

Sovereign credit ratings, market volatility, and financial gains

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Additional results

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I- Data and Sources

Daily sovereign yield data come from Reuters. The respective tickers are:

BE10YT_RR, DE10YT_RR, IE10YT_RR, GR10YT_RR, ES10YT_RR, FR10YT_RR, IT10YT_RR, NL10YT_RR, AT10YT_RR, PT10YT_RR, FI10YT_RR, MT10YT_RR, SI10YT_RR, SK10YT_RR, DK10YT_RR, GB10YT_RR, BG10YT_RR, CZ10YT_RR, HU10YT_RR, LT10YT_RR, LV10YT_RR, PL10YT_RR, RO10YT_RR, SE10YT_RR.

Daily equity indexes are provided by DataStream:

Germany - Equity/index - DAX 30 Performance Index - Historical close - Euro
France - Equity/index - France CAC 40 Index - Historical close - Euro
Athens Stock Exchange ATHEX Composite Index - Historical close - Euro
Standard & Poors/MIB Index - historic close - Euro
Portugal PSI-20 Index - historic close - Euro
Amsterdam Exchange (AEX) Index - historic close - Euro
Spain IBEX 35 Index - historic close - Euro
Belgium BEL 20 Index - historic close - Euro
Ireland Stock Exchange Overall (ISEQ) Index - historic close - Euro
Nordic Exchange OMX Helsinki (OMXH) Index - historic close - Euro
Austrian Traded Index (ATX) - Percentage change in the latest trade price or value from the historic close - Euro
Slovenian Stock Exchange (SBI) Index - Percentage change in the latest trade price or value from the historic close - Euro
Cyprus Stock Exchange General Index - Historical close - Euro
Malta Stock Exchange Index - Percentage change in the latest trade price or value from the historic close - Maltese lira
Slovakia SAX 16 Index - Percentage change in the latest trade price or value from the historic close - Euro
Bulgaria Stock Exchange SOFIX Index - Historical close, end of period - Bulgarian lev, provided by Bloomberg
Prague PX 50 Index - Historical close, end of period - Czech koruna
Nordic Exchange OMX Copenhagen (OMXC) 20 Index - Historical close, end of period - Danish krone
Nordic Exchange OMX Tallinn (OMXT) Index - Historical close, end of period - Estonian kroon
Nordic Exchange OMX Riga (OMXR) Index - Historical close, end of period - Latvian lats
Nordic Exchange OMX Vilnius (OMXV) Index - Historical close, end of period - Lithuanian litas
Budapest Stock Exchange BUX Index - Historical close, end of period - Hungarian forint
Warsaw Stock Exchange General Index - Historical close, end of period - Polish zloty
Romania BET Composite Index (Local Currency) - Historical close, end of period - Romanian leu
Nordic Exchange OMX Stockholm 30 (OMXS30) Index - Historical close, end of period - Swedish krona
Financial Times Stock Exchange (FTSE) 100 Index - Historical close, end of period - UK pound sterling

Table A1 – Summary of rating announcements

Country	Announcements since 1995				Starting date and total announcements captured		
	Upgrade	Downgrade	Positive Outlook	Negative Outlook	Yields	CDS	Equity
Euro Area							
Austria	0 (0,0,0)	0 (0,0,0)	0 (0,0,0)	0 (0,0,0)	2 Jan 1995 (0)	6 Jan 2004 (0)	1 Jan 2002 (0)
Belgium	2 (0,0,2)	1 (0,0,1)	1 (1,0,1)	0 (0,0,0)	10 May 1996 (4)	5 Jan 2004 (2)	1 Jan 2002 (3)
Finland	8 (3,2,3)	0 (0,0,0)	3 (3,0,0)	0 (0,0,0)	2 Jan 1995 (11)	14 May 2008 (0)	1 Jan 2002 (1)
France	0 (0,0,0)	0 (0,0,0)	0 (0,0,0)	0 (0,0,0)	28 May 1996 (0)	16 Aug 2005 (0)	1 Jan 2002 (0)
Germany	0 (0,0,0)	0 (0,0,0)	0 (0,0,0)	0 (0,0,0)	2 Jan 1995 (0)	8 Jan 2004 (0)	1 Jan 2002 (0)
Greece	12 (4,3,5)	11 (4,3,4)	7 (1,2,4)	6 (3,1,2)	2 Nov 1998 (33)	9 Jan 2004 (19)	1 Jan 2002 (23)
Ireland	6 (3,3,1)	7 (3,2,2)	1 (1,0,0)	3 (1,1,1)	2 Jan 1995 (17)	11 Aug 2003 (10)	1 Jan 2002 (10)
Italy	3 (0,2,1)	3 (2,0,2)	1 (0,1,0)	4 (3,0,1)	12 Jun 1996 (9)	20 Jan 2004 (4)	1 Jan 2002 (7)
Netherlands	0 (0,0,0)	0 (0,0,0)	0 (0,0,0)	0 (0,0,0)	8 May 1996 (0)	7 Sep 2005 (0)	1 Jan 2002 (0)
Portugal	4 (1,2,1)	5 (3,1,1)	1 (1,0,0)	6 (3,1,2)	2 Jan 1995 (16)	26 Jan 2004 (11)	1 Jan 2002 (11)
Spain	5 (2,1,2)	4 (2,1,1)	3(2,1,0)	3 (2,1,0)	3 Jul 1996 (15)	27 Apr 2005 (7)	1 Jan 2002 (10)
Non-euro area							
Bulgaria	17 (7,5,5)	2 (1,0,1)	5 (1,3,1)	3 (1,0,2)	3 Sep 2002 (12)	8 Sep 2004 (12)	2 Jan 2002 (21)
Czech Republic	7 (2,2,3)	2 (1,0,1)	4 (2,1,1)	0 (0,0,0)	14 Apr 2000 (9)	8 Sep 2004 (7)	1 Jan 2002 (9)
Denmark	3 (1,1,1)	0 (0,0,0)	3 (1,1,1)	0 (0,0,0)	2 Jan 1995 (6)	22 Mar 2006 (0)	1 Jan 2002 (1)
Estonia	8 (3,1,4)	3 (1,0,2)	8 (3,1,4)	3 (1,1,1)	-	8 Feb 2006 (10)	1 Jan 2002 (16)
Hungary	10 (4,3,3)	8 (3,3,2)	4 (1,1,2)	10 (4,2,4)	8 Jun 1999 (26)	8 Sep 2004 (16)	1 Jan 2002 (18)
Latvia	5 (2,1,2)	12 (5,3,4)	5 (2,1,2)	4 (1,1,2)	-	13 Jan 2006 (17)	1 Jan 2002 (24)
Lithuania	13 (4,4,5)	8 (3,2,3)	6 (2,3,2)	3 (1,1,1)	-	6 Jun 2005 (14)	1 Jan 2002 (27)
Poland	9 (4,2,3)	0 (0,0,0)	8 (4,1,3)	1 (1,0,0)	3 Aug 1999 (11)	8 Sep 2004 (5)	1 Jan 2002 (8)
Romania	16 (6,4,6)	8 (3,2,3)	8 (3,2,3)	5 (2,1,2)	-	8 Sep 2004 (13)	1 Jan 2002 (22)
Sweden	7 (1,3,3)	1(0,1,0)	3 (1,1,1)	2 (1,1,0)	1 Jan 1999 (9)	21 Nov 2007 (0)	1 Jan 2002 (4)
United Kingdom	0 (0,0,0)	0 (0,0,0)	0 (0,0,0)	1 (1,0,0)	27 Set 1996 (1)	8 Sep 2004 (1)	1 Jan 2002 (1)
Euro area, total	40 (13,12,15)	31 (14,7,11)	17 (8,5,4)	22 (12,4,6)	105	53	64
Non-euro area, total	95 (34,26,35)	44 (17,11,16)	54 (20,15,20)	32 (13,7,12)	74	94	150
Total	135 (47,38,50)	75 (31,18,27)	71 (28,20,24)	54 (25,11,18)	179	147	214

