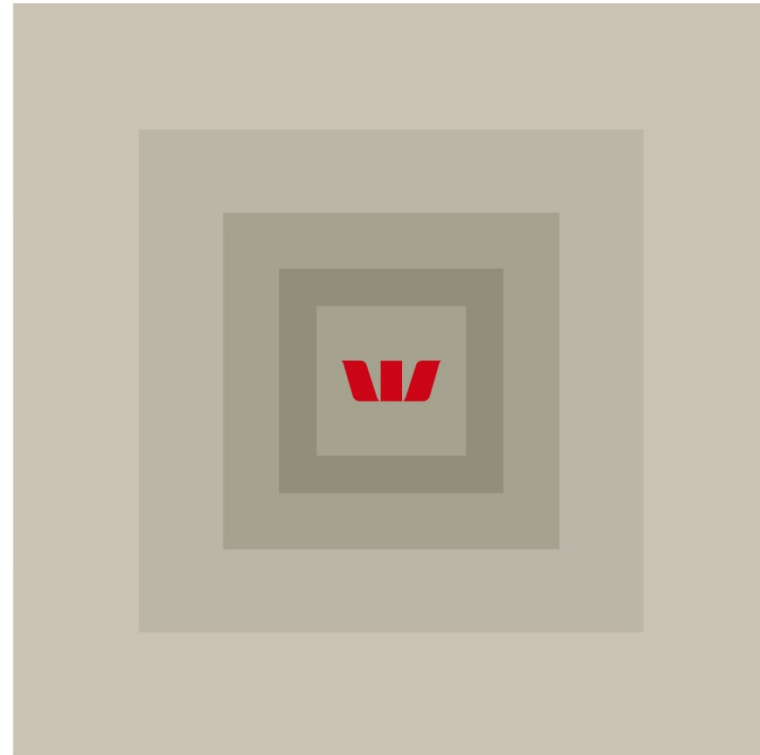


Fundamental Review of the Trading Book

SFMW Seminar

April 2014



Agenda

- **Background**
 - What is capital
 - What is market risk capital
 - How big is it?
 - How is it currently calculated
- **Fundamental Review of Trading Book**
 - Motivation
 - Regulatory response
 - Explanation: expected shortfall
 - Explanation: liquidity horizons
 - Proposed calculation approach
 - Reporting requirements
 - Impacts
 - Questions

What is capital?

- **different contexts – refer Capital 101**
- **here – a financial buffer against risk taking activities**
- **regulatory capital**
 - what the regulators tell us to hold to protect against our risks
- **economic capital**
 - what we think we should hold to protect against our risks
- **market risk capital**
 - covers positions held in the trading book
 - capital covering losses from large moves in market rates
 - capital covering default events in the trading book

Size of market risk capital?

- **Sep 2013**
 - reg cap - \$725m
- **total reg cap (off RWAs)**
 - = \$24,590m (MR = 2.9%)
- **total reg cap held**
 - = \$37,656m (MR = 1.9%)

	2013 \$m	2012 \$m
Common equity	45,381	40,873
Deductions from common equity	(17,392)	(15,902)
Total common equity after deductions	27,989	24,971
Additional Tier 1 capital	4,789	5,571
Net Tier 1 regulatory capital	32,738	30,542
Tier 2 capital	4,918	5,792
Deductions from Tier 2 capital	-	(1,622)
Total Tier 2 capital after deductions	4,918	4,170
Total regulatory capital	37,656	34,712
Credit risk:		
On-balance sheet assets	185,023	182,831
Off-balance sheet assets	75,245	62,268
Equity risk	-	1,263
Market risk	9,059	12,087
Operational risk	27,299	26,757
Interest rate risk in the banking book	6,929	10,234
Other assets	3,817	2,461
Total risk weighted assets	307,372	297,901
Common Equity Tier 1 capital ratio	9.1%	8.4%
Additional Tier 1 capital ratio	1.6%	1.9%
Tier 1 capital ratio	10.7%	10.3%
Tier 2 capital ratio	1.6%	1.4%
Total regulatory capital ratio	12.3%	11.7%

¹ Basel III was not effective in Australia until 1 January 2013. The 2012 comparative is presented on a Basel II basis.

	RWA	Capital	%Contrib RWA	%Contrib RC
Credit on-balance sheet	185,023	14,802	60%	39%
Credit off-balance sheet	75,245	6,020	24%	16%
Equity	-	-	0%	0%
Market	9,059	725	2.9%	1.9%
Operational	27,299	2,184	9%	6%
IRRBB	6,929	554	2%	1%
Other assets	3,817	305	1%	1%
Total risk weighted assets	307,372	24,590	100%	65%
Total reg cap		37,656		

Current market risk regulatory capital method

- Standard Method

OR

- $BII = (10d VaR) \times m$
- $BII.5 = (10d VaR + ESR) \times m1 + (10d SVaR + ESR) \times m2$
- What is 10d VaR?

