AFA and SAFA

Comparison with IRBA, SFA, MSFA, SSFA, RRBA

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Basel Policy Principles

"Simplicity, Risk sensitivity and Comparability: the Regulatory Balancing Act", Wayne Byres, 25-26 February 2013, Extract:

'*Finding the right balance:*

I am sure that many of you know the story of Goldilocks and the three bears. In it, Goldilocks explored the bears' house, testing the porridge, the chairs and the beds until she found things that she thought were "just right". When I took up my role in Basel, a friend suggested I had a "Goldilocks" job. By this he meant that my task was to take a range of competing objectives, and find some middle ground that was "just right". In an international policymaking context, that implies policies that are:

- ***comprehensive, yet simple;***
- ***strong, but not burdensome;***
- ***risk-based, yet easy to understand and compare;***
- ***flexible and adaptable, yet consistently applied;***
- ***suitable for normal times, but founded on the lessons from crises;***
- ***built on consensus, but also on the broadest possible engagement; and***
- ***utilising appropriately the relative strengths of both regulation (rules) and supervision (oversight).'***

The proposed Arbitrage-Free Approach is fully compatible with all the above

Basel 2 Arbitrage-Free Approach: 4 Common Sense Principles

Principle 1: *(Objective statistical basis)* Capital for securitisation exposures should be based on their marginal contribution to a single, widely accepted statistical measure of the bank's total portfolio risk.

Principle 2: *(Neutrality)* Apart from model risk charges, the capital a Bank must hold against a set of assets should be unaffected by packaging these assets into securities.

Principle 3: *(Regulatory control)* Control parameters should be available that permit regulators and supervisors to achieve their objectives and exercise judgments in the allocation of capital across different types of exposure. Such parameters should reflect the economic reality of transactions so that they could in principle be calibrated from empirical data.

Principle 4: *(Transparency)* Capital formulae should reflect in a simple way the nature of risk and be consistent with other regulatory capital approaches to facilitate comparisons and to promote transparency.

Application of Principle 1: Objective Statistical Basis

IRBA Capital for an loan asset:

$$Loan\ Capital = \underbrace{Stressed\ EL_{Loan} - EL_{Loan}}_{UL_{Loan}} + MRC_{Loan}$$

$$RW_{Loan} * 8\%$$

Expected Loss: $EL_{Loan} = PD_{Loan} \cdot LGD_{Loan}$

When the bank is under stress at 99.9%:
$Stressed\ EL_{Loan} = Stressed\ PD_{Loan} \cdot LGD_{Loan} = MVaR_{Loan}$

Unexpected Loss: $UL_{Loan} = Stressed\ EL_{Loan} - EL_{Loan}$

Model Risk Charge = $MRC_{Loan} = 6\% \cdot UL_{Loan}$

$$UL_{Pool} = \sum_{n\ loans} UL_{Loan}$$

AFA Capital for a tranche asset:

$$Tranche\ Capital = \underbrace{Stressed\ EL_{Tranche} - EL_{Tranche}}_{UL_{Tranche}} + MRC_{Tranche}$$

$$RW_{Tranche} * 8\%$$

Expected Loss: $EL_{Tranche} = PD_{Tranche} \cdot LGD_{Tranche}$

When the bank is under stress at 99.9%:
$Stressed\ EL_{Tranche} = Stressed\ PD_{Tranche} \cdot LGD_{Tranche} = MVaR_{Tranche}$

Unexpected Loss: $UL_{Tranche} = Stressed\ EL_{Tranche} - EL_{Tranche}$

Model Risk Charge = $MRC_{Tranche} = 6\% \cdot UL_{Pool}$

$$UL_{Pool} = \sum_{N\ tranches} UL_{Tranche}$$

Application of Principle 2: Neutrality

The AFA is based on a simple extension of the assumption of the original Asymptotic Single Risk Factor model employed in Basel II:

(1) $$Z_i = \sqrt{\rho_i}\, Y_{Bank} + \sqrt{1-\rho_i}\, Z_{F_i}$$ ⟸ ASRF (with Vasicek distribution)

Y_{Bank} is the Basel asymptotic single risk factor, and Z_i the factor of a loan

(2) $$Z_{F_i} = \sqrt{\rho^*}\, X_{SPV} + \sqrt{1-\rho^*}\, \varepsilon_i$$ ⟸ AFA Concentration Factor

X_{SPV} is an uncorrelated additional common factor and the ε_i's are idiosyncratic shocks.

Choosing the correlation parameters, ρ_i, to take the Basel II values, ensures that the MVaR of a pool of such assets will equal the Basel II levels and so capital for all the tranches of a securitisation equals the Basel II levels for on balance sheet assets.

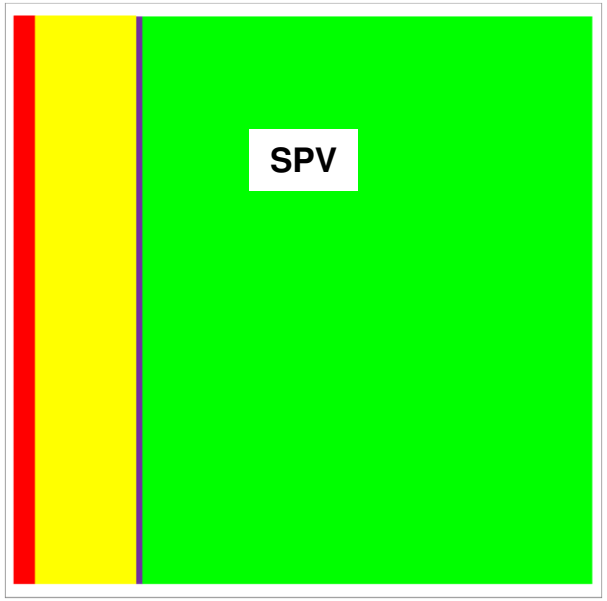
The additional common risk factor X_{SPV} spreads risk and capital across tranches in the structure in a smooth and economically well-motivated way, via the concentration correlation ρ^*

