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ECB-PUBLIC

ESRB
European Systemic Risk Board
European System of Financial Supervision

Adverse scenario for the European Insurance and Occupational Pensions Authority's EU-wide pension fund stress test and for the European Securities and Markets Authority's money market fund stress-testing guidelines in 2019

Introduction

The European Supervisory Authorities, in cooperation with the European Systemic Risk Board (ESRB), are requested by legislation to use stress tests in order to assess the resilience of financial institutions or market participants to adverse market developments. As part of this cooperation, the ESRB designs scenarios of adverse economic and financial market developments.

The ESRB was asked to provide adverse financial market scenarios for the stress-testing exercises planned by the European Insurance and Occupational Pensions Authority (EIOPA) and the European Securities and Markets Authority (ESMA). Specifically, EIOPA will be undertaking its third stress test for institutions for occupational retirement provision (IORP), while ESMA is developing guidelines for managers of money market funds (MMF) who are required to conduct internal stress tests and report the results to national competent authorities and ESMA.[1]

The European Central Bank, in collaboration with the ESRB, EIOPA and ESMA, has developed the narrative and has calibrated the adverse scenario for both exercises described in this document,[2] which has been approved by the ESRB General Board and transmitted to EIOPA and ESMA.

Designing a single scenario increases the coherence between the stress-testing exercises, allowing for an appropriate response from the institutions and companies included in the scope of the exercises. The risk factors to be considered in this scenario differ between the stress-testing exercises:

- ESMA's stress-testing guidelines focus on short maturities (between one month and two years), while the EIOPA stress test focuses on long maturities (e.g., five years);
- despite the importance of interest rates for both exercises, the MMF exercise also considers asset liquidity and the IORP exercise also considers equity prices, residential real estate prices and inflation swap rates;

[1] Article 28 of the MMF Regulation provides that ESMA shall develop guidelines that establish common reference parameters of the stress test scenarios to be included in the stress tests that managers of MMFs are required to conduct.
[2] The scenario presented in this document is not a forecast. It should not be interpreted as either the ESRB's expectations about future economic and financial developments or any unintended consequences of future monetary policy decisions. It constitutes a severe yet plausible scenario that could arise if a risk environment such as the one explained in the note were to materialise.

The list of risk factors to be considered in each exercise can be found in Annex B.

This document presents the main sources of risk that lead to the adverse scenario and the key features that EIOPA and ESMA consider relevant to the IORP and MMF sectors. The calibration of the scenario has benefited from guidance from EIOPA and ESMA, and from discussions with ESRB member institutions. The methodology underlying the calibration of the financial shocks is based on the same models used in previous stress tests.[3] The shocks reported should be interpreted as one-off, instantaneous and permanent shifts in asset prices relative to their end-2018 levels.[4]

Assumptions about long-term risk premia, which are needed for other components of EIOPA's stress test, are developed by EIOPA and are not presented in this document. Likewise, assumptions on redemptions which are needed for ESMA's MMF stress test are developed by ESMA and presented in the separate methodological document. In addition, guidance on applying the scenario is provided by EIOPA and ESMA and is not covered here.

Systemic risks and vulnerabilities addressed by the scenario

The scenario reflects the ESRB's assessment of prevailing sources of systemic risk for the EU financial system:

1. repricing of risk premia in global financial markets;
2. persistent weaknesses in balance sheets of EU banks, insurers and pension schemes;
3. debt sustainability challenges in EU sovereign, corporate and household sectors;
4. vulnerabilities in the EU shadow banking sector and contagion to the financial system.

Narrative and calibration of the scenario

The methodology for the scenario calibration is based on a non-parametric application of a multivariate copula model.[5] The scenario is the outcome of several simulations based on different triggers that reflect the main sources of financial stability risks, with a special focus on the repricing of some types of assets: swap rates (in the EU, the United States and emerging market economies), government credit spreads and equity prices in the EU and other advanced economies, and bid-ask spreads on government bonds. The calibration sample and probability of the triggering events have been chosen to reflect the main features of the scenario in the calibration and were motivated by the narrative developed jointly with

[3] See, for example: https://eiopa.europa.eu/Pages/Financial-stability-and-crisis-prevention/Occupational-Pensions-Stress-Test-2017-.aspx.