Note: This table shows the number of announcements since 1995. Between parentheses we report the number of announcements for each agency (S&P, Moody's, Fitch). For instance, in the upgrade column Greece (4,3,5) means: 4, 3, and 5 upgrades from S&P, Moody's, and Fitch, respectively.

II- Estimation of EGARCH with announcements

Table A2 –EGARCH estimation results with announcements

Country	Upgrade			Downgrade		
	<i>t</i>	<i>t-1</i>	<i>t-2</i>	<i>t</i>	<i>t-1</i>	<i>t-2</i>
Stock Market						
Belgium	1.030**	-2.38***	2.310***			
[2,0]	(2.17)	(-4.61)	(4.03)			
Finland	-0.291***	-1.064***	1.364***			
[1,0]	(-3.93)	(-14.29)	(3.12)			
Greece	0.935	-0.782	-0.398	0.855***	-1.033**	0.436
[3,19]	(0.87)	(-0.66)	(-0.62)	(2.73)	(-2.14)	(1.09)
Ireland				0.751***	-0.759*	-0.096
[0,15]				(2.78)	(-1.81)	(-0.25)
Italy	-1.070	-0.236	1.553*	-1.033	-0.664	1.519***
[2,3]	(-1.21)	(-0.20)	(1.71)	(-0.97)	(-0.63)	(2.62)
Portugal				0.501	-1.070	0.688
[0,12]				(1.15)	(-1.35)	(1.03)
Spain	0.000	0.027	-0.082	-0.539	0.034	0.557
[2,7]	(0.00)	(0.03)	(-0.08)	(-0.91)	(0.05)	(1.15)
Bulgaria	0.928*	-0.983*	0.680	-0.626	0.629	1.732*
[14,2]	(1.70)	(-1.72)	(1.44)	(-0.79)	(0.94)	(1.79)
Czech Republic	-0.264	-0.223	0.758			
[6,0]	(-0.41)	(-0.32)	(1.51)			
Denmark	-0.006	1.282***	-2.260***			
[1,0]	(-0.08)	(67.38)	(-2.83)			
Estonia	-1.142	0.815	0.267	1.711***	-1.273	1.092
[7,3]	(-0.94)	(0.73)	(0.48)	(3.90)	(-1.16)	(1.10)
Hungary	-1.728***	0.686***	1.515***	-0.573	-0.192	0.439
[1,10]	(-12.53)	(3.53)	(3.38)	(-1.18)	(-0.25)	(0.79)
Latvia	1.495**	-1.351*	0.265	0.179	0.574	-0.108
[6,12]	(2.13)	(-1.88)	(0.41)	(0.32)	(0.87)	(-0.22)
Lithuania	0.109	-0.103	-1.09**	0.811*	-0.191	0.050
[11,8]	(0.23)	(-0.17)	(-2.23)	(1.82)	(-0.15)	(0.05)
Romania	-0.328	1.011*	-1.177**	1.819***	-0.670*	-0.363
[14,2]	(-0.79)	(1.71)	(-2.19)	(8.20)	(-1.76)	(-0.61)
Sweden	0.887	-0.651	0.105			
[4,2]	(1.08)	(-0.55)	(0.12)			
Yield						
Belgium	-0.218	-0.290	1.014***	0.040	-2.066***	2.364***
[2,1]	(-0.29)	(-0.38)	(2.78)	(0.44)	(-17.04)	(3.43)
Finland	0.333	-0.108	-0.644*			
[8,0]	(1.04)	(-0.23)	(-1.67)			
Greece	-0.405	0.627	-0.152	0.437	1.105*	-0.913*
[10,19]	(-1.09)	(1.18)	(-0.37)	(-0.97)	(1.92)	(-1.91)
Ireland	0.121	-0.440	0.267	0.518	0.137	-0.559
[6,15]	(0.24)	(-0.63)	(0.48)	(1.21)	(0.25)	(-1.35)
Italy	-3.056***	2.856***	0.303	-0.316	-0.311	0.279
[3,3]	(-11.97)	(3.33)	(0.36)	(-0.69)	(-0.30)	(0.30)
Portugal	-1.143***	0.542	0.078	0.304	1.074	-1.028
[4,12]	(-5.64)	(1.26)	(0.13)	(0.44)	(0.96)	(-1.23)
Spain	-0.255	-0.319	0.261	-0.192	0.486	0.393
[5,7]	(-0.35)	(-0.44)	(0.88)	(-0.37)	(0.68)	(0.74)
Hungary	0.488	-1.130	0.494	0.227	0.777	-0.637
[7,10]	(0.53)	(-0.92)	(0.58)	(0.39)	(0.84)	(-0.97)
Poland	-1.574*	2.221	0.014			
[5,0]	(-1.72)	(1.61)	(0.01)			
Sweden	0.576	-0.336	-0.304			
[6,0]	(1.37)	(-0.52)	(-0.58)			

