



EUROPEAN CENTRAL BANK

EUROSYSTEM

Annex 4

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GUIDANCE FOR CALCULATION OF LOSSES DUE TO APPLICATION OF MARKET RISK PARAMETERS AND SOVEREIGN HAIRCUTS

This annex introduces the reference risk parameters for the market risk component of the stress-testing exercise. The stress test of the trading book requires banks to project the gains and losses on the trading book positions resulting from a broad-based financial market downturn that affects a broad set of market risk parameters: interest rates, exchange rates, equity and commodity prices, dividends and volatilities. The list of market risk parameters was agreed by the participating institutions. The gains and losses on the trading book positions are to be deducted from the net trading income accrued over the two-year horizon of the exercise. Banks are requested to apply the market risk parameters, which are provided for the baseline and the adverse macroeconomic scenarios, to their trading book positions, with the exception of sovereign exposures, which are to be stressed through the application of valuation haircuts. Most of the market risk parameters and all of the sovereign valuation haircuts were calibrated by the ECB to be consistent with the adverse macroeconomic scenario.

Market risk parameters for the trading book

The market risk parameters depend on the scenario assumptions for the evolution of some macro-financial variables – short- and long-term interest rates, exchange rates, and stock prices. In terms of deviations from the baseline scenario, European stock prices are assumed to 15% lower, the US dollar to be 11% weaker against all major (non-pegged) currencies, short-term interest rates to be higher by 125 basis points and long-term euro area sovereign bond yields to be higher on average 75 basis points. Commodity prices remain unchanged.

Those assumptions are translated, via a satellite multi-equation market risk model, to an internally consistent set of stressed market risk parameters. The model specification is selected on the basis of standard information criteria combined with sign restrictions on coefficients set up to ensure that the response to the shock is broadly in line with economic theory. This modelling framework covers non-European stock prices, credit spreads, swap rates, volatility parameters, and macro-financial variables in the emerging markets. The satellite model does not cover dividends, ABS/RMBS/CMBS credit spreads, market liquidity and counterparty credit risk adjustments, which are all calibrated separately on the basis of expert judgement, under the lead of EBA.

The stressed market risk parameters are constructed as the 25th /75th percentile from the density forecast generated by the model, conditional on the adverse macroeconomic scenario. The choice of the specific percentile has been motivated by the need to take into account a possible overshooting of market risk parameters as well as to mitigate the impact of model uncertainty on the results. As the forecast covers a horizon of two years, and the trading book stress is envisaged as an instantaneous shock, the stressed risk parameters are fixed at the minimum/maximum value over the forecast horizon (2011-2012).

The parameters for emerging market country groupings were proxied by a sample of countries that are considered to be representative for each grouping and for which sufficiently long time series are available (dating back at least to 2002/03). The shocks affecting the group of “other developed countries” were calibrated as the average of shocks hitting the euro area, the US, the UK, and Japan.

Although the macroeconomic scenario does not involve a shock to commodity prices, a small and transitory shock of 5% was assumed for all commodities, which subsides immediately after the end of the holding period for the trading book. Due to its transitory character, this shock does not need to be fed back into the adverse macroeconomic scenario, as in particular its potential impact on the macroeconomic outlook would have been negligible.

The baseline market risk parameters are calibrated by the ECB, using the median of the density forecast conditional on the macro-financial variables taking values prescribed in the macroeconomic baseline scenario. Judgemental adjustments were applied to some parameters where the raw output of the satellite model suggested a substantial improvement compared to the current market outlook.

Banks are requested to apply market risk parameters under the baseline and adverse scenarios according to Tables 1 and 2. As the shocks to the market risk parameters are directional, banks may record gains on a specific asset class in their trading books, and are allowed to book those gains.

Valuation haircuts for sovereign exposures

The adverse scenario includes a country-specific shock to sovereign credit spreads in the EU countries. The widening of spreads is reflected in the valuation haircuts which are provided for maturities between 3 months and 15 years (see Table 3).