[4] For this reason, the severity of the scenario designed for EIOPA and ESMA cannot be directly compared with that of the European Banking Authority (EBA), because in the EBA scenario, the overall impact depends on the accumulation of shocks occurring over three years. In addition, the narrative of the scenario differs from that of the EBA as it is more focused on risk factors linked to the IORP and MMF sectors, even though they are based on the same overall risk assessment process.

[5] See the methodological note describing the Financial Shock Simulator.

EIOPA and ESMA. More precisely, the sample chosen for the calibration spans from January 2004[6] to December 2018 and the probability of the shocks to the triggering variables is below 1% over the horizon of one quarter.

The scenario is assumed to be initiated by an abrupt reversal in global risk premia, which is deemed the most relevant financial stability risk. While the shocks to interest rates are higher on short maturities owing to greater uncertainty and risks to growth caused by political tensions, concerns in the euro area (EA) about growth in the long term (for demographic reasons, for example) would result in lower shocks for long-term maturities. The swap rate curve would shift upwards by 80 basis points in the EA for the one-year maturity and by more than 140 basis points in other major advanced economies (see Charts 1 and 2). The swap rate curve would shift upwards by 25 basis points in the EA for the ten-year maturity and by more than 40 basis points in other major advanced economies (see Charts 1 and 2).

Chart 1: Shock to swap rates (basis points)

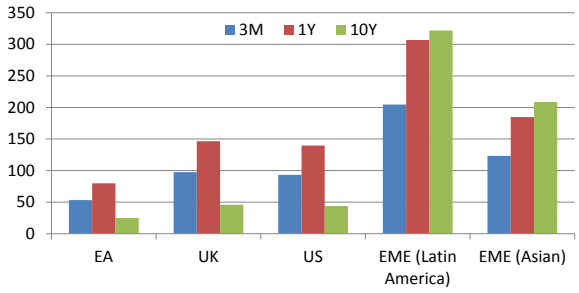
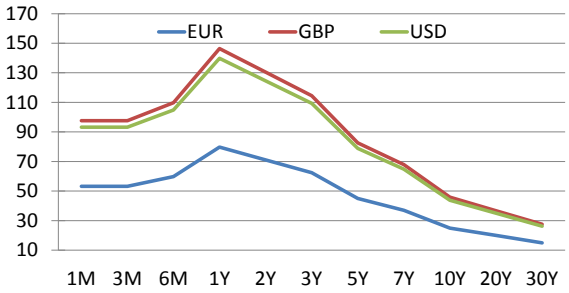


Chart 2: Distribution of swap rate shocks across different maturities (basis points)



The overall repricing of risk premia would raise concerns about the debt sustainability of some EU Member States, leading to a widening of yield spreads between those government bonds and the equivalent German bonds. On average, ten-year government bond yields in the EU would increase by about 110 basis points, with a range between 29 basis points and 347 basis points under the adverse scenario (see Chart 3). The variance across EU countries is lower on one-year government bond yields, where shocks range from 60 basis points to 213 basis points. Overall, one-year government bond yields in the EU would increase by 130 basis points on average (see Chart 4). Other advanced economies experience a shock of over 155 basis points for one-year government bond yields and of around 143 basis points for ten-year government bond yields (see Chart 5). Government bond yields respond both to the increase in risk-free rates and to the widening of the spreads owing to concerns about debt sustainability. For this reason the distribution of the shocks to government bond yields is bi-modal.

[6] The model uses daily data and the majority of time series have sufficient data as of 2004.