Note: This table shows the estimation of the coefficients of the announcement dummies when included in specification of the conditional variance in the EGARCH model in (5). The t-statistics for the statistical significance of the estimated coefficients are reported between parentheses. In this table "***", "**", "*" represents statistical significance at 1%, 5%, and 10%, respectively. In square brackets is the number of upgrades and downgrades in the sample, respectively.

III- Additional Estimation Results

Table A3 – Estimation results of regressions of stock and bond market volatilities,
Full sample

Events	Stock market		Bond market		
		(1)	(2)	(3)	(4)
Upgrade	<i>t</i>	0.019 (0.81)	0.019 (0.80)	0.029 (0.18)	0.029 (0.18)
	<i>t-1</i>	0.033 (0.66)	0.033 (0.66)	-0.012 (-0.63)	-0.012 (-0.64)
	<i>t-2</i>	-0.013 (-0.54)	-0.013 (-0.54)	0.024 (0.83)	0.025 (0.84)
Downgrade	<i>t</i>	0.026** (2.30)	0.024** (2.20)	0.025 (0.13)	0.022 (0.11)
	<i>t-1</i>	0.072*** (4.02)	0.070*** (3.90)	0.021* (1.97)	0.020 (1.70)
	<i>t-2</i>	0.008 (0.59)	0.008 (0.52)	0.112*** (3.55)	0.112*** (3.53)
Positive outlook	<i>t</i>		0.026 (1.28)		-0.027 (-1.71)
	<i>t-1</i>		0.008 (-0.15)		-0.010 (-0.58)
	<i>t-2</i>		0.021 (0.50)		-0.044** (-2.56)
Negative outlook	<i>t</i>		0.032 (1.17)		0.012 (1.04)
	<i>t-1</i>		0.035 (1.37)		-0.010 (-0.93)
	<i>t-2</i>		0.046 (1.34)		0.040 (1.08)
Lagged volatility		0.963*** (156.87)	0.963*** (156.52)	0.977*** (300.61)	0.977*** (300.02)
R2		0.955	0.955	0.973	0.973
Observation		53821	53821	66539	66539
Countries		21	21	17	17
#Upgrades		74	74	65	65
#Downgrades		93	93	67	67
# Positive outlooks			35		33
# Negative outlooks			57		43
Test 3 rd lag ^s		0.42 (0.661)	0.84 (0.517)	0.30 (0.747)	1.68 (0.203)
Test 5 th lag ^s		8.06 (0.003)	5.51 (0.004)	0.64 (0.539)	1.86 (0.168)
Test 22 nd lag ^s		1.16 (0.334)	1.20 (0.342)	0.93 (0.414)	2.50 (0.084)

Note: This table shows the estimation of the coefficients with associated t-statistics reported in brackets. In this table "***", "**", "*" represents statistical significance at 1%, 5%, and 10%, respectively. Control variables include weekday, month and year dummies. ^s F-test for joint significance of the 3rd, 5th and 22nd lag.

Table A4 – Estimation results using non-parametric volatilities (square and absolute returns), Full sample

Events		Stock market		Bond market	
		Squared	Absolute	Squared	Absolute
Upgrade	<i>T</i>	0.000028 (0.59)	0.001197 (0.94)	-0.000042** (-2.32)	-0.000512 (-0.91)
	<i>t-1</i>	-0.000042 (-0.91)	-0.000798 (-0.83)	0.000095 (0.79)	0.001087 (0.77)
	<i>t-2</i>	0.000003 (-0.06)	0.000433 (0.36)	-0.000009 (-0.31)	0.000191 (0.19)
Downgrade	<i>T</i>	0.000266 (1.67)	0.005939** (2.58)	0.000163** (2.62)	0.004256*** (4.18)
	<i>t-1</i>	0.000047 (0.61)	0.001199 (1.14)	0.000866** (2.56)	0.010220*** (5.14)
	<i>t-2</i>	0.000290*** (3.23)	0.004751*** (3.21)	0.000659 (0.97)	0.002428 (0.94)
Lagged volatility		0.198*** (10.94)	0.201*** (10.69)	0.115*** (9.67)	0.180*** (6.61)
R2		0.103	0.136	0.023	0.117
Observation		53821	53821	66539	66539
Countries		21	21	17	17
#Upgrades		74	74	65	65
#Downgrades		93	93	67	67

Note: This table shows the estimation of the coefficients with associated t-statistics reported in brackets. In this table "****", "***", "**" is to say statistical significance at 1%, 5%, and 10%, respectively. Control variables include weekday, month and year dummies. "Absolute" means absolute return and "Squared" means square return.