The shocks to sovereign credit spreads differ by maturity¹ in line with the slope of the CDS curve for the euro area. This curve is estimated as a weighted average of national sovereign CDS curves. The adverse macroeconomic scenario involves a widening of credit spreads on ten-year euro area bonds by 75 basis points compared with the end-2010 level of 185 basis points, which translates into an average 40% increase in credit spreads. This relative average increase is applied to all maturities from one year to

¹ This is consistent with the adverse macroeconomic scenario which specifies only the ten-year sovereign yields and the three-month interbank rates. Moreover, the CDS curve is nearly flat beyond five-year maturity, so the resulting shocks are nearly identical in magnitude.

fifteen years in order to account for the upward sloping credit spread curve and to preserve its shape under the adverse scenario.

Following this approach, euro area average sovereign bond yields increase under the adverse scenario by 51 basis points for the one-year maturity and by 76 basis points for the fifteen-year maturity (see Table 4). Sovereign bills, which are not covered by the CDS curve, are subject to the same shock as one-year bonds.

Aggregate shocks at different maturities are distributed across countries following the same approach as that used in the adverse macroeconomic scenario to distribute the original shock to ten-year sovereign yields by making the shock for each country proportional to the recent volatility of its CDS spread over the period from 31 October to 1 December 2010, immediately preceding the first stage of scenario development.

The sovereign haircuts under the adverse scenario were derived from changes in prices of benchmark sovereign bonds that are implied by the increase in nominal sovereign bond yields from the starting point of the exercise² to the levels envisaged under the adverse macroeconomic scenario. The sample of bonds reflects the composition of outstanding sovereign debt in the local currency³ for each country. For each maturity, bonds maturing within a short window around the desired maturity date were selected. The length of the window varies from two months for three-month maturity to one year for ten-year maturity. The fifteen-year maturity represents an average haircut for ultra-long dated bonds and takes into consideration all sovereign bonds maturing after 2026.

Within the maturity group, individual bonds were priced using the discounted cash flow method, taking into account their specific maturity dates, coupons and coupon frequencies. The haircuts for individual bonds are then aggregated to country-specific haircuts for that maturity group, which are weighted by the outstanding amount of individual bonds.

When there is no available debt instrument to derive a valuation haircut, the relevant haircuts are interpolated. No haircuts are provided for Estonia, which has no marketable sovereign debt outstanding⁴. The haircuts are not extrapolated for long and ultra-long maturities if there is no appropriate outstanding sovereign bond.

² Note: the baseline yields were adjusted to take into account the change in the starting point from the baseline scenario cut-off date to 31 December 2010, retaining the absolute movements of yields between the baseline starting point and baseline end-2012 figure. The adverse involves a parallel upward shift from the baseline that is country-specific and amounts to 75 basis points on average for the euro area (66 basis points for the EU). The impact of the adjustment made to the baseline level of yields on the level of haircuts is not material.

³ For the euro area countries, only the bonds denominated in euro were considered. Across the EU, this approach does not generally introduce a large selection bias, apart from some Central and Eastern European member states which have issued a substantial fraction of debt in foreign currencies, mainly in euro. As the interest rate assumptions refer to domestic currency yield curves, it was necessary to use local currency debt.

⁴ Should a bank nevertheless have an exposure to the Estonian sovereign, it should use the average of haircuts for Slovakia and Slovenia, the two countries subject to the most similar credit spread shock.

Banks are requested to apply the relevant valuation haircut⁵ to the gross exposure to the sovereign as defined in the methodological note, also providing a disclosure of exposures and losses. By construction, the valuation haircuts are influenced by two main factors: a widening of the sovereign credit spread for each issuer, and the expected upward movement of the risk-free interest rate from the baseline scenario (e.g., the latter amounts to 43 basis points for the euro area). The corresponding decomposition of haircuts is provided in Table 3. The resulting losses on sovereign debt exposures are therefore to be split into two components, which are reported separately, that due to general interest rate risk (in the interest rate risk section of the template) and that due to the widening of sovereign credit spreads (in the credit section of the template). Example 1 below provides an illustration of these instructions.

