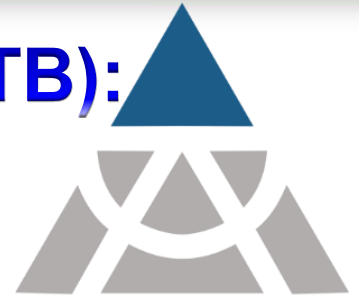
2nd Seminar on Banking Finance and Investment

Mumbai

22-May-2019

Fundamental Review of Trading Book (FRTB): Overview and challenges



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Agenda

- Evolution of Basel regulation
- Basel 2.5
- Motivation for FRTB
- Comparison of Basel 2.5 and FRTB
- IMA
- NMRF
- Back testing
- PnL Attribution
- Challenges

Evolution of Basel

Pre 1988	• Balance Sheet
1988, BIS Accord (Basel I)	• Cook Ratio=Capital/RWA >8%
1995, Netting	• Net Replacement Ratio
1998, Amended Basel I	• Market Risk using 10D 99% VaR
2006, Basel II	• Three pillar, Credit risk modified ,Operation Risk
2009, Basel 2.5	• Stressed VaR, IRC and CRM
2010, Basel 3	• Counterparty Risk, Leverage and liquidity Ratio, Countercyclical buffer
2022, FRTB	• Go live of FRTB