Graphical Representation of a SPV's Balance Sheet

Securitisation =
***Concentrated** Assets*

Expected Loss
Unexpected Loss
Model Risk Charge
No (regulatory) Loss

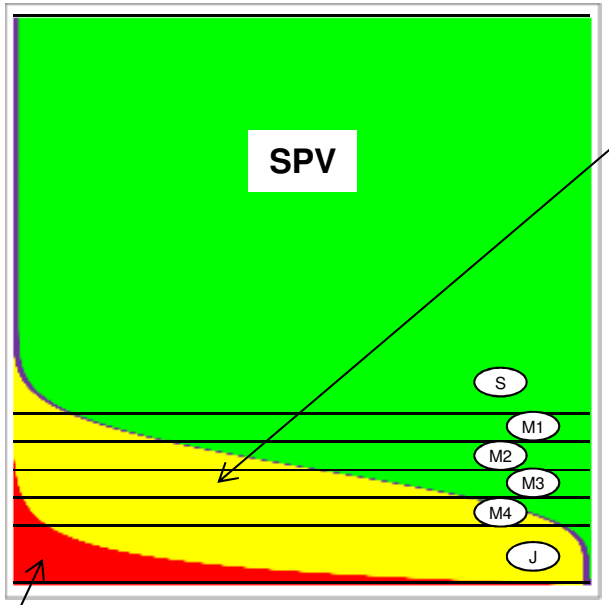
S Senior
M1 Mezzanine 1
M2 Mezzanine 2
M3 Mezzanine 3
M4 Mezzanine 4
J Junior



SPV Assets

Marginal Contribution to the Expected Loss of the **Bank**

Marginal Contribution to the Value at Risk of the **Bank**



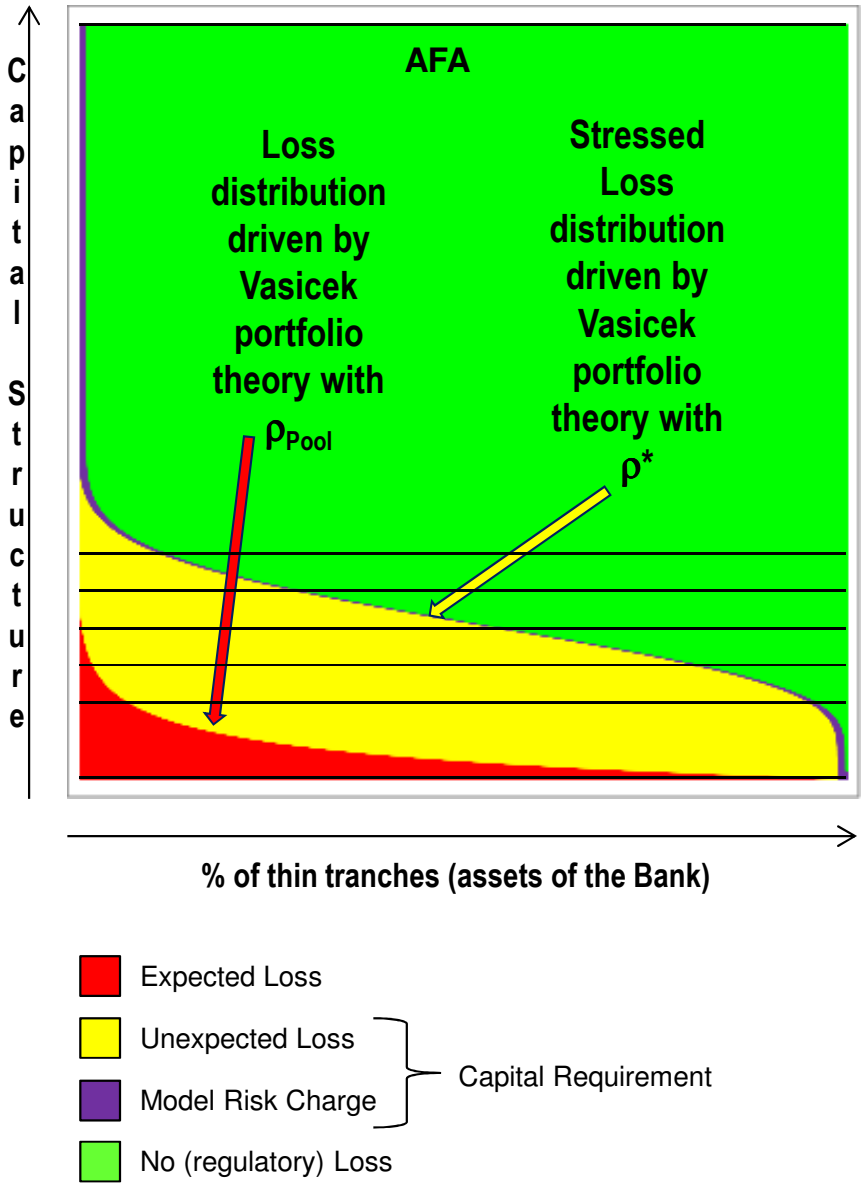
SPV Liabilities

Marginal Contribution to the Value at Risk of the **Bank**

Marginal Contribution to the Expected Loss of the **Bank**

The additional common risk factor spreads risk and capital across tranches in the structure in a smooth and economically well-motivated way