Example 1 Treatment of a long sovereign bond position

A bank holds for trading €100 of 10-year Spanish government debt which is not hedged at all. The fair value of this position on 31 December 2010 is €95.

For the baseline scenario, the bank does not apply any haircuts. The bank must take into account an increase in Spanish sovereign yields of 43 basis points. The bank loses approximately €3.14, equivalent to a haircut of 3.3%, on the bond it holds and reports the loss as due to general interest rate risk.

For the adverse scenario, the bank applies a haircut of 14.6%, as given in the table of haircuts for 10-year Spanish government debt. The loss of €13.88 (€95 times 14.6%) is split into two parts: €3.14 reported as due to general interest rate risk and €10.74 reported as due to widening of the sovereign credit spread. The latter loss is equivalent to the contribution of the credit spread to the haircut of 11.3% (see Table 3).

Banks are instructed not to apply the swap curve shock mentioned in the list of market risk parameters to the sovereign bond positions. To account for possible hedging from interest rate risk, and for a fair treatment of net open positions on the interest rate, banks are in turn allowed to exclude short interest rate swap positions which hedge long sovereign debt exposures against interest rate risk from the swap curve shock, provided that the notional of the swaps is not larger than the market value of sovereign debt exposures and that there is no maturity mismatch.

The bank should use the haircut that is appropriate for the maturity of the sovereign exposure, using Table 5 as a guideline.

The haircuts presented in Table 3 are not to be confused with the haircuts applied by the Eurosystem to the sovereign bonds posted as collateral in the open market operations. In particular, the EU-wide stress testing exercise makes no assumption about the evolution of sovereign credit ratings.

⁵ Contrary to the 2010 exercise, the haircuts assume a frontloaded shock to the interest rates and do not project the value of sovereign bond positions as at the end of the two-year horizon of the exercise. This is in line with the treatment of other trading book positions.

Indirect sovereign exposures

For indirect sovereign exposures, regardless of the direction of the position, the bank should internally compute its stressed value using the provided shocks to sovereign credit. This treatment is relevant (*inter alia*) for CDS positions in which a bank bought protection on a sovereign issuer to hedge a long sovereign bond position and for written sovereign CDS. Example 2 below provides more details.

Example 2 **Treatment of a long sovereign bond position hedged with CDS**

Bank holds for trading €100 of 10-year Spanish government debt which is fully hedged with a 10-year credit default swap on Spain. The fair value of the long bond position on 31 December 2010 is €95 and the fair value of the CDS is zero.

Under the baseline scenario the bank takes into account the shift in the sovereign yield curve (a rise of 43 bps). It records a loss of €3.14 due to general interest rate risk, precisely as in Example 1.

For the adverse scenario, the bank is fully hedged from sovereign risk. Nevertheless, the shocks must be applied to gross exposures, so that the bank applies a haircut to the long bond position and re-prices the hedge. The two effects should cancel out, but have to be reported in different lines in the template: one as sovereign losses of €10.74, and the other as gains of €10.74 on the CDS book. The loss of €3.14 related to the 43 bps upward movement of sovereign yields envisaged under the baseline is also recognised under the adverse scenario as a loss due to general interest rate risk.