Table A5 – Estimation results of regressions of stock and bond market volatilities, different samples and control variables

Events		Stock market			Bond market		
		Euro Area	2008-2011	Weekly dummies	Euro Area	2008-2011	Weekly dummies
Upgrade	<i>t</i>	-0.042* (-2.14)	0.051 (0.61)	0.016 (0.74)	0.051 (0.61)	0.262*** (79.87)	-0.001 (-0.05)
	<i>t-1</i>	-0.037 (-1.73)	0.093 (0.76)	0.029 (0.61)	0.093 (0.76)	0.033*** (11.87)	-0.016 (-0.92)
	<i>t-2</i>	-0.048*** (-3.88)	0.040 (0.81)	-0.013 (-0.52)	0.040 (0.81)	0.973*** (377.64)	0.020 (0.73)
Downgrade	<i>t</i>	0.023** (3.08)	0.0189 (1.20)	0.017 (1.22)	0.0189 (1.20)	0.016 (1.06)	0.005 (0.26)
	<i>t-1</i>	0.080*** (6.52)	0.075 *** (3.89)	0.063*** (2.84)	0.075 *** (3.89)	0.021 (1.44)	0.024** (2.12)
	<i>t-2</i>	-0.015* (-1.83)	0.010 (0.66)	-0.001 (-0.09)	0.010 (0.66)	0.098** (2.82)	0.114*** (3.41)
Lagged volatility		0.976*** (594.21)	0.960*** (145.25)	0.939*** (146.76)	0.960*** (145.25)	0.971*** (146.96)	0.968*** (169.61)
R2		0.976	0.944	0.958	0.984	0.959	0.975
Observation		28193	21000	53821	45434	17000	66539
Countries		11	9	21	11	17	17
#Upgrades		10	83	74	38	2	65
#Downgrades		56	93	93	57	58	67

Note: This table shows the estimation of the coefficients with associated t-statistics reported in brackets. In this table "****", "***", "*" represents statistical significance at 1%, 5%, and 10%, respectively. Control variables include weekday, month and year dummies.

Table A6 – Estimation results of regressions of CDS market volatility, Full sample

Events		CDS market			
		(1)	(2)	(3)	(4)
Upgrade	<i>t</i>	0.006 (0.15)	0.006 (0.15)	- -	-0.057 (-1.53)
	<i>t-1</i>	0.092** (2.73)	0.092** (2.72)	- -	0.050 (1.31)
	<i>t-2</i>	-0.089*** (-4.63)	-0.089*** (-4.58)	- -	-0.097 (-3.54)
Downgrade	<i>t</i>	-0.015 (-1.32)	-0.018 (-1.58)	-0.024 (-1.70)	-0.003 (-0.19)
	<i>t-1</i>	0.171*** (4.68)	0.170*** (4.63)	0.155*** (3.26)	0.186*** (4.88)
	<i>t-2</i>	0.017 (0.66)	0.018 (0.72)	-0.002 (-0.25)	0.046 (1.73)
Positive	<i>t</i>		0.005 (0.06)		
	<i>t-1</i>		0.014 (0.26)		
	<i>t-2</i>		-0.094** (-2.87)		
Negative	<i>t</i>		-0.025 (-1.20)		
	<i>t-1</i>		0.089* (2.18)		
	<i>t-2</i>		-0.029 (-1.05)		
Lagged Volatility		0.934*** (170.42)	0.933*** (170.39)	0.919*** (125.24)	0.873*** (92.10)
R2		0.913	0.913	0.867	0.919
Observation		16887	16887	9894	16887
Countries		17	17	10	17
#Upgrades		7	7	0	7
#Downgrades		64	64	40	64
# Positive outlooks			7		
# Negative outlooks			33		

Note: This table shows the estimation of the coefficients with associated t-statistics reported in brackets. In this table "****", "***", "**" represents statistical significance at 1%, 5%, and 10%, respectively. Control variables include weekday, month and year dummies. (1) is the baseline estimation, (2) includes positive and negative outlooks, (3) includes only Euro-Area countries, and (4) includes week dummies as controls.

Table A7 – Estimation results of regressions of stock and bond market volatilities, by rating agency

Events		Stock market			Bond market		
		S&P	Moody's	Fitch	S&P	Moody's	Fitch
Upgrade	<i>t</i>	0.083 (1.66)	-0.010 (-0.29)	-0.016 (-0.90)	0.037 (0.68)	0.001 (0.04)	-0.025 (-0.64)
	<i>t-1</i>	-0.003 (-0.04)	0.022 (0.50)	0.066 (1.00)	-0.013 (-0.76)	-0.005 (-0.18)	-0.016 (-0.48)
	<i>t-2</i>	0.019 (0.55)	-0.057** (-2.11)	-0.015 (-0.41)	0.051 (1.25)	0.039 (0.81)	-0.014 (-0.43)
Downgrade	<i>t</i>	0.077** (2.55)	-0.001 (1.20)	-0.013 (-0.55)	0.043 (1.52)	-0.052 (-1.19)	-0.002 (-0.09)
	<i>t-1</i>	0.087*** (3.29)	0.057*** (3.89)	0.051 (1.54)	0.008 (0.28)	0.058*** (2.93)	0.001 (0.04)
	<i>t-2</i>	-0.050*** (-3.51)	0.014 (0.66)	0.069 (1.47)	0.132* (1.99)	0.165 (1.73)	0.014 (0.38)
Lagged volatility		0.963*** (156.76)			0.977*** (300.40)		
R2		0.955			0.973		
Observation		53821			66539		
Countries		21			17		
#Upgrades		25	17	32	21	20	24
#Downgrades		38	25	32	27	20	22

Note: This table shows the estimation of the coefficients with associated t-statistics reported in brackets. In this table "****", "***", "*" represents statistical significance at 1%, 5%, and 10%, respectively. Control variables include weekday, month and year dummies.