IRBA distribution (Vasicek) drives the AFA



Key input assumption: **pool is concentrated**

- **ρ is the current Basel 2 systemic correlation**
- **ρ^* is an asset class specific additional correlation to represent the fact that the pool is concentrated**

The implied pool correlation of the pool is:

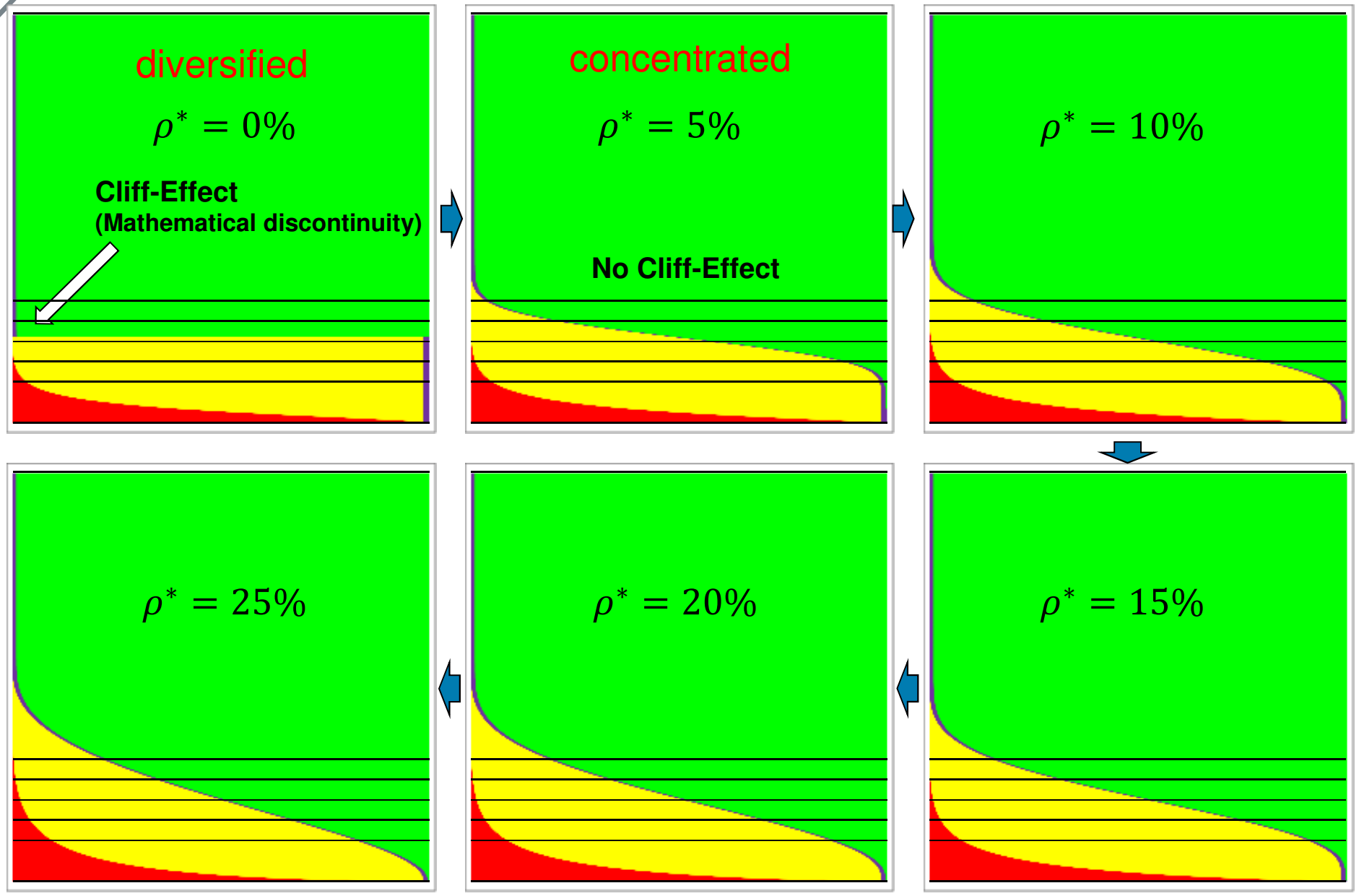
$$\rho_{Pool} = \rho + (1 - \rho) \cdot \rho^*$$