Table I
Calibrated market risk parameters – part I

(starting point: 31 December 2010)⁶

	Parameter	Unit	Baseline	Adverse	Comments	
	Non Emerging Markets					
	USD 3M	bp	10	135	Swap curve (risk-free). For each currency, yield curve to be interpolated linearly up to 10Y, constant at the level of the 10Y from that point on. In the adverse scenario EU Sovereign exposures are subject to the application of a country specific parallel increase in the credit sovereign spreads, the losses will be computed by the application of the valuation haircuts	
	USD 2Y	bp	55	160		
	USD 10Y	bp	100	180		
	EUR 3M	bp	70	195		
	EUR 2Y	bp	55	160		
	EUR 10Y	bp	43	125		
	UK 3M	bp	120	245		
	UK 2Y	bp	100	185		
	UK 10Y	bp	70	125		
	Others non Emerging Markets 3M	bp	85	210		
	Others non Emerging Markets 2Y	bp	60	180		
	Others non Emerging Markets 10Y	bp	35	150		
Interest Rates	Emerging Markets					
	Asia 3M	%	15	35	Swap curve (risk-free). For each currency, yield curve to be interpolated linearly up to 10Y, constant at the level of the 10Y from that point on. For pegged currencies use the shocks prescribed for the reference currency (EUR, USD).	
	Asia 2Y	%	20	40		
	Asia 10Y	%	25	45		
	Eastern Europe 3M	%	20	45		
	Eastern Europe 2Y	%	10	30		
	Eastern Europe 10Y	%	-5	20		
	Middle / South America 3M	%	10	20		
	Middle / South America 2Y	%	10	20		
	Middle / South America 10Y	%	5	10		
	US Volatility	%	10	40		
	EUR Volatility	%	10	40		
	UK Volatility	%	10	40		
	Others non Emerging Markets Volatilities	%	20	70		
	Emerging Markets Volatilities	%	20	70		
Fx	EUR/USD	%	5	15	Exchange rates quoted as units of USD per 1 unit of the other currency. An increase means a depreciation of the US dollar	
	JPY/USD	%	0	10		
	GBP/USD	%	7.5	20		
	Other non Emerging Markets currencies/USD	%	5	15		
	Emerging Markets currencies/USD	%	5	15		
	EUR/USD Volatility	%	7.5	10		
	JPY/USD Volatility	%	10	15		
	GBP/USD Volatility	%	7.5	12.5		
	Others non Emerging Markets currencies/USD Volatilities	%	10	15.0		
	Emerging Markets Volatilities currencies/USD Volatilities					
	Asia	%	10	40		percentage change of the reference point (ex: 20% + 30% of 20% = 26%)
	Eastern Europe	%	10	45		
Middle / South America	%	10	40			
Gold/USD	%	-5	-20			

Source: ECB.

⁶ For Interest rates - Non Emerging markets: although Denmark is one of the other non-emerging countries, the euro risk parameters should be applied to exposures in Danish Krona, given the currency peg of the Danish Krona to the euro.

Table 2
Calibrated market risk parameters – part 2

(starting point: 31 December 2010)

Equity	Europe (Eurostoxx50)	%	0	-15	
	US (S&P500)	%	0	-10	
	Japan (NIKKEI)	%	0	-20	
	EM (MSCI)	%	0	-20	
	Others non Emerging markets	%	0	-15	
	Europe (Eurostoxx50) Volatility	%	20	30	
	US (S&P500) Volatility	%	15	25	
	Japan (NIKKEI) Volatility	%	20	30	
	EM (MSCI) Volatility	%	20	30	
	Others non Emerging markets Volatility	%	20	30	
	Dividends Europe	%	-10	-20	
	Dividends US	%	-10	-20	
	Dividends Japan	%	-10	-20	
	Dividends EM	%	-10	-20	
	Dividends non Emerging Markets	%	-10	-20	
Funds	Real Estate Funds	%	0 (*)	-10 (*)	
	Hedge Funds	%	-5	-20	
	Mutual Funds	%	-0.5	-2	
Commodities	Brent	%	-2.5	-5	
	Brent Volatility	%	0	5	
	Other commodities	%	30	50	
	Other commodities Volatility	%	0	5	
Credit	EEA Countries sovereign credit spreads (ECB spreads for the computation of haircuts, see Tables 3 and 4)	bp			
	Spread swap / governments for non EEA and non Emerging countries	%	5	15	
	Spread swap / governments for non EEA emerging countries	%	7.5	20	
	Itraxx Generic EUR / CDX IG / Itraxx Asia IG	%	10	40	= % change in the spread
	Itraxx High Volume EUR / CDX HY / Itraxx Asia HY	%	25	100	
	Itraxx SNR Financials	%	25	110	
	Itraxx SUB Financials	%	25	100	
	ABX and CMBX (all series - ratings equal or above AA)	%	30	60	
	ABX and CMBX (all series - ratings below AA)	%	30	60	
	RMBS and CMBS Europe (all series - ratings equal or above AA)	%	30	60	
RMBS and CMBS Europe (all series - ratings below AA)	%	20	40		
Counterparty (CVA on derivatives not covered by CSA)	For investment grade counterparties (ratings equal or above BBB)	%	5%	10%	CVA haircuts (irrespective of the type and maturity of the derivatives)
	For non-investment grade counterparties (ratings below BBB)	%	7.50%	15%	
Market Liquidity Stress	Market Liquidity Reserve shock	%	100	200	Expected increase in liquidity reserves (losses or null) due to a widening of bid-ask spreads (see paragraph 99 of the October IASB communication)

