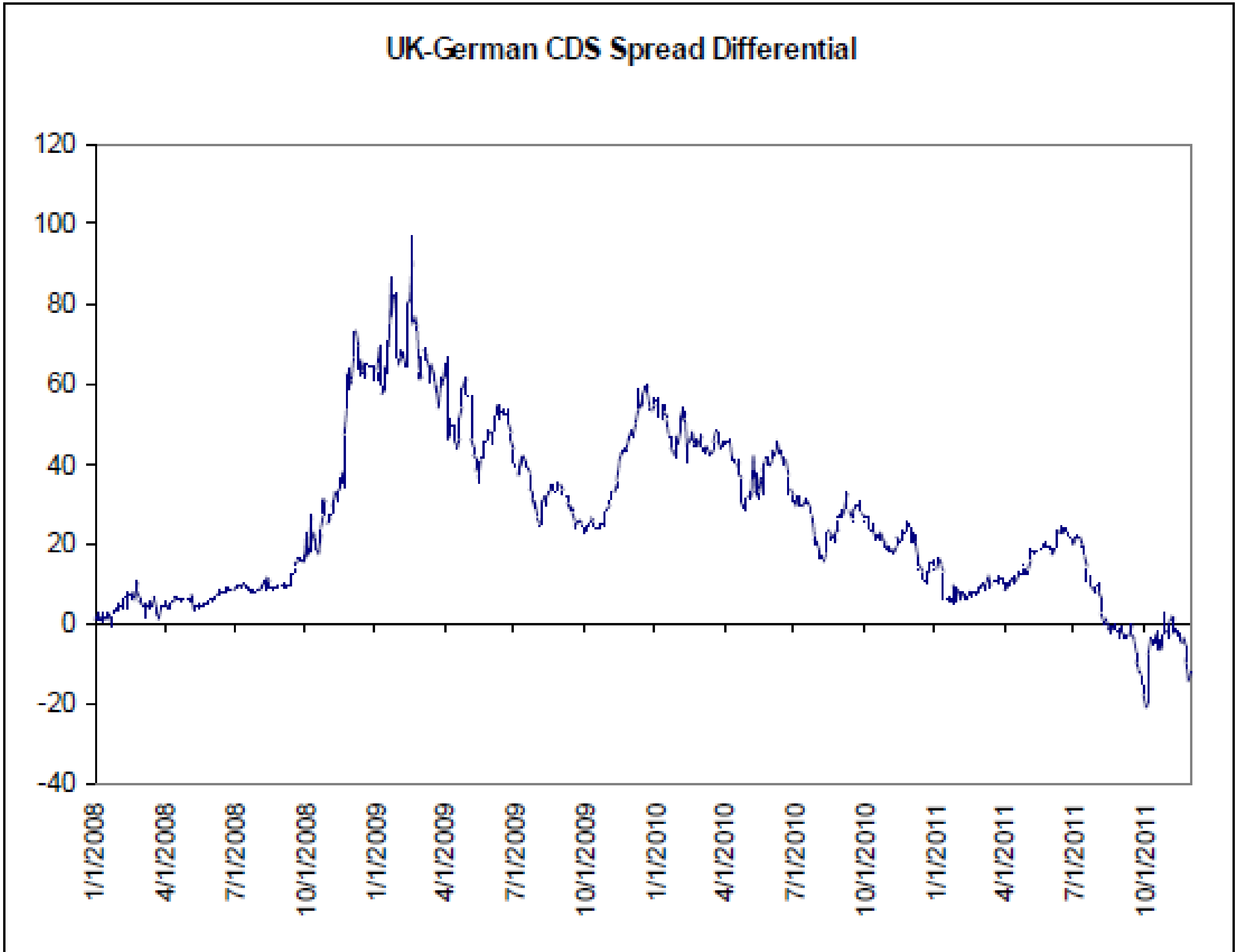
Vince Cable, business secretary,

Shunned Bund sale fuels debt crisis fears

Auction raises only two-thirds of target

ing floors, Germany started to trade like a risk asset with Bund yields, which have an inverse relationship with prices, rising

Woodford returns Ex-Olympus chief back in Tokyo


UK-German CDS Spread Differential
120
100
80
60
40
20
0
-20
-40
1/1/2008
4/1/2008
7/1/2008
10/1/2008
1/1/2009
4/1/2009
7/1/2009
10/1/2009
1/1/2010
4/1/2010
7/1/2010
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7/1/2011
10/1/2011

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Appendix

- The GARCH(1,1) specification (which is usually the benchmark in any deterministic volatility estimation) is represented by:

$$\sigma_t^2 = \omega + \rho\sigma_{t-1}^2 + \vartheta\varepsilon_{t-1}^2$$

  where rho and theta are the GARCH and ARCH coefficients, respectively.

- Volatility is assumed to be determined in period *t* by two predetermined variables at time t-1: a stochastic shock and the previous level of volatility which shows a certain degree rho of persistence.

Stochastic Volatility Model

$$y_t = H\mathrm{B}_t + Ax_t + \varepsilon_t^y$$

$$\mathrm{B}_t = \Gamma_0 + \Gamma_1 \mathrm{B}_{t-1} + \varepsilon_t$$

- the basic stochastic model is represented by two blocks of equations which establish the state space system: the measurement equation and the state equation

In our model…

$$y_t = \gamma \prod_{j=1}^{J} x_{jt}^{\beta_j} \sigma_t \varepsilon_t$$

- This is our measurement equation containing CDS (for Germany and GIIPS), TED, and VIX

$$\ln \sigma_t^2 = \omega + \rho \ln \sigma_{t-1}^2 + \eta_t$$

- And this our state equation which express the stochastic dynamics in the volatility of the CDS

…we apply Max-Likelihood to a Kalman Filter to the following representation

$$\ln y_t^2 = \mu + \sum_{j=1}^{J} \beta_j \ln x_{jt}^2 + \ln \sigma_t^2 + \xi_t$$

- Measurement Equation

$$\ln \sigma_t^2 = \omega + \rho \ln \sigma_{t-1}^2 + \eta_t$$

- State equation

Go back to presentation