Table A8 – Estimation results of regressions of stock and bond market volatilities, including cross-market lagged volatility, full sample

Events		Stock market (1)	Bond market (2)
Upgrade	<i>t</i>	-0.022 (-1.46)	0.051* (2.02)
	<i>t-1</i>	-0.041*** (-3.20)	-0.026 (-0.79)
	<i>t-2</i>	-0.007 (-0.35)	0.060 (0.91)
Downgrade	<i>t</i>	0.025*** (3.74)	0.000 (0.01)
	<i>t-1</i>	0.066*** (3.54)	0.018 (1.65)
	<i>t-2</i>	-0.019** (-2.16)	0.111*** (3.50)
Lagged volatility			
Stock Market		0.976*** (783.61)	0.006*** (4.44)
Bond Market		0.000 (0.12)	0.976*** (198.41)
R2		0.975	0.973
Observation		41007	41007
Countries		16	16
#Upgrades		22	22
#Downgrades		66	66

Note: This table shows the estimation of the coefficients with associated t-statistics reported in brackets. In this table "****", "***", "*" represents statistical significance at 1%, 5%, and 10%, respectively. Control variables include weekday, month and year dummies.

Table A9 – Estimation results of regressions of stock and bond market volatilities (Equation(7)), Contagion, alternative volatility measures, Euro Area

Events		Stock market			Bond market		
		GJR GARCH	EGARCH Gaussian distribution	EGARCH Autocorrelated returns	GJR GARCH	EGARCH Gaussian returns	EGARCH Autocorrelated distribution
Upgrade	<i>t</i>	-0.009 (-1.20)	-0.010 (-1.35)	-0.011 (-1.48)	-0.007* (-1.96)	0.013*** (3.57)	0.016*** (4.31)
	<i>t-1</i>	-0.041** (-2.95)	-0.046** (-2.89)	-0.042** (-2.52)	-0.012*** (-7.19)	-0.013*** (-5.93)	-0.013 (-7.76)
	<i>t-2</i>	-0.025* (-2.01)	-0.028* (-1.86)	-0.029* (-1.89)	-0.016*** (-6.30)	-0.016*** (-4.30)	-0.016 (-6.52)
Downgrade	<i>t</i>	0.024*** (4.43)	0.031*** (5.29)	0.030*** (5.04)	0.011** (3.14)	0.012*** (3.35)	0.009** (2.54)
	<i>t-1</i>	0.049*** (6.27)	0.049*** (6.45)	0.043*** (5.24)	0.004 (0.84)	0.007 (1.25)	0.006 (1.45)
	<i>t-2</i>	-0.005 (-1.57)	-0.004 (-0.91)	-0.004 (-0.96)	0.002 (0.33)	0.000 (0.04)	-0.002 (-0.47)
Upgrade Others	<i>t</i>	-0.045** (-3.15)	-0.039 (-1.80)	-0.039* (-1.99)	-0.013 (-1.05)	-0.006 (-0.33)	-0.012 (-0.79)
	<i>t-1</i>	-0.026 (-1.29)	-0.040 (-1.66)	-0.037 (1.72)	-0.008 (-0.98)	-0.006 (-0.40)	0.002 (0.13)
	<i>t-2</i>	-0.051*** (-7.64)	-0.052*** (-4.09)	-0.042** (-3.05)	-0.012* (-1.96)	-0.005 (-0.78)	-0.003 (0.43)
Downgrade Others	<i>t</i>	0.016 (1.61)	0.023** (3.28)	0.020** (2.58)	0.012 (0.81)	0.015 (0.90)	0.004 (0.20)
	<i>t-1</i>	0.085*** (4.56)	0.079*** (7.24)	0.077*** (6.81)	0.030** (2.54)	0.033*** (3.83)	0.026* (2.25)
	<i>t-2</i>	-0.011 (-1.78)	-0.013 (-1.40)	-0.016* (-1.97)	0.124** (2.48)	0.104*** (3.32)	0.074 (1.81)
Lagged volatility		0.976*** (681.91)	0.975*** (525.37)	0.976*** (506.29)	0.979*** (205.52)	0.981*** (412.61)	0.982*** (384.60)
R2		0.973	0.973	0.975	0.981	0.984	0.985
Observation		28193	23067	23067	45434	45434	41050
Countries		11	9	6	11	11	10
#Upgrades		10	9	10	38	38	34
#Downgrades		56	56	56	57	57	45
#Upgrades (other)		100	81	80	349	349	315
#Downgrades (other)		533	427	427	548	548	502

Note: This table reports the estimation results that corresponds to the regression Equation in (7) using volatilities that are filtered based on: (i) GJR-GARCH model (Glosten et al., 1993); (ii) EGARCH model with Gaussian distribution; and (iii) EGARCH model with autoregressive terms in the mean equation. The t-statistics for the statistical significance of the estimated coefficients are reported between parentheses. In this table "****", "***", "*" represents statistical significance at 1%, 5%, and 10%, respectively. Control variables, X, in (7) include weekday, month and year dummies. Euro Area: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain.