Chart 3: Distribution of shocks to ten-year government bond yields in EU (basis points)

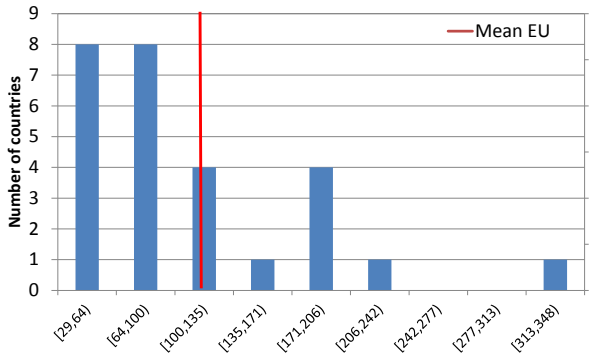


Chart 4: Distribution of shocks to one-year government bond yields in EU (basis points)

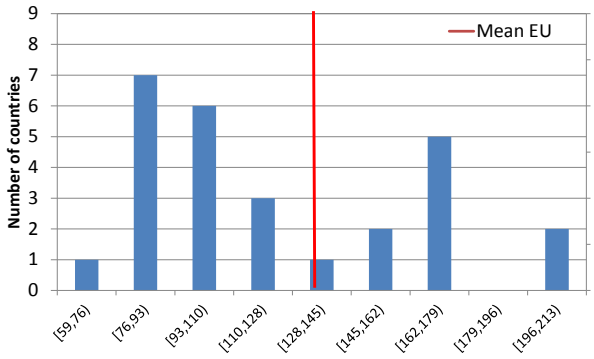
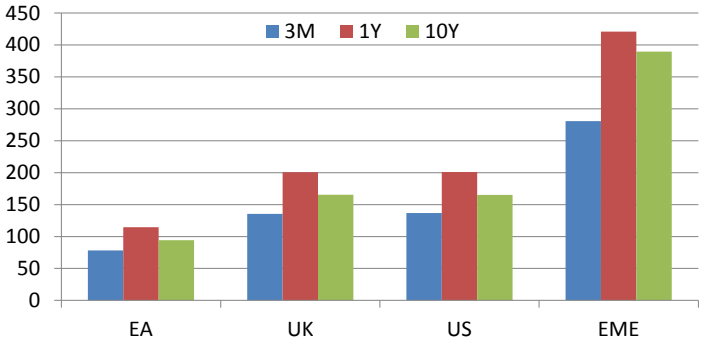
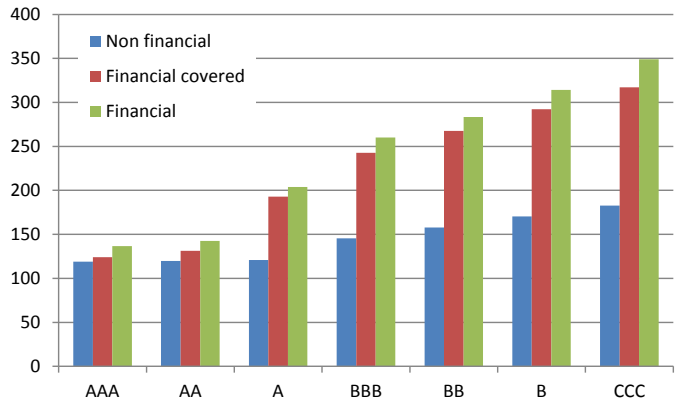


Chart 5: Shocks to government bond yields across countries (basis points)



In addition, yields on non-financial corporate and bank debt would increase, following the generalised increase in risk premia (see Chart 6). In the banking sector, shocks to credit spreads would be aggravated by fundamental concerns about prospective mark-to-market losses on fixed-income assets, bringing about an increase of more than 340 basis points for lower-rated financial corporations. AAA-rated non-financial corporate bond yields would also increase by about 120 basis points in the EU, but the impact on credit spreads would be more pronounced for lower-rated issuers, reaching 180 basis points for CCC-rated non-financial corporate bonds.

Chart 6: Shocks to corporate bond yields in EU (basis points)



The repricing of risk premia would also bring about a substantial drop in equity prices, amplified by a general sell-off of equities by the non-banking sector. Overall, equity prices in the EU would decline by about 39% (see Chart 7). Residential and commercial real estate prices would also decline significantly, by 20% and 31%, respectively, with respect to the baseline at EU level (see Chart 8).