The Vasicek loss distribution is used in IRBA

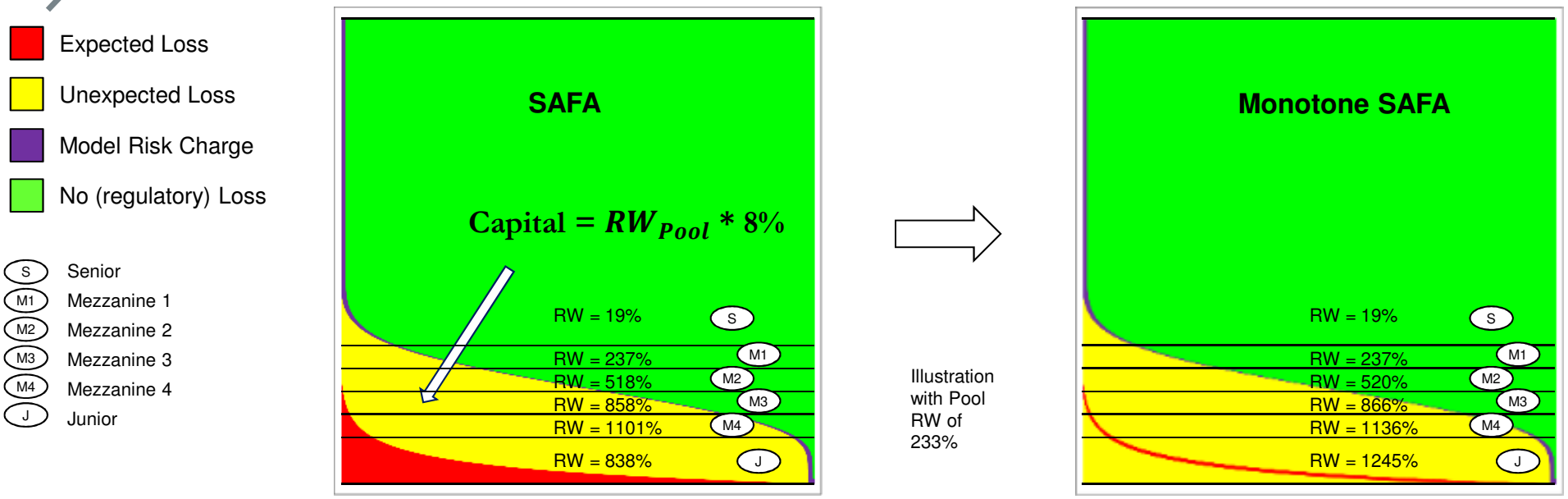
This Unexpected Loss (yellow surface) is the surface between the Vasicek stressed loss distribution (with Stressed PD and ρ^*) and the Vasicek loss distribution (PD and ρ_{Pool})

If $\rho^* = 0$, then a cliff-effect appears. To avoid the cliff-effect, the pool of assets that is securitised needs to be considered as more concentrated than the diversified bank wide asset base

Application of Principle 3: Regulatory Control with ρ^*



SAFA (Simplified AFA): a Solution for RW input



Key input assumption: pool is concentrated, risk weight of pool (RW) only is known

UL (yellow surface) = RW_{Pool} * 8% / MRSF
(Model Risk Scaling Factor = 1.06 for IRBA bank and 1.25 for SA bank)

The capital distribution is boosted by a proxy for regulatory expected loss.

If the regulatory expected loss is included in the SAFA (“red becomes yellow”), the capital distribution becomes Monotonic

The SAFA capital is distributed like in the AFA with ρ^*

The Simplified AFA (SAFA) can be used for those situations where PD or LGD of the underlyings are not known, eg. Standardised Approach or when RW only is known such as with the Slotting criteria approach in IRBA.

Calibrating ρ^*

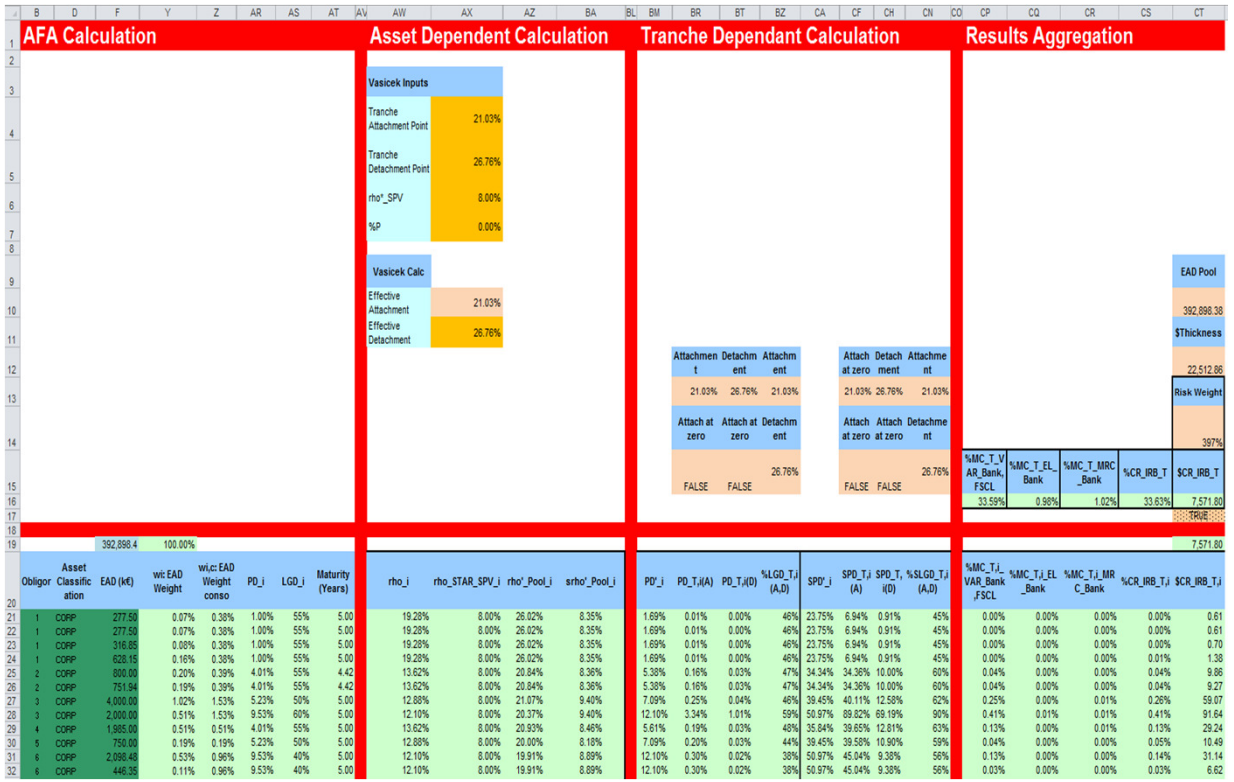
- The ρ^* parameter may be set based on regulatory judgement.
- This could be done by asset class or on some other basis.
- Importantly, because it has economic interpretation, it may also be benchmarked against data.
- If it is believed that the allocation of capital should be done differently for short versus long maturity deals, ρ^*, could be given a maturity dimension.