Motivation - Issues with current method

Issue
Market risk capital was deemed to be insufficient during the GFC
Calculation approach misses events beyond the 99 th percentile
10d liquidity assumption proved inadequate under stressed conditions
Correlations were proven to break down in periods of stress
Complex (credit) products were not captured well in the framework
Capital was pro-cyclical
Capital calculations were inconsistent across different banks
Regulatory arbitrage between banking and trading book
Difficult to revoke accreditation status

Regulatory Response

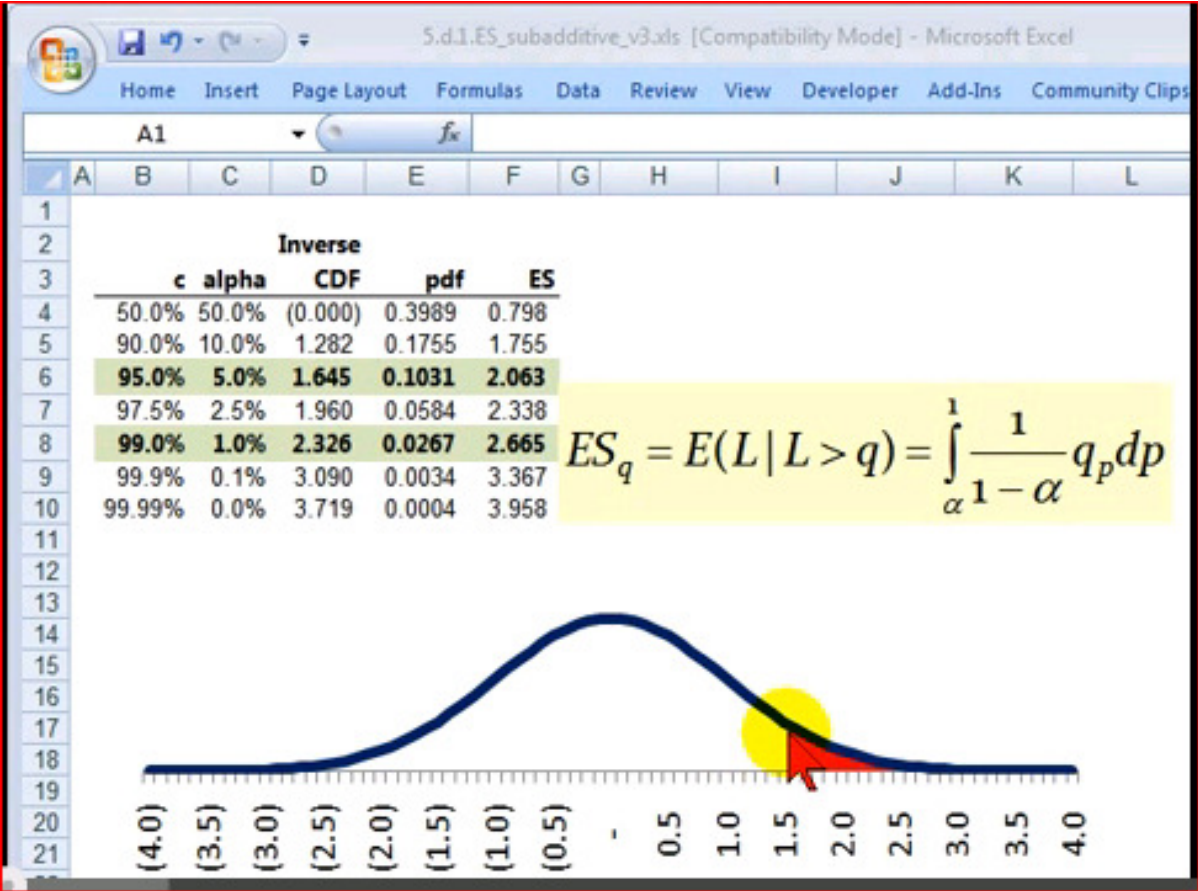
Issue	Response
Market risk capital was deemed to be insufficient during the GFC	<ul style="list-style-type: none"> - Rework the capital framework from the ground up - Considering using the standard method as a floor on capital - Introducing an additional leverage ratio measure
Calculation approach misses events beyond the 99 th percentile	<ul style="list-style-type: none"> - Introduce expected shortfall (ES) as the average beyond the 97.5th percentile
10d liquidity assumption proved inadequate under stressed conditions	<ul style="list-style-type: none"> - Introduce the concept of different liquidity horizons for different risk factors
Correlations were proven to break down in periods of stress	<ul style="list-style-type: none"> - Employ data from a period of stress relevant for the bank's portfolio - Restrict recognition of diversification across risk factors
Complex (credit) products were not captured well in the framework	<ul style="list-style-type: none"> - Structured credit products to be treated via standard method - It will be more difficult to obtain approval for complex/illiquid products
Capital was pro-cyclical	<ul style="list-style-type: none"> - Employ data from a period of stress relevant for the bank's portfolio
Capital calculations were inconsistent across different banks	<ul style="list-style-type: none"> - More prescriptive standards, - Greater alignment between regulators, - Need to compute standard method as well for comparison purposes - Much greater and more detailed reporting requirements
Regulatory arbitrage between banking and trading book	<ul style="list-style-type: none"> - New incremental default risk model (IDR) to resemble banking book model - Thought to introduce interest rate and credit spread risk to banking book capital - Movement between books effectively locked down - No capital decreases can be realised from shifting between books
Difficult to revoke accreditation status	<ul style="list-style-type: none"> - Accreditation will be at the desk level - Tighter controls over accreditation – <u>backtesting</u> & P/L analysis - Standard method to be used as the fall-back