Source: ECB.

Table 3
Valuation haircuts on sovereign bonds

Country	Adverse scenario							of which due to widening of sovereign spreads						
	3M	1Y	2Y	3Y	5Y	10Y	15Y	3M	1Y	2Y	3Y	5Y	10Y	15Y
Austria	0.2%	0.5%	1.1%	1.9%	3.4%	5.5%	8.4%	0.0%	0.2%	0.3%	0.6%	1.1%	1.9%	2.9%
Belgium	0.2%	1.2%	2.1%	3.7%	5.9%	9.8%	15.3%	0.1%	0.6%	1.2%	2.2%	3.7%	6.1%	9.5%
Bulgaria	0.3%	1.1%	2.1%	3.3%	5.4%	8.7%		0.1%	0.6%	1.2%	2.0%	3.4%	5.5%	
Cyprus	0.4%	1.5%	3.4%	5.0%	7.7%	12.3%		0.2%	1.0%	2.4%	3.7%	5.8%	9.2%	
Czech Republic	0.2%	0.5%	1.2%	2.3%	3.2%	5.8%	11.1%	0.1%	0.2%	0.5%	1.0%	1.5%	2.7%	5.1%
Denmark	0.1%	0.5%	1.0%	1.6%	2.6%	6.3%	9.9%	0.0%	0.1%	0.2%	0.4%	0.7%	1.7%	2.7%
Finland	0.1%	0.4%	0.9%	1.9%	2.7%	4.2%		0.0%	0.1%	0.1%	0.3%	0.5%	0.8%	
France	0.2%	0.8%	1.6%	2.6%	4.1%	7.3%	13.1%	0.1%	0.3%	0.7%	1.3%	2.1%	3.8%	6.6%
Germany	0.1%	0.5%	0.9%	1.3%	2.1%	3.5%	6.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Greece	0.5%	2.5%	5.2%	7.8%	12.6%	17.1%	23.6%	0.4%	2.0%	4.2%	6.5%	10.6%	14.3%	19.5%
Hungary	0.2%	0.9%	1.8%	2.9%	5.1%	8.0%		0.2%	0.9%	1.7%	2.7%	4.8%	7.5%	
Ireland	0.5%	2.2%	5.2%	7.4%	12.6%	19.1%	22.7%	0.4%	1.7%	4.3%	6.2%	10.7%	16.0%	18.9%
Italy	0.3%	1.5%	3.0%	5.0%	8.4%	13.1%	20.1%	0.2%	1.0%	2.1%	3.7%	6.3%	9.7%	14.7%
Latvia	0.2%	0.8%	1.8%	2.8%	4.3%			0.1%	0.4%	0.9%	1.5%	2.3%		
Lithuania	0.2%	1.2%	1.8%	3.1%	4.8%			0.1%	0.6%	0.9%	1.8%	2.8%		
Luxembourg				3.1%	5.6%	9.3%					1.9%	3.5%	5.8%	
Malta	0.3%	1.3%	2.6%	4.8%	7.4%	13.2%		0.2%	0.9%	1.8%	3.5%	5.5%	9.8%	
Netherlands	0.1%	0.6%	1.2%	2.1%	3.2%	5.2%	9.5%	0.0%	0.2%	0.4%	0.7%	1.1%	1.7%	3.1%
Poland	0.1%	0.6%	1.2%	1.7%	2.8%	5.0%	7.7%	0.1%	0.6%	1.2%	1.7%	2.8%	5.0%	7.6%
Portugal	0.5%	2.9%	5.5%	8.1%	11.6%	19.8%	30.6%	0.4%	2.3%	4.5%	6.7%	9.7%	16.5%	24.9%
Romania	0.3%	1.0%	2.0%	3.4%		8.7%		0.2%	0.6%	1.3%	2.2%		5.8%	
Slovakia	0.2%	0.8%	1.4%	2.2%	3.5%	5.9%	8.0%	0.1%	0.3%	0.5%	0.9%	1.5%	2.5%	3.3%
Slovenia	0.2%	0.8%	1.4%	2.3%	3.7%	6.0%		0.1%	0.3%	0.6%	1.0%	1.7%	2.8%	
Spain	0.5%	1.6%	3.4%	5.5%	9.0%	14.6%	23.2%	0.3%	1.2%	2.5%	4.2%	7.0%	11.3%	17.6%
Sweden	0.1%	0.3%	0.6%	1.2%	1.9%	3.1%	6.5%	0.0%	0.0%	0.1%	0.2%	0.3%	0.5%	1.0%
United Kingdom	0.2%	1.1%	1.9%	3.1%	4.7%	7.6%	14.1%	0.0%	0.2%	0.5%	0.8%	1.3%	2.1%	3.8%
Iceland		0.3%	1.0%	1.6%	3.6%	5.2%	7.4%		0.2%	0.5%	0.8%	2.0%	2.8%	4.0%
Norway	0.1%	0.4%	0.8%	1.1%	1.5%	3.3%		0.0%	0.0%	0.1%	0.1%	0.2%	0.5%	