Maximum Likelihood based estimates					
	ρ	ρ*	ρ*	ρ*	ρ*
Sector	Assumed Basel value	All regions 2000-2012	All regions 2005-2012	North America 2000-2012	North America 2005-2012
1. RMBS	15%	3%	6%	3%	6%
2. ABS	10%	11%	11%	12%	11%
3. Other	10%	3%	3%	2%	2%
4. PF	20%	26%	34%	26%	34%
5. CDO	20%	11%	7%	8%	4%
6. CMBS	9%	4%	4%	4%	3%
7. Structured Products	16%	10%	10%	4%	6%

Model is Easy to Implement in Excel

Obligor
Asset Classification
EAD
wi: EAD Weight
wi,c: EAD Weight consolidated per obligor
Maturity (Years)
rho_i
rho_STAR_SPV_i
rho'_Pool_i
srho'_Pool_i
PD'_i
PD_T,i(A)
PD_T,i(D)
%LGD_T,i(A,D)
SPD'_i
SPD_T,i(A)
SPD_T,i(D)
%SLGD_T,i(A,D)
%MC_T,i_VAR_Bank,FSCL
%MC_T,i_EL_Bank
%MC_T,i_MRC_Bank
%CR_IRB_T,i
$CR_IRB_T,i

The numbers of intermediary variables for each asset (see Step by Step Implementation – Annex 4 of the paper "A Principles-Based Approach to Regulatory Capital for Securitisations")



This spreadsheet is available from the authors upon request

Capital Calculations for a CLO Using Different Formulae

CORPORATE POOL (such as SME, Leveraged Loan)

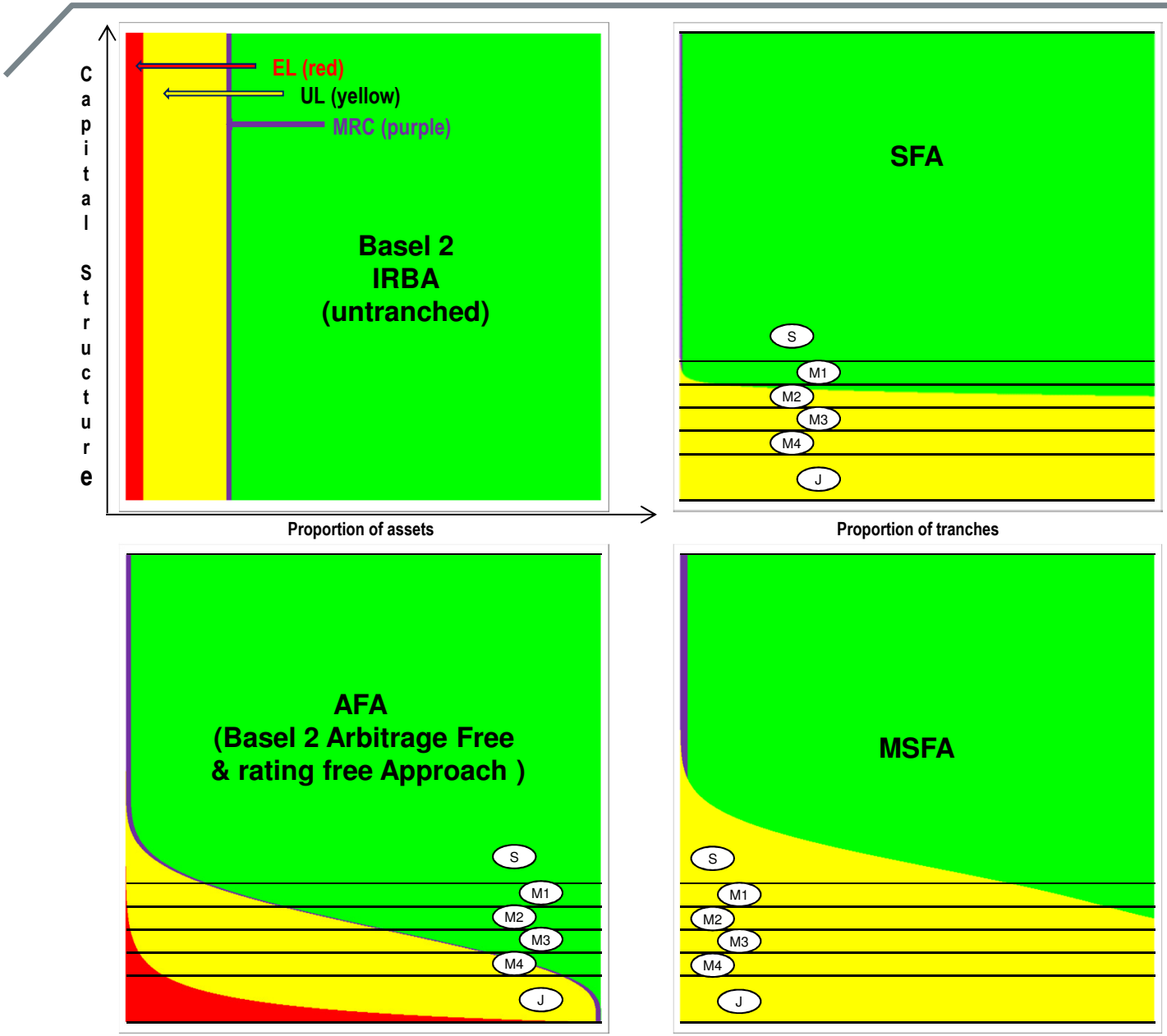
	Approach:	SFA	AFA	AFA	AFA	MSFA
	rho star ('stressed correlation')	0%	5%	10%	15%	0%
	Model Risk Charge (Floor) (RW%)	7.0%	13.2%	13.2%	13.2%	20.0%
Thickness	Tranche	nche Notional (prior to Adjustments)				
70.0%	Senior	7%	15%	20%	26%	114%
5.0%	Mezzanine 1	19%	151%	248%	303%	987%
5.0%	Mezzanine 2	851%	509%	532%	539%	1191%
5.0%	Mezzanine 3	1250%	973%	867%	804%	1250%
5.0%	Mezzanine 4	1250%	1189%	1093%	1010%	1250%
10.0%	Junior	1250%	817%	822%	820%	1250%
100.0%	*Total Tranches After Securitisation*	*298%*	*233%*	*233%*	*233%*	*439%*
100.0%	*Total Pool Before Securitisation*	*233%*	*233%*	*233%*	*233%*	*233%*
	Ratio After / Before	1.28	1.00	1.00	1.00	1.88