Chart 7: Shocks to equity prices (%)

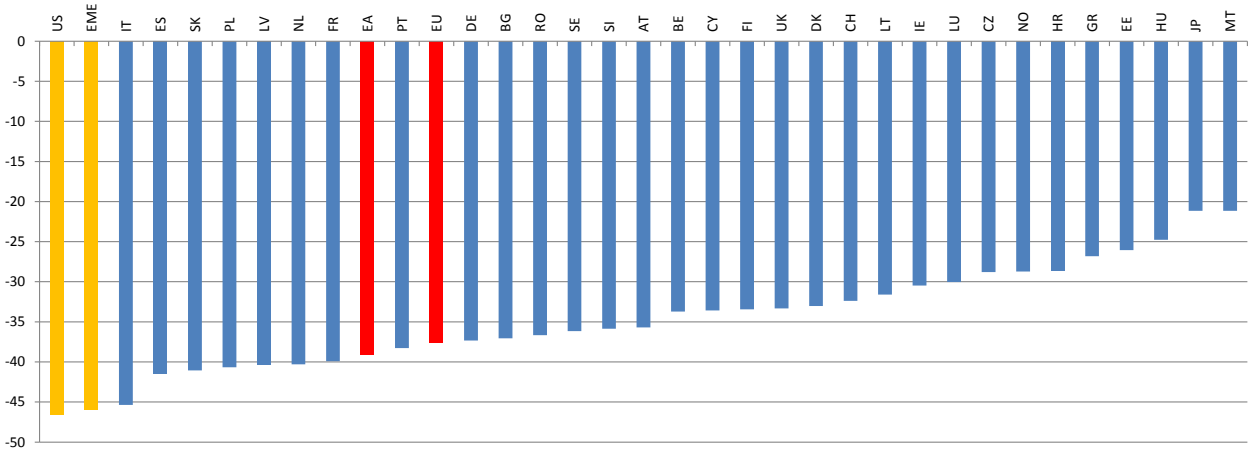
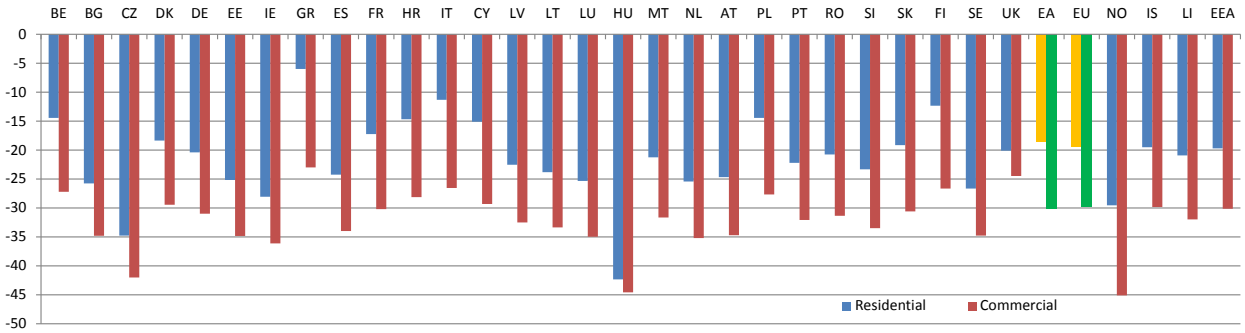


Chart 8: Shocks to residential real estate prices and commercial real estate prices (%)



The value of investments in private equity and hedge funds would fall by between 32% and 50% (see Chart 9). Commodity prices would also decline significantly, between 28% and 47%.

Chart 9: Shocks to other equities (%)

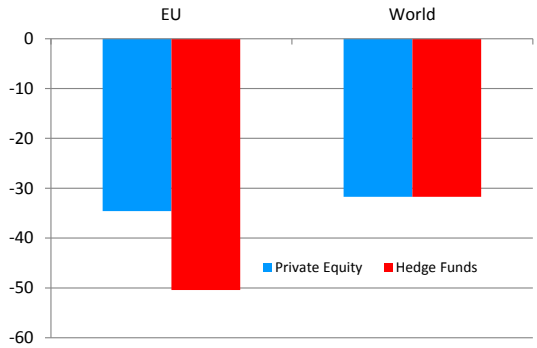
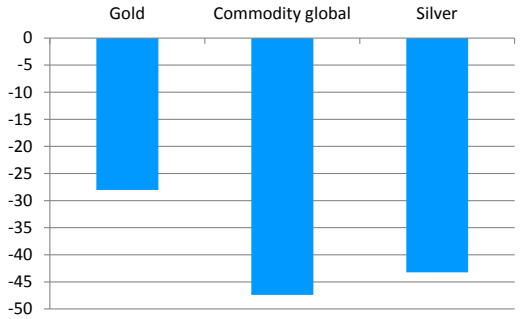