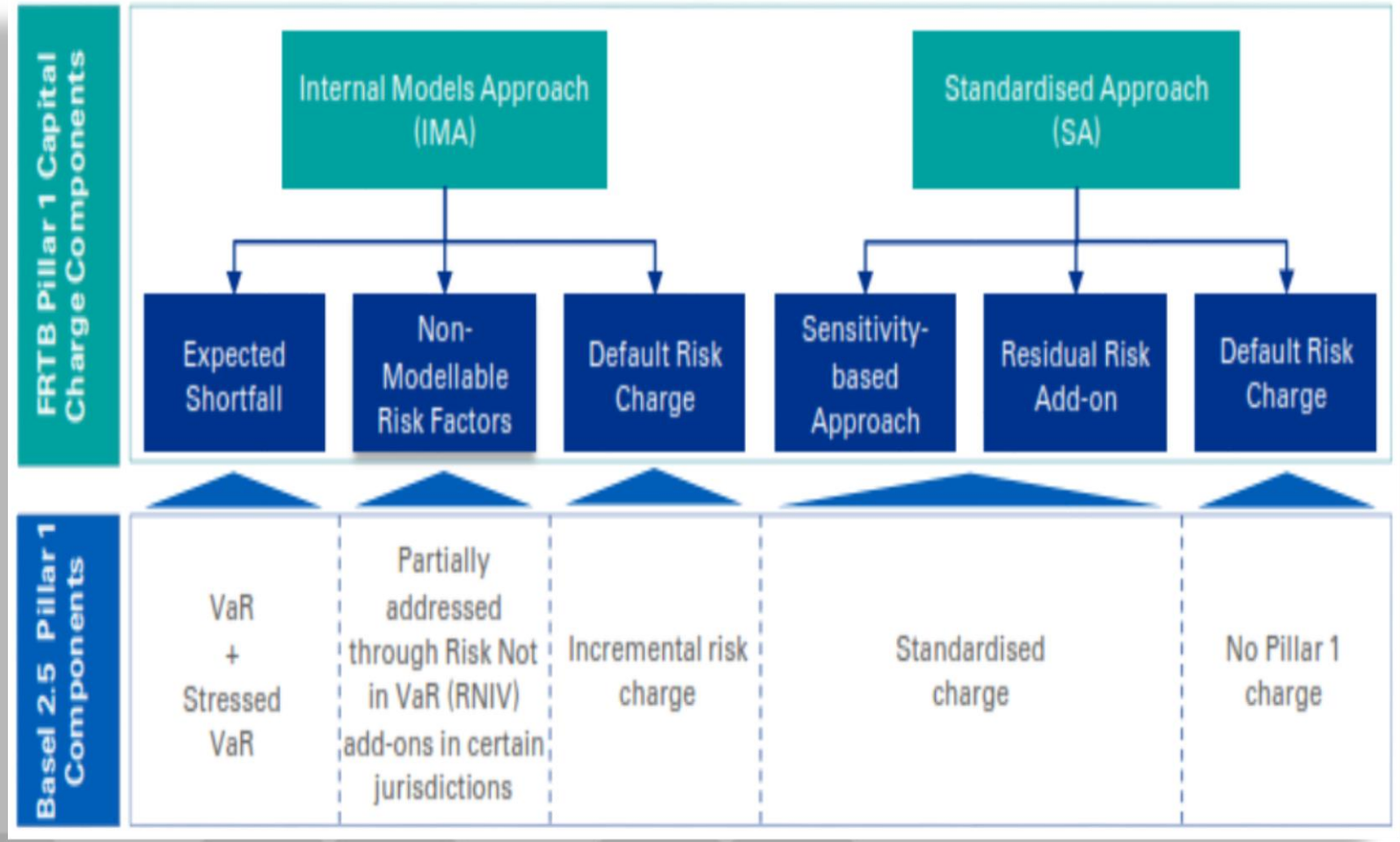
Basel 2.5

- IMA model:
  - Capital=3*(VaR+ SVaR)
  - SVaR based on one year stress window from 2008 on wards
  - VaR based on recent two year window
  - Risk measure based on 10d horizon and 99% Confidence level
  - Back testing using traffic light approach on 1D VaR
- IRC
- Standardized model
- Computed at entity level

Motivation for FRTB

- Addressing weakness of market risk capital framework following 2008 crisis
- Correlation breaks down during crisis and reduction of diversification benefit
- Capital should not pro-cyclical
- Coherent Risk measure
- Removal of double counting effect
- Pushing Banks towards covering of all risk of positions in the Risk Management engine
- Liquidity varies by asset class
- Risk Sensitivity based standardized model
- Increasing granularity of capital computation at desk level

Comparison of Basel 2.5 and FRTB



IMA under FRTB

- 97.5% ESF risk measure used
- Removes double counting by considering ESF during stress period leading to conservative and non-pro-cyclical estimate of market risk capital
- 3 multiplier replaced by risk factor based liquidity horizon.

$$ES = \sqrt{\left(ES_T(Q_1)\cdot\sqrt{\frac{LH_1}{T}}\right)^2 + \sum_{j>1}\left(ES_T(Q_j)\cdot\sqrt{\frac{(LH_j - LH_{j-1})}{T}}\right)^2}$$

IMA under FRTB (2)

$$ES = \sqrt{\left(ES_T(Q_1)\cdot\sqrt{\frac{LH_1}{T}}\right)^2 + \sum_{j>1}\left(ES_T(Q_j)\cdot\sqrt{\frac{(LH_j - LH_{j-1})}{T}}\right)^2}$$

Risk factor category	n
Interest rate: specified currencies – EUR, USD, GBP, AUD, JPY, SEK, CAD and domestic currency of a bank	10
Interest rate: – unspecified currencies	20
Interest rate: volatility	60
Interest rate: other types	60
Credit spread: sovereign (IG)	20
Credit spread: sovereign (HY)	40
Credit spread: corporate (IG)	40
Credit spread: corporate (HY)	60
Credit spread: volatility	120
Credit spread: other types	120
Equity price (large cap)	10
Equity price (small cap)	20
Equity price (large cap): volatility	20

Risk factor category	n
Equity price (small cap): volatility	60
Equity: other types	60
FX rate: specified currency pairs[37]	10
FX rate: currency pairs	20
FX: volatility	40
FX: other types	40
Energy and carbon emissions trading price	20
Precious metals and non-ferrous metals price	20
Other commodities price	60
Energy and carbon emissions trading price: volatility	60
Precious metals and non-ferrous metals price: volatility	60
Other commodities price: volatility	120
Commodity: other types	120

Total Capital — Fully Diversified Capital — Capital by Asset Class

$$IMCC = \rho\big(IMCC(C)\big) + (1-\rho)\Big(\sum_{i=1}^{R} IMCC(C_i)\Big)$$

Diversification Parameter

- Worst case (5+16)*3=63 runs of ES
- ES by risk class can be computed once in a week
- Aggregated ES computed as average of constrained and unconstrained ESF required to be computed daily
- Correlation set at 50% for capital computation