RW Stability Analysis

Approach:	SFA	AFA	AFA	AFA	MSFA
RW Instability Ratio Mezzanine 2 / Mezzanine 1	*44.65*	*3.37*	*2.15*	*1.78*	*1.21*
RW Instability Ratio Mezzanine 3 / Mezzanine 2	*1.47*	*1.91*	*1.63*	*1.49*	*1.05*
RW Instability Ratio Mezzanine 4 / Mezzanine 3	*1.00*	*1.22*	*1.26*	*1.26*	*1.00*
RW Instability Ratio Junior / Mezzanine 4	*1.00*	*0.69*	*0.75*	*0.81*	*1.00*

- The underlying pool is typical of a European corporate transaction (SME or Leveraged Loans)
- Pool IRBA RW: 233%
- IRBA Model Risk Charge (6% of RW): 13.2%

Comparative Review IRBA – SFA – MSFA - AFA (European Real Economy Corporates)



Expected Loss (EL)
covered by FMI -Future Margin Interest-
- IRBA: Yes
- AFA: Yes
- SFA: No
- MSFA: No

Unexpected Loss (UL)
- IRBA: UL definition
- AFA: UL conservation
- SFA: UL creation
- MSFA: massive UL creation

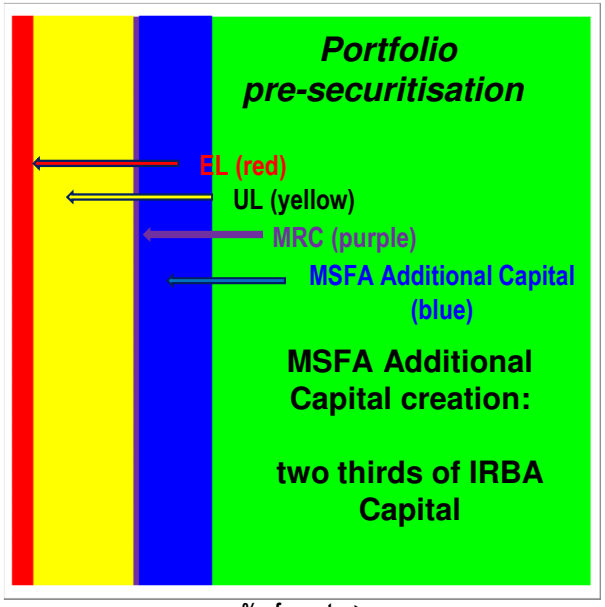
Model Risk Charge (MRC)
- IRBA: 6% * K_{IRB} (105 bps)
- AFA: 6% * K_{IRB}
- SFA: 56 bps
- MSFA: 160 bps

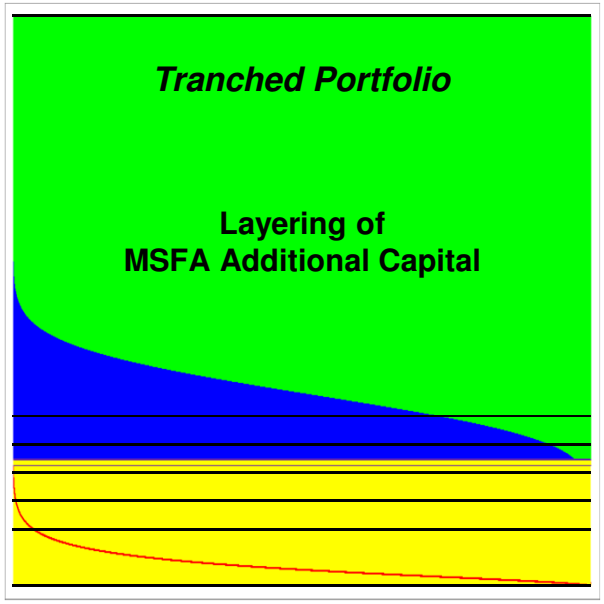
RW STABILITY for mezzanine tranches
- IRBA: n/a
- AFA: stable
- SFA: unstable
- MSFA: stable