Chart 10: Shocks to commodity prices (%)



Annex A

Table A.1: Shocks to swap rates

Shocks to interest rate yields absolute changes (basis points)												
Geographic Area	**Country**	**Description**	**1M**	**3M**	**6M**	**1Y**	**2Y**	**3Y**	**5Y**	**7Y**	**10Y**	**20Y**	**30Y**
EU	**Euro area**	Interest rate swap on the EUR (euro)	53	53	60	80	71	62	45	37	25	20	15
EU	**Bulgaria**	Interest rate swap on the BGN (Bulgarian lev)											
EU	**Croatia**	Interest rate swap on the HRK (Croatian kuna)	53	53	60	80	71	62	45	37	25	20	15
EU	**Czech Republic**	Interest rate swap on the CZK (Czech koruna)	-4	-4	-4	-5	3	10	26	27	29	27	
EU	**Denmark**	Interest rate swap on the DKK (Danish krone)	53	53	60	80	71	62	45	37	25	20	15
EU	**Hungary**	Interest rate swap on the HUF (Hungarian forint)	74	74	83	111	119	127	144	141	136	131	
EU	**Poland**	Interest rate swap on the PLN (Polish zloty)	25	25	28	37	53	69	101	98	94	88	
EU	**Romania**	Interest rate swap on the RON (Romanian leu)	153	153	172	229	217	205	180	123	38		
EU	**Sweden**	Interest rate swap on the SEK (Swedish krona)	26	26	30	40	55	70	101	88	68	44	
EU	**United Kingdom**	Interest rate swap on the GBP (British pound)	98	98	110	146	130	115	83	68	46	37	28
Rest of Europe	**Iceland**	Interest rate swap on the ISK (Icelandic króna)											
Rest of Europe	**Norway**	Interest rate swap on the NOK (Norwegian krone)	20	20	22	30	39	47	65	56	42	45	
Rest of Europe	**Russia**	Interest rate swap on the RUB (Russian ruble)	122	122	137	183	184	185	187	181	173	136	
Rest of Europe	**Switzerland**	Interest rate swap on the CHF (Swiss franc)	31	31	35	46	54	61	76	68	56	34	31
Rest of Europe	**Turkey**	Interest rate swap on the TRY (Turkish lira)	197	197	221	295	307	320	345	332	314		
North America	**Canada**	Interest rate swap on the CAD (Canadian dollar)	46	46	51	68	70	72	76	67	55	46	
North America	**United States**	Interest rate swap on the USD (US dollar)	93	93	105	140	125	109	79	65	44	35	26
Australia and Pacific	**Australia**	Interest rate swap on the AUD (Australian dollar)	33	33	37	50	62	74	98	93	85	80	
Australia and Pacific	**New Zealand**	Interest rate swap on the NZD (New Zealand dollar)											
South and Central America	**Brazil**	Interest rate swap on the BRL (Brazilian real)											
South and Central America	**Chile**	Interest rate swap on the CLP (Chilean peso)	206	206	232	309	376	444	578	463	291	266	
South and Central America	**Colombia**	Interest rate swap on the COP (Colombian peso)	162	162	183	243	276	308	373	330	264	495	
South and Central America	**Mexico**	Interest rate swap on the MXN (Mexican peso)	245	245	276	368	360	352	337	366	411		
Asia	**China**	Interest rate swap on the CNY (Chinese yuan)	13	13	14	19	17	15	11	18	28		
Asia	**Hong Kong**	Interest rate swap on the HKD (Hong Kong dollar)	208	208	235	313	320	327	341	325	300		
Asia	**India**	Interest rate swap on the INR (Indian rupee)	263	263	296	395	394	392	389	367	336		
Asia	**Japan**	Interest rate swap on the JPY (Japanese yen)	9	9	10	14	19	25	35	36	36	27	
Asia	**Korea**	Interest rate swap on the KRW (South Korean won)	134	134	150	200	209	217	234	243	255	257	
Asia	**Malaysia**	Interest rate swap on the MYR (Malaysian ringgit)	90	90	101	134	153	173	211	227	251	283	
Asia	**Singapore**	Interest rate swap on the SGD (Singapore dollar)	116	116	130	173	176	179	185	191	199	221	
Asia	**Thailand**	Interest rate swap on the THB (Thai baht)	164	164	184	245	257	269	292	299	310	263	
Africa	**South Africa**	Interest rate swap on the ZAR (South African rand)	10	10	11	14	25	36	57	59	62	64	