Table A10 – Estimation results of regressions of stock and bond market volatilities (Equation (7)), Contagion, including lagged volatility of all countries

Events		Stock market			Bond market		
		Euro Area	Core Countries	Periphery Countries	Euro Area	Core Countries	Periphery Countries
Upgrade	<i>t</i>	-0.046** (-2.41)	-0.055*** (-5.20)	-0.039 (-1.75)	-0.016 (-0.70)	-0.055*** (-48.93)	-0.011 (-0.44)
	<i>t-1</i>	-0.040 (-1.78)	-0.054*** (-2.64)	-0.035 (-1.46)	-0.017* (-1.94)	-0.045*** (-11.57)	-0.015 (-1.58)
	<i>t-2</i>	-0.050*** (-4.09)	-0.021* (-4.03)	-0.049** (-3.83)	-0.008 (-1.04)	0.046*** (9.80)	-0.015 (-1.76)
Downgrade	<i>t</i>	0.023*** (3.20)	- -	0.020** (2.64)	0.018 (1.04)	- -	0.020 (1.14)
	<i>t-1</i>	0.079*** (6.94)	- -	0.075*** (6.66)	0.032** (3.12)	- -	0.033** (3.16)
	<i>t-2</i>	-0.013 (-1.46)	- -	-0.016 (-1.86)	0.101** (-0.016)	- -	0.100** (2.62)
Upgrade Others	<i>t</i>	-0.012* (-2.10)	-0.012*** (-5.20)	-0.010 (0.74)	0.008** (2.28)	0.010 (2.03)	0.006 (1.18)
	<i>t-1</i>	-0.050*** (-3.55)	-0.057* (-2.64)	-0.042 (0.61)	-0.017*** (-6.22)	-0.017*** (-8.64)	-0.018** (-3.16)
	<i>t-2</i>	-0.029** (-2.27)	-0.033** (-4.03)	-0.024 (-0.52)	-0.015*** (-5.13)	-0.012** (-4.23)	-0.020** (-3.58)
Downgrade Others	<i>t</i>	0.030*** (5.75)	0.028** (3.98)	0.031** (3.81)	0.012*** (3.42)	0.010*** (9.42)	0.015* (2.06)
	<i>t-1</i>	0.045*** (6.63)	0.041** (4.46)	0.049*** (4.69)	0.005 (1.10)	0.004 (2.01)	0.005 (0.55)
	<i>t-2</i>	-0.006 (-1.58)	-0.011 (-1.76)	-0.000 (-0.04)	-0.003 (-0.71)	-0.012*** (-9.42)	0.006 (0.81)
Lagged volatility		0.973*** (277.93)	0.979*** (193.50)	0.964*** (173.07)	0.974*** (344.71)	0.974*** (193.74)	0.970*** (304.94)
Austria		-0.002 (-0.50)	-0.010 (-0.75)	0.002 (1.04)	-0.014*** (-4.16)	-0.012 (-2.05)	-0.015** (-3.98)
Belgium		0.017** (2.85)	0.014*** (6.71)	0.021* (2.14)	-0.013** (-2.83)	-0.008 (-1.57)	-0.015* (-2.21)
Finland		0.002 (1.03)	0.001 (0.16)	0.003 (0.96)	0.003 (1.61)	0.004 (1.31)	0.002 (1.03)
France		-0.006 (-0.98)	-0.008 (-0.56)	-0.006 (-0.97)	0.011 (1.61)	0.002 (0.29)	0.020 (1.72)
Germany		-0.001 (-0.37)	-0.006 (-0.80)	0.001 (0.23)	0.021*** (4.83)	0.026*** (4.58)	0.017* (2.56)
Greece		-0.002 (-0.58)	0.002 (0.63)	-0.003 (-0.71)	-0.001 (-0.66)	0.000 (0.03)	-0.002 (-0.56)
Ireland		-0.005* (-1.84)	-0.002 (-0.75)	-0.007 (-1.88)	0.007* (2.12)	0.006** (3.99)	0.009 (1.47)
Italy		-0.006 (-1.61)	0.000 (0.03)	-0.011 (-1.63)	0.010* (2.15)	0.009*** (4.76)	0.013 (1.43)
Netherlands		0.007* (1.89)	0.003 (0.42)	0.010* (2.11)	-0.017*** (-3.17)	-0.016*** (-5.07)	-0.018 (-1.73)
Portugal		0.014** (2.46)	0.018*** (7.14)	0.012 (1.47)	0.002 (0.44)	0.004*** (4.91)	0.002 (0.18)
Spain		-0.013*** (-4.33)	-0.012*** (-4.99)	-0.013** (-2.86)	-0.005* (-1.95)	-0.002 (-2.07)	-0.008 (-1.63)
R2		0.976	0.975	0.977	0.981	0.987	0.976
Observation		28193	12815	15378	37279	16945	20334
Countries		11	5	6	11	5	6
#Upgrades		10	1	9	24	2	22
#Downgrades		56	0	56	57	0	57
#Upgrades (other)		100	49	51	231	114	117
#Downgrades (other)		533	265	268	543	270	273

Note: This table reports the estimation results that correspond to the regression Equation in (7). The t-statistics for the statistical significance of the estimated coefficients are reported between parentheses. In this table "****", "***", "**" represents statistical significance at 1%, 5%, and 10%, respectively. Control variables, X, in (7) include weekday, month and year dummies. Core (Austria, Finland, Germany, France, Netherlands); and Periphery (Belgium, Ireland, Italy, Greece, Portugal and Spain). "-" is to indicate that downgrades are not observed in Core Countries.

IV-Summary of portfolio choice

Table A11 – Financial gain in annualized basis points (bp) of credit rating downgrades information, alternative volatility measures.

	Observations	$\eta=3$	$\eta=5$	$\eta=7$
<i>GJR-GARCH</i>				
Stock Market				
<i>In-sample prediction</i>	2562(554)	9.8	6.2	4.7
<i>Out-of-sample prediction</i>	518 (289)	16.5	10.1	7.3
Bond Market				
<i>In-sample prediction</i>	2562(446)	3.5	1.8	1.2
<i>Out-of-sample prediction</i>	518 (287)	137.6	79.6	54.9
<i>EGARCH Gaussian distribution</i>				
Stock Market				
<i>In-sample prediction</i>	2562(471)	5.1	3.1	2.3
<i>Out-of-sample prediction</i>	518 (289)	0.5	0.3	0.2
Bond Market				
<i>In-sample prediction</i>	2562(446)	1.9	1.1	0.8
<i>Out-of-sample prediction</i>	518 (287)	59.0	34.9	24.6
<i>EGARCH Autocorrelated returns</i>				
Stock Market				
<i>In-sample prediction</i>	2562(415)	5.5	3.5	2.7
<i>Out-of-sample prediction</i>	518 (289)	13.4	8.0	5.7
Bond Market				
<i>In-sample prediction</i>	2562(412)	1.4	0.8	0.5
<i>Out-of-sample prediction</i>	518 (227)	46.5	26.9	18.5