Source: ECB.

Table 4
Adverse scenario: shocks to sovereign credit spreads, by maturity

(in basis points)

Country	3M	1Y	2Y	3Y	5Y	10Y	15Y
Austria	16	16	19	21	23	23	24
Belgium	53	53	62	70	76	78	79
Bulgaria	55	55	64	72	79	81	82
Cyprus	93	93	108	123	134	137	139
Czech Republic	24	24	28	32	34	35	36
Denmark	11	11	13	15	17	17	17
Finland	7	7	8	9	10	10	11
France	33	33	38	43	47	48	49
Germany	0	0	0	0	0	0	0
Greece	174	174	201	229	250	255	259
Hungary	78	78	91	103	112	114	117
Ireland	176	176	204	232	253	258	263
Italy	93	93	108	123	134	137	139
Latvia	38	38	44	50	54	55	56
Lithuania	44	44	51	58	64	65	66
Luxembourg	53	53	62	70	76	78	79
Malta	93	93	108	123	134	137	139
Netherlands	15	15	18	20	22	22	23
Poland	46	46	53	60	66	67	68
Portugal	168	168	195	222	242	247	251
Romania	62	62	72	82	90	91	93
Slovakia	22	22	26	29	32	32	33
Slovenia	26	26	30	35	38	38	39
Spain	112	112	130	148	161	164	167
Sweden	4	4	5	5	6	6	6
United Kingdom	19	19	22	25	28	28	29
Iceland	28	28	32	37	40	41	42
Norway	4	4	5	5	6	6	6
Euro area average	51	51	60	68	74	75	76

Source: ECB.

Table 5
Application of haircuts by maturity

Haircut maturity	3M	1Y	2Y	3Y	5Y	10Y	15Y+
Apply to exposures of maturity equal to and longer than:	1 day	6 months	18 months	2 years 6 months	4 years	7 years	13 years
Apply to exposures of maturity less than:	6 months	18 months	2 years 6 months	4 years	7 years	13 years	unlimited

Source: ECB.