Note: The grey cells show cases in which data are not available.

Table A.2: Shocks to government bond yields

Shocks to government bond yields absolute changes (basis points)										
Geographic Area	**Country**	**3M**	**6M**	**1Y**	**2Y**	**3Y**	**5Y**	**7Y**	**10Y**	**20Y**
EU	**Austria**	65	73	96	91	86	77	73	67	49
EU	**Belgium**	64	72	94	93	93	92	87	81	64
EU	**Bulgaria**	62	69	90	89	88	86	90	96	74
EU	**Croatia**	56	63	82	75	68	55	47	35	27
EU	**Cyprus**	102	115	151	130	109	66	76	91	70
EU	**Czech Republic**	113	127	167	160	152	136	123	103	79
EU	**Denmark**	66	73	96	88	79	63	52	36	23
EU	**Finland**	61	68	89	84	79	69	63	54	42
EU	**France**	66	74	96	94	91	86	81	75	59
EU	**Germany**	58	65	85	76	67	50	42	30	20
EU	**Greece**	120	135	178	185	192	207	202	195	161
EU	**Hungary**	143	160	212	240	268	323	333	347	266
EU	**Ireland**	109	122	161	155	150	139	133	123	94
EU	**Italy**	111	125	165	173	182	200	189	173	163
EU	**Latvia**	56	63	82	90	97	112	89	55	42
EU	**Lithuania**	62	69	91	95	99	107	96	80	61
EU	**Luxembourg**	41	46	60	60	59	58	55	49	38
EU	**Malta**	77	86	113	112	112	110	106	101	77
EU	**Netherlands**	63	70	92	86	81	70	64	54	34
EU	**Poland**	110	123	162	174	187	211	220	233	28
EU	**Portugal**	76	85	111	137	163	216	211	205	82
EU	**Romania**	76	85	112	119	126	140	115	79	60
EU	**Slovakia**	75	83	109	105	100	90	90	89	45
EU	**Slovenia**	89	99	130	129	128	127	117	102	78
EU	**Spain**	118	132	175	184	193	210	204	193	171
EU	**Sweden**	68	76	100	92	84	68	62	54	41
EU	**United Kingdom**	135	152	201	210	218	220	192	165	135
EA (weighted averages)	**EA (weighted averages)**	**78**	**87**	**114**	**113**	**112**	**110**	**103**	**93**	**76**
EU (weighted averages)	**EU (weighted averages)**	**89**	**100**	**131**	**132**	**133**	**132**	**122**	**109**	**84**
Advanced economies	**Switzerland**	26	30	41	49	56	71	63	51	29
Advanced economies	**Norway**	15	17	25	34	42	60	51	37	28
Advanced economies	**Iceland**	26	30	41	49	56	71	63	51	29
Advanced economies	**Liechtenstein**	26	30	41	49	56	71	63	51	29
EEA (weighted averages)	**EEA (weighted averages)**	**86**	**96**	**127**	**128**	**129**	**129**	**119**	**106**	**82**
Advanced economies	**United States**	137	153	201	200	198	196	184	165	132
Advanced economies	**Japan**	94	106	141	160	180	219	206	186	120
Advanced economies	**Advanced economies non EU and non US**	81	91	122	137	152	182	181	180	128
Advanced economies	**Advanced economies (weighted average)**	**105**	**118**	**155**	**158**	**161**	**165**	**156**	**143**	**110**
Emerging markets	**Emerging markets**	**281**	**316**	**421**	**424**	**427**	**433**	**416**	**390**	**211**
World	**World**	**193**	**217**	**288**	**291**	**294**	**299**	**286**	**266**	**161**

Note: The weighted averages are based on real GDP and some missing values have been interpolated.