Note: This table reports in-sample and out-of-sample predictions of the financial gain of credit rating downgrades information in (14) using volatilities that are filtered based on: (i) GJR-GARCH model (Glosten et al., 1993); (ii) EGARCH model with Gaussian distribution; and (iii) EGARCH model with autoregressive terms in the mean equation. The gain is in annualized basis points (bp). In this table " η " represents the risk aversion parameter. These financial gains are within two weeks of a downgrade. Between parentheses is the number of periods corresponding to two weeks after a downgrade.

Table A12 – Value at Risk with and without credit rating downgrades information, alternative volatility measures.

	$\eta=3$	$\eta=5$	$\eta=7$
GJR-GARCH			
Stock Market			
<i>In-sample prediction</i>			
Without rating information	-0.0828 (3.8%)	-0.0511 (3.6%)	-0.0378 (3.6%)
With rating information	-0.0823 (3.8%)	-0.0508 (3.6%)	-0.0377 (3.6%)
<i>Out-of-sample prediction</i>			
Without rating information	-0.1480 (6.3%)	-0.0891 (5.6%)	-0.0640 (4.9%)
With rating information	-0.1465 (6.3%)	-0.0882 (5.2%)	-0.0633 (4.9%)
Bond Market			
<i>In-sample prediction</i>			
Without rating information	-0.0410 (3.7%)	-0.0273 (4.8%)	-0.0220 (4.8%)
With rating information	-0.0406 (3.7%)	-0.0271 (4.5%)	-0.0218 (4.8%)
<i>Out-of-sample prediction</i>			
Without rating information	-0.1339 (4.3%)	-0.0813 (4.3%)	-0.0589 (4.3%)
With rating information	-0.1320 (4.3%)	-0.0801 (4.3%)	-0.0581 (4.3%)
EGARCH Gaussian distribution			
Stock Market			
<i>In-sample prediction</i>			
Without rating information	-0.0812 (4.5%)	-0.0500 (4.2%)	-0.0369 (4.2%)
With rating information	-0.0807 (4.5%)	-0.0497 (4.2%)	-0.0367 (4.2%)
<i>Out-of-sample prediction</i>			
Without rating information	-0.1347 (4.5%)	-0.0812 (4.9%)	-0.0584 (4.9%)
With rating information	-0.1338 (4.5%)	-0.0806 (4.5%)	-0.0580 (4.9%)
Bond Market			
<i>In-sample prediction</i>			
Without rating information	-0.0407 (6.0%)	-0.0266 (6.9%)	-0.0210 (6.6%)
With rating information	-0.0404 (6.0%)	-0.0264 (6.6%)	-0.0209 (6.3%)
<i>Out-of-sample prediction</i>			
Without rating information	-0.1290 (6.4%)	-0.0781 (6.4%)	-0.0565 (6.0%)
With rating information	-0.1274 (6.8%)	-0.0771 (6.4%)	-0.0558 (6.0%)
EGARCH Autocorrelated returns			
Stock Market			
<i>In-sample prediction</i>			
Without rating information	-0.0753 (2.2%)	-0.0463 (1.9%)	-0.0343 (2.2%)
With rating information	-0.0748 (2.2%)	-0.0461 (1.9%)	-0.0341 (1.9%)
<i>Out-of-sample prediction</i>			
Without rating information	-0.1312 (3.1%)	-0.0792 (3.5%)	-0.0570 (3.1%)
With rating information	-0.1299 (3.1%)	-0.0783 (3.5%)	-0.0564 (2.8%)
Bond Market			
<i>In-sample prediction</i>			
Without rating information	-0.0406 (3.3%)	-0.0270 (3.3%)	-0.0217 (3.0%)
With rating information	-0.0403 (3.3%)	-0.0269 (3.6%)	-0.0216 (3.0%)
<i>Out-of-sample prediction</i>			
Without rating information	-0.1293 (7.5%)	-0.0784 (7.5%)	-0.0568 (7.5%)
With rating information	-0.1283 (7.5%)	-0.0778 (7.5%)	-0.0564 (7.5%)

Note: this table reports in-sample and out-of-sample predictions of the value-at-risk with and without using credit rating downgrades information for estimating volatilities (equations (15) and (16)), using volatilities that are filtered based on: (i) GJR-GARCH model (Glosten et al., 1993); (ii) EGARCH model with Gaussian distribution; and (iii) EGARCH model with autoregressive terms in the mean equation. In this table " η " represents the risk aversion parameter. The value-at-risks are within two weeks of a downgrade. These value-at-risks correspond to each unit nit invested in the mean-variance portfolios. In brackets is the percentage of value-at-risk violations.