ARBITRAGEABLE
- IRBA: n/a
- AFA: No (additive)
- SFA: Yes
- MSFA: Yes

MSFA Capital Creation: Impact on Corporate & Mortgage Assets

CORPORATES





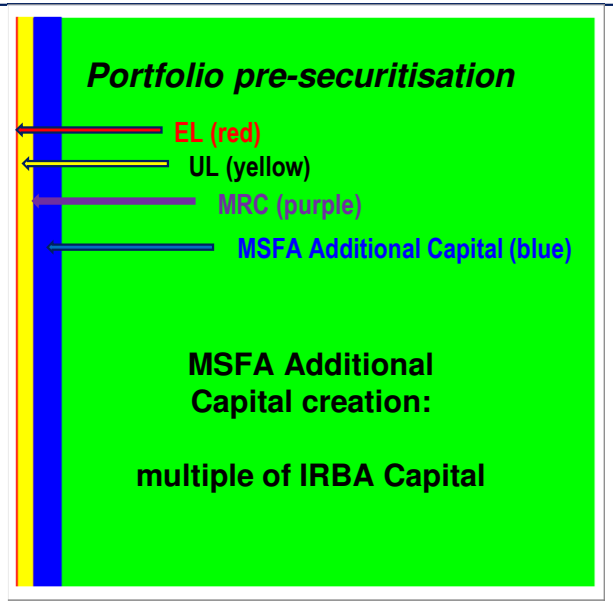
- PD = 5%
- LGD = 55%
- M = 5 years
- K_{IRB} = 17.58%
- MRC = 1.05%
- **CR_{IRB} = 18.63%**

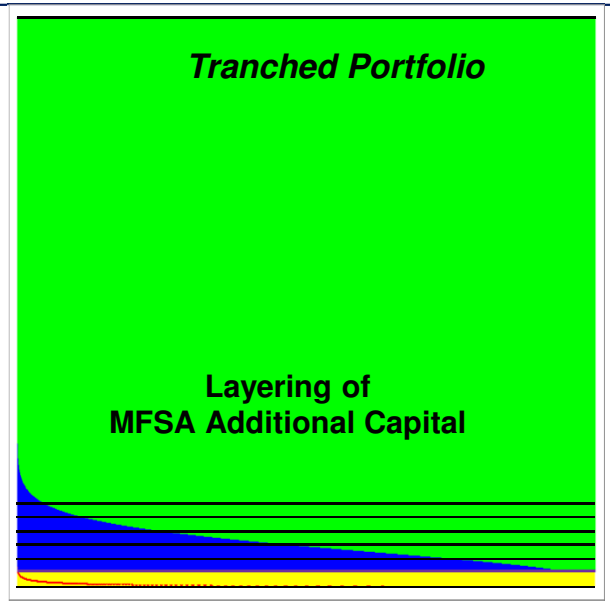
- **MSFA Capital Creation = 11.98%**

- MFSA Creation Ratio = 0.64

- **After/Before Ratio = 1.89**

MORTGAGES





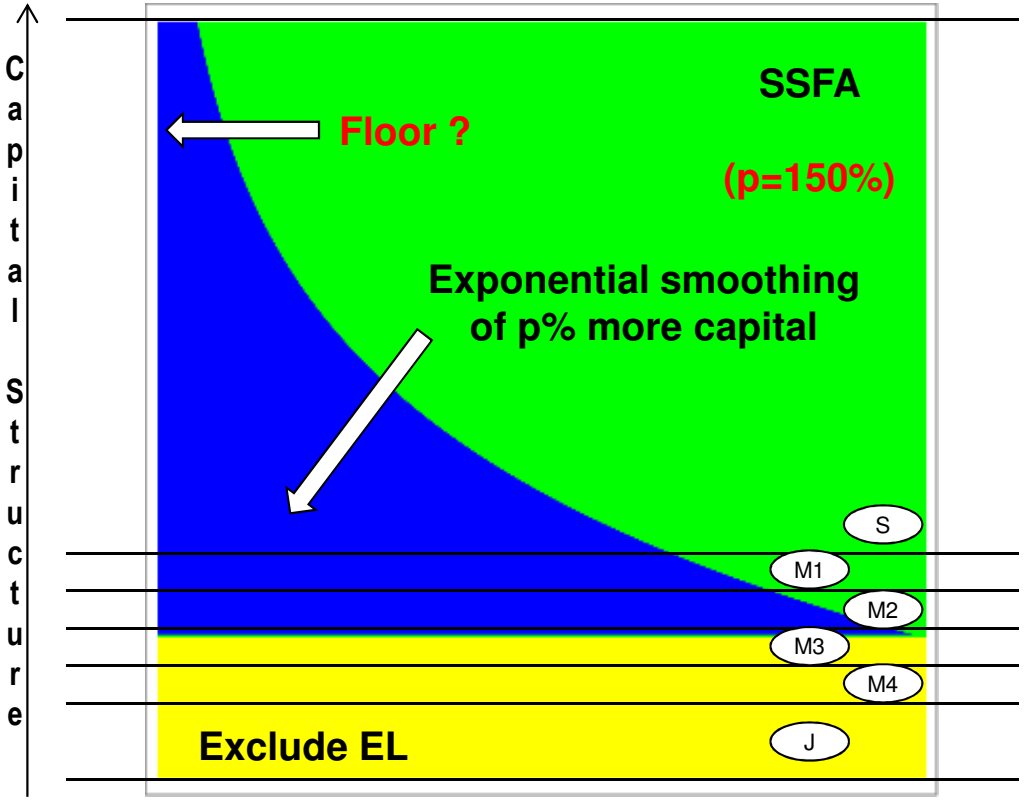
- PD = 1.5%
- LGD = 20%
- M = 5 years
- K_{IRB} = 2.60%
- MRC = 0.16%
- **CR_{IRB} = 2.76%**