Table A.3: Shocks to equity prices

Shocks to equity prices relative changes (%)		
Geographic Area	**Country**	**Shock**
EU	**Austria**	-36
EU	**Belgium**	-34
EU	**Bulgaria**	-37
EU	**Cyprus**	-34
EU	**Croatia**	-29
EU	**Czech Republic**	-29
EU	**Denmark**	-33
EU	**Estonia**	-26
EU	**Finland**	-33
EU	**France**	-40
EU	**Germany**	-37
EU	**Greece**	-27
EU	**Hungary**	-25
EU	**Ireland**	-30
EU	**Italy**	-45
EU	**Latvia**	-40
EU	**Lithuania**	-32
EU	**Luxembourg**	-30
EU	**Malta**	-21
EU	**Netherlands**	-40
EU	**Poland**	-41
EU	**Portugal**	-38
EU	**Romania**	-37
EU	**Slovakia**	-41
EU	**Slovenia**	-36
EU	**Spain**	-42
EU	**Sweden**	-36
EU	**United Kingdom**	-33
EA (weighted averages)	**EA (weighted averages)**	-39
EU (weighted averages)	**EU (weighted averages)**	-38
Advanced economies	**Switzerland**	-32
Advanced economies	**Norway**	-29
Advanced economies	**United States**	-47
Advanced economies	**Japan**	-21
Advanced economies	**Advanced economies non EU and non US**	-24
Advanced economies	**Advanced economies (weighted average)**	-39
Emerging markets	**Emerging markets**	-46

Note: The weighted averages are based on real GDP.

Table A.4: Shocks to residential and commercial real estate prices

Shocks to real estate prices relative changes (%)			
Geographic Area		**Residential**	**Commercial**
EU	**Austria**	-25	-35
EU	**Belgium**	-14	-27
EU	**Bulgaria**	-26	-35
EU	**Croatia**	-15	-29
EU	**Cyprus**	-15	-28
EU	**Czech Republic**	-35	-42
EU	**Denmark**	-18	-29
EU	**Estonia**	-25	-35
EU	**Finland**	-12	-27
EU	**France**	-17	-30
EU	**Germany**	-20	-31
EU	**Greece**	-6	-23
EU	**Hungary**	-42	-45
EU	**Ireland**	-28	-36
EU	**Italy**	-11	-27
EU	**Latvia**	-23	-33
EU	**Lithuania**	-24	-33
EU	**Luxembourg**	-25	-35
EU	**Malta**	-21	-32
EU	**Netherlands**	-25	-35
EU	**Poland**	-14	-28
EU	**Portugal**	-22	-32
EU	**Romania**	-21	-31
EU	**Slovakia**	-19	-31
EU	**Slovenia**	-23	-33
EU	**Spain**	-24	-34
EU	**Sweden**	-27	-35
EU	**United Kingdom**	-20	-24
EA (weighted averages)	**EA (weighted averages)**	**-19**	**-30**
EU (weighted averages)	**EU (weighted averages)**	**-20**	**-30**
Advanced economies	**Switzerland**	-21	-32
Advanced economies	**Norway**	-30	-45
Advanced economies	**Iceland**	-20	-30
Advanced economies	**Liechtenstein**	-21	-32
EEA (weighted averages)	**EEA (weighted averages)**	**-20**	**-30**

Note: The weighted averages are based on real GDP.

Table A.5: Shocks to corporate bond yields and credit spreads

Shocks to CDS absolute changes (basis points)		
Geographic Area	Index	1Y
EU	Itraxx Overall 5y	84
	Itraxx Crossover 5y	204
	Itraxx High vol 5y	132
	Itraxx Non financial 5y	71
	Itraxx SubFinancial 5y	192
US	Investment yield CDSI	78
	High yield CDSI	127

	Shocks to general corporate credit yields [1-3Y] absolute changes (basis points)			
	Non financial	Financial covered	Financial	All
AAA	119	124	137	127
AA	120	131	143	131
A	121	193	204	173
BBB	146	243	260	216
BB	158	268	283	236
B	170	292	314	259
<=CCC	183	317	349	283
Investment grade	126	173	186	162
High yield	177	305	332	271
All	145	224	241	204

Note: Due to lack of information on the exact existing volumes, aggregates are calculated on the basis of simple averages.