IMA under FRTB (3)

- ESF measure required to be mapped to one year stress period calibrated at portfolio level from 2007
- FRTB permits using Reduced set of risk factors, provided reduced portfolio represent at least 75% ESF of the full portfolio over the past 12 week period
- $ES = ES_{R,S} * ES_{F,C}/ES_{R,C}$
- $ES_{R,C}$ =ESF under recent one year window with reduced set of risk factors
- $ES_{F,C}$ =ESF under recent one year window with full set of risk factors
- $ES_{F,S}$ =ESF under recent stress window with reduced set of risk factors

IMA under FRTB (4)

- Stress window must be worst one year window for the portfolio spanned from 2007
- IMA ES is multiplied by 1.5 to arrive at the capital

$$C_A = max\{IMCC_{t-1} + SES_{t-1};\ m_c \cdot IMCC_{avg} + SES_{avg}\}$$

- IMCCavg and SESavg is most recent 60 days average of IMA and NMRF capital
- Multiplier mc is floored at 1.5 with positive addon ranging from 0 to 0.5 depending on the backtesting performance of the model

NMRF under FRTB

- Risk Factor Eligibility Test (RFET) for risk factor to be modellable either of this Criteria to be met on quarterly basis
  - Atleast 24 real price observation per year and 4 real price in any 90 days
  - Atleast 100 real price observations over the previous 12 months
- Non-modellable risk factor has to be capitalised using a stress scenario specific to the risk class
- The liquidity horizon for such risk factor corresponds to the maximum LH of that risk class

NMRF under FRTB(2)

- Firm has to rely on internal, external data vendor, data pooling to reduce NMRF
- No diversification benefit between other non-modellable risk factors except within Credit and Equity allowed
- This may lead to higher capital charge and also failure of the PnL attribution and backtesting test
- Capital from NMRF component has two part, one with zero aggregation correlation for non-modellable risk factors covering Equity and credit and second part covering all others risk factors with aggregation correlation of 60%
- Both this part are then added as simple sum

$$SES = \sqrt{\sum_{i=1}^{I} ISES_{NM,i}^2} + \sqrt{\sum_{j=1}^{J} ISES_{NM,j}^2} + \sqrt{\left(\rho * \sum_{k=1}^{K} SES_{NM,k}\right)^2 + (1-\rho^2) * \sum_{k=1}^{K} SES_{NM,k}^2}$$

PnL Attribution & Backtesting

- For IMA bank need to successfully pass backtesting at the bank-wide level
- Further need to pass both backtesting and PnL attribution test at trading desk level
- PnL attribution requests two different measure of PnL to be compared: Hypothetical and Risk theoretical
- Hypothetical PnL computed using front office pricing models and Risk theoretical using risk engine
- Both PnL are compared using Spearman correlation metric and Kolmogorov –Smirnov (KS) test on recent 250 day's data
- Each desk need to compare:
  - 1D 97.5% and 99% VaR against one yar of current observation of desk's one day actual PnL and hypothetical PnL

PnL Attribution & Backtesting(2)

- Desk fails and falls to SBA if any of the below is met:
  - Spearman correlation metric <0.7
  - KS test >0.12
  - More than 12 exception at 99th percentile
  - More than 30 exception at 97.5th percentile

- To avoid cliff effect traffic light approach adopted based on the results of the both the test so that desk doesn't jump from IMA to SBA

Zone	Spearman correlation	KS test
Amber zone thresholds	0.80	0.09 (p-value = 0.264)
Red zone thresholds	0.70	0.12 (p-value = 0.055)

- Amber zone leads to surcharge in capital but desk still stays in IMA

Challenges

- Overhaul of internal system, processes and infrastructure
- More granular reporting i.e. desk level
- Constrained diversification benefit leading to higher capital
- Multiple re-computation under full valuation for complex products
- Historical data and external source
- Vendor data management and standardization of risk factors consistent with vendor
- NMRF may be costly for firm given the vendor setup pushing it away from IMA
- Passing PL attribution test
- SBA will act as floor to IMA model, both model need to be setup
- Explaining the driver of daily changes would be complicated for risk manager to sign off i.e. NMRF

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THANKS FOR YOUR TIME !!!