- **MSFA Capital Creation = 4.67%**

- MSFA Creation Ratio = 1.69

- **After/Before Ratio = 3.28**

SSFA in BCBS236 (Post Securitisation)



Expected Loss

Unexpected Loss

Model Risk Charge

No (regulatory) Loss

and

Additional SSFA Capital

SSFA explained:

1. **Define capital**
   Replace K_{IRB} (including EL) by K_{SA} (excluding EL)
   Add a delinquency add-on 'w'

2. **Consider (erroneously) capital as a 'first loss'**

3. **Add p% more capital (p=1.5 in BCBS236)**

4. **Smooth exponentially the additional capital**

5. **Add a floor** (sometimes the capital charge is so high that the floor is never reached!)

How it should be:

Comparative Review Between Securitisation Capital Approaches

Method (PD, LGD, rho)	ASRF	Concentration Factor	MVaR Statistical Measure for Expected Loss when Bank under stress at 99.9%	Regulatory Expected Loss Treatment	Source of Distribution	Risk Sensitive Model Risk Charge	Maturity Sensitive
IRBA	Yes	N/A	Yes	Excluded	Vasicek	Yes, 6% times UL	Yes for size
Original SSFA	Yes	Implicit	Yes, implicit but premium added	Included	Exponential (capital)	No, fixed floor	Yes for size
SFA	Yes	No	Yes	Included	Random Tranches (tau), granularity (delta), smoothing (omega)	No, fixed floor	Yes for size
MSFA	Yes	No	No, Expected Shortfall at 99.7%	Included and multiplied several times over	Maturity modelling and volatility, recovery variance (tau), smoothing (omega)	No, fixed floor	Yes for size and dispersion, but with issues
AFA	Yes	Yes	Yes	Excluded	Vasicek, concentration (rho star), granularity (delta)	Yes, 6% times UL	Yes for size and dispersion(+)
Monotonic AFA	Yes	Yes	Yes	Included	Vasicek, concentration (rho star), granularity (delta)	Yes, 6% times UL	Yes for size and dispersion(+)
SAFA	Yes	Yes	Yes	Excluded, by proxy	Vasicek, concentration (rho star), granularity (delta)	Yes, 6% times UL	Yes for size and dispersion(+)
Monotonic SAFA	Yes	Yes	Yes	Included, by proxy	Vasicek, concentration (rho star), granularity (delta)	Yes, 6% times UL	Yes for size and dispersion(+)

Method (RW)	ASRF	Concentration Factor	MVaR Statistical Measure for Expected Loss when Bank under stress at 99.9%	Regulatory Expected Loss Treatment	Source of Distribution	Risk Sensitive Model Risk Charge	Maturity Sensitive
SA	Implicit	N/A	Yes, implicit	Excluded, implicit	N/A	N/A	No for size
SSFA	Implicit	Implicit	Yes, implicit but premium added	Excluded	Exponential (capital)	No, fixed floor	No for size
SAFA	Yes	Yes	Yes	Excluded, by proxy	Vasicek, concentration (rho star), granularity (delta)	Yes, 25% times UL	No for size, Only for dispersion(+)
Monotonic SAFA	Yes	Yes	Yes	Included, by proxy	Vasicek, concentration (rho star), granularity (delta)	Yes, 25% times UL	No for size, Only for dispersion(+)

The DNA of Securitisation Capital Approaches

Bank Liabilities

Bank Debt

Bank Capital

(Basel 2)

Correct use of diversified ASRF: flat distribution (capital = 1st loss in liability side of bank balance sheet)

flat distribution (cliff effect)

Incorrect use of diversified ASRF

1 Risk Factor only

SPV Liabilities tranched

ERROR

(1st step: include EL1)

SFA PD, LGD (2nd step: ULP theory)

(Basel 2)

MSFA PD, LGD (3rd step: many theories)

(BCBS236)

(1st step: exclude EL1)

SSFA RW (2nd step: p=50%)

(exponential smoothing)

(~US Trading Book)

SSFA RW (3rd step: p=150%)

(~US CDO of ABS)

(BCBS236)

BCRA RW

F=2

F=1

(BCBS236)

Bank Assets

IRBA

(Basel 2)

Diversified Bank

SPV Assets untranched

IRBA

(Basel 2)

Concentrated Pool

2 Risk Factors

Monte Carlo

RBA (IAA)

(Basel 2)

RRBA (IAA?)

(BCBS236)

Vasicek

AFA PD, LGD

(exclude EL1)

(Apr 21, 2013)

(Industry Proposal)

SAFA RW

(exclude EL1)

(Jun 17, 2013)

(Industry Proposal)

Monotone AFA and SAFA PD, LGD or RW

(add EL1)

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