Table A.6: Shocks to Residential Mortgage-Backed Securities yields

Shocks to RMBS absolute changes (bps)					
Geographic Area	AAA	AA	A	BBB	All
EU	156	176	196	240	192
North America	168	192	216	269	211
Asia	143	160	176	212	173
All	156	176	196	240	192

Note: Due to lack of information on the exact existing volumes, aggregates are calculated on the basis of simple averages.

Table A.7: Shocks to other assets

Shocks to other equity prices relative changes (%)		
Private Equity	EU	-35
	World	-32
Hedge Funds	EU	-50
	World	-32
REIT	EU	-38
	Other	-30
	US	-35
Commodities	Gold	-28
	Commodity global	-47
	Silver	-43

Table A.8: Shocks to inflation swap rates

Shocks to inflation swap rate yields absolute changes (basis points)		
	EA	US
1Y	101	199
2Y	58	64
3Y	44	44
5Y	37	34
7Y	32	29
10Y	23	24
20Y	17	15
30Y	18	13

Table A.9: Shocks to exchange rates

[To be published when ESMA publishes its MMF stress-testing guidelines under Article 28 of the MMF Regulation]

Table A.10: Shocks to bid-ask spreads on government bonds

[To be published when ESMA publishes its MMF stress-testing guidelines under Article 28 of the MMF Regulation]

Annex B: List of risk factors

Table B.1 List of risk factors to be considered for the ESMA MMF stress-testing guidelines

Swaps			
Countries	Euro area	EU countries	Rest of Europe
	US	North America	Australia and Pacific
	South and Central America	Asia	Africa
Maturities	1M	3M	6M
	1Y	2Y	
Government bonds			
Countries	Euro area countries	EU countries	EEA countries
	US	Japan	Other advanced economies
	Emerging markets		
Maturities	3M	6M	
	1Y	2Y	
FX shocks			
Countries	Euro area	EU countries	Rest of Europe
	US	North America	Australia and Pacific
	South and Central America	Asia	Africa
Bid-ask spreads			
Countries	EU countries		
Maturities	3M	6M	
	1Y	2Y	
Credit spreads			
Credit spread indices	Itraxx Overall	Itraxx crossover	Itraxx high vol
	Itraxx non financial	Itraxx sub financial	Investment yield CDSI
	High yield CDSI		
Maturities	1Y		
Corporate yields			
Sector	Non-financial	Financial covered	Financial
Rating	AAA	AA	BBB
	BB	B	CCC

Table B.2 List of risk factors to be considered for the EIOPA IORP stress test

Interest rate swaps			
Countries:	Euro area		
Maturities:	1Y	2Y	3Y
	5Y	7Y	10Y
Inflation swaps			
Countries	Euro area countries		
Maturities	1Y	2Y	3Y
	5Y	7Y	10Y
Government bonds			
Countries	Austria	Belgium	Bulgaria
	Cyprus	Czech Republic	Germany
	Denmark	Spain	Finland
	France	Greece	Croatia
	Hungary	Ireland	Iceland
	Italy	Liechtenstein	Lithuania
	Luxembourg	Latvia	Malta
	Netherlands	Norway	Poland
	Portugal	Romania	Sweden
	Slovenia	Slovakia	United Kingdom
	United States	Other advanced countries	Total advanced countries
	Euro area average	Europe average	Emerging markets
	World		
Maturities	2Y	5Y	10Y
Corporate bonds			
Sector	Non-financial	Financial covered	Financial
Rating	AAA	AA	A
	BBB	BB	B
	CCC	Lower grade	Investment grade
	High yield	All	
Residential mortgage-backed securities			
Countries	EU countries	US	Other
Real estate investment trust			
Countries	EU countries	US	Other
Equity (listed)			
Countries	Developed markets (EU, US, other developed)	Emerging markets	

Alternative investment			
Countries	Private equity (unlisted)	Commodities	Hedge funds
Real estate			
Countries	EEA countries		