Figure A1: Out-of-sample portfolio returns and Value-at-risk, with and without rating announcement information

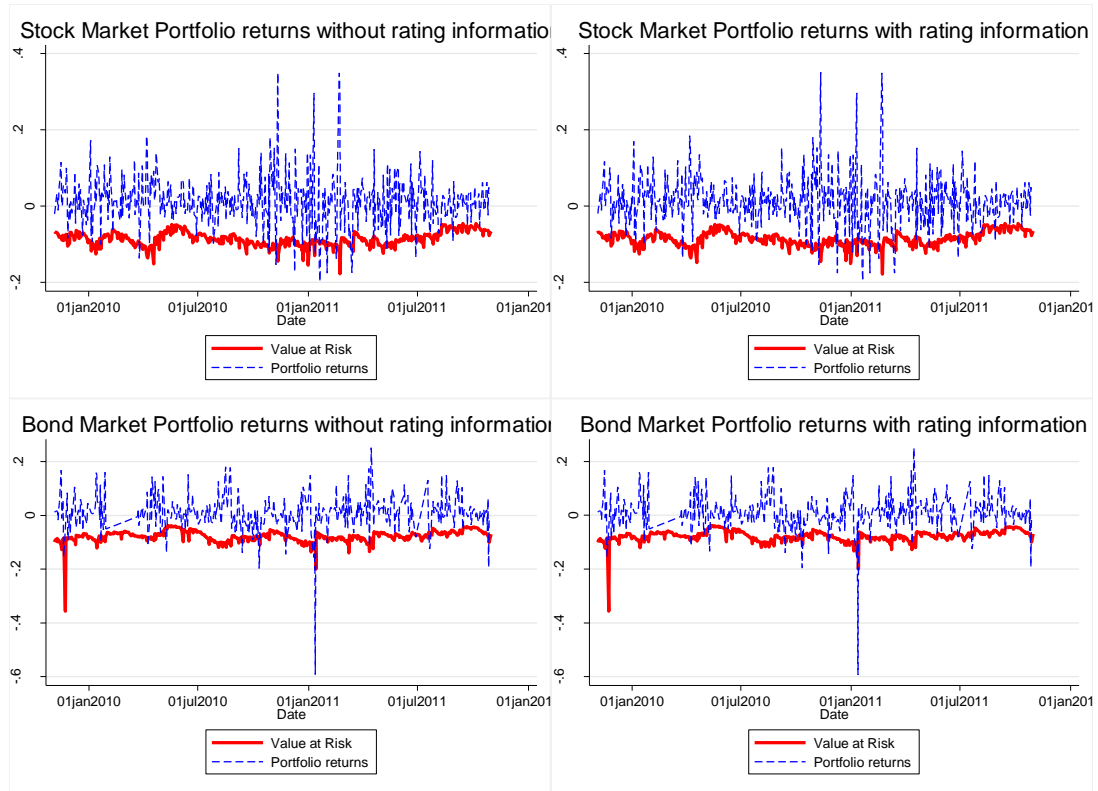


Table A13 – Average portfolio returns, standard deviation and Value-at-Risk, with and without credit rating downgrades information compared to the equally weighted portfolio

	Returns			St. Deviation			Value-at-Risk		
	$\eta=3$	$\eta=5$	$\eta=7$	$\eta=3$	$\eta=5$	$\eta=7$	$\eta=3$	$\eta=5$	$\eta=7$
Stock Market									
<i>In-sample prediction</i>									
Without rating information	0.0054	0.0031	0.0021	0.0456	0.0281	0.0208	-0.0824	-0.0508	-0.0376
With rating information	0.0053	0.0030	0.0021	0.0454	0.0280	0.0207	-0.0820	-0.0506	-0.0375
Equally weighted portfolio	0.0003	0.0003	0.0003	0.0110	0.0110	0.0110	-0.0214	-0.0214	-0.0214
<i>Out-of-sample prediction</i>									
Without rating information	0.0184	0.0109	0.0077	0.0851	0.0513	0.0368	-0.1450	-0.0873	-0.0627
With rating information	0.0181	0.0108	0.0076	0.0845	0.0509	0.0365	-0.1439	-0.0866	-0.0622
Equally weighted portfolio	0.0002	0.0002	0.0002	0.0100	0.0100	0.0100	-0.0198	-0.0198	-0.0198
Bond Market									
<i>In-sample prediction</i>									
Without rating information	0.0025	0.0015	0.0010	0.0216	0.0142	0.0113	-0.0410	-0.0271	-0.0216
With rating information	0.0025	0.0015	0.0010	0.0214	0.0141	0.0113	-0.0407	-0.0269	-0.0215
Equally weighted portfolio	-0.0004	-0.0004	-0.0004	0.0105	0.0105	0.0105	-0.0214	-0.0214	-0.0214
<i>Out-of-sample prediction</i>									
Without rating information	0.0207	0.0122	0.0086				-0.1318	-0.0799	-0.0579
With rating information	0.0202	0.0119	0.0084	0.0750	0.0453	0.0328	-0.1301	-0.0789	-0.0572
Equally weighted portfolio	-0.0006	-0.0006	-0.0006	0.0090	0.0090	0.0090	-0.0177	-0.0177	-0.0177

Note: This table reports in-sample and out-of-sample predictions of the average portfolio returns, average portfolio standard deviation and average value-at-risk with and without using credit rating downgrades information for estimating volatilities (equations (15) and (16)) and the equally weighted portfolio. In this table " η " represents the risk aversion parameter. The value-at-risks are within two weeks of a downgrade. These value-at-risks correspond to each unit invested in the mean-variance portfolios. In brackets is the percentage of value-at-risk violations.

Table A14 – Financial gain in annualized basis points (bp) of credit rating downgrades information (regression without lagged volatility)

	Observations	$\eta=3$	$\eta=5$	$\eta=7$
<u>Relative to portfolio without rating information</u>				
Stock Market				
<i>In-sample prediction</i>	2562(554)	5416.0	3145.5	2165.1
<i>Out-of-sample prediction</i>	518 (289)	23889.5	13824.9	9514.2
Bond Market				
<i>In-sample prediction</i>	2562(446)	2251.1	1264.0	847.3
<i>Out-of-sample prediction</i>	518 (287)	110004.6	65243.2	46064.6

Note: This table reports in-sample and out-of-sample predictions of the financial gain of credit rating downgrades information in a regression without lagged volatility. The gain is in annualized basis points (bp). In this table " η " represents the risk aversion parameter. These financial gains are within two weeks of a downgrade. Between parentheses is the number of periods corresponding to two weeks after a downgrade.