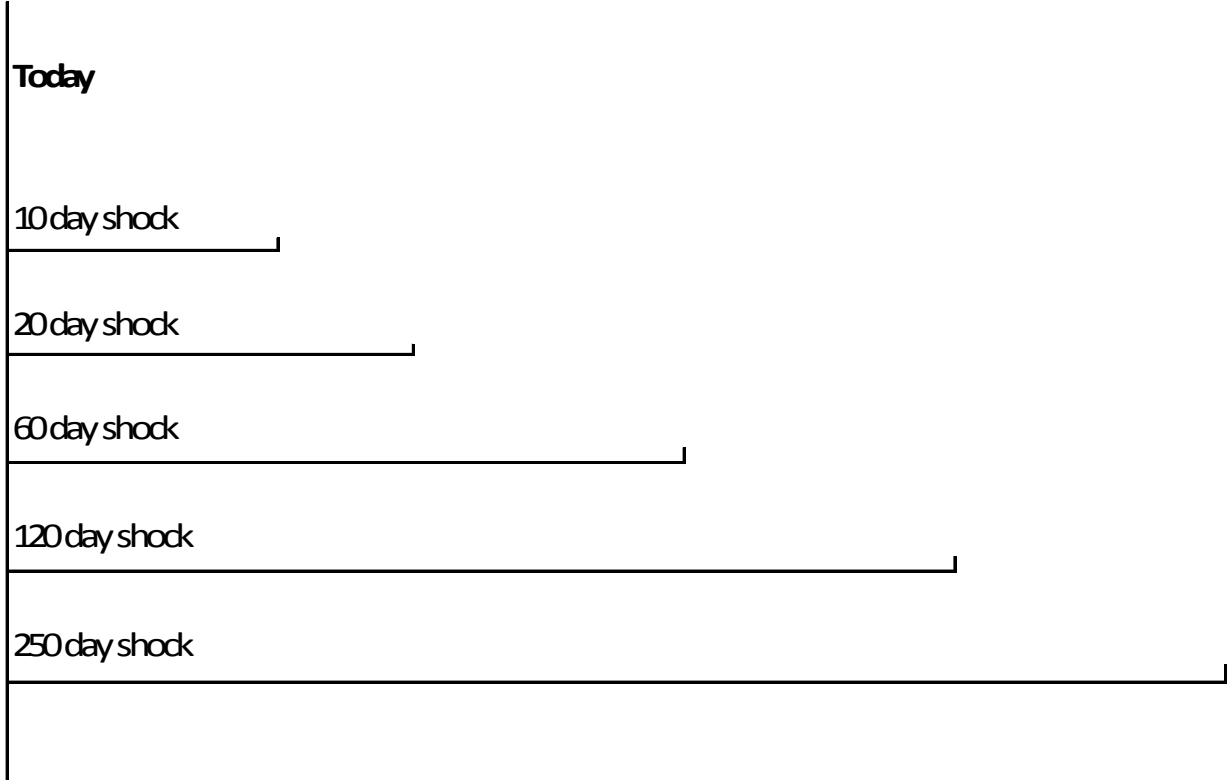
**Institutional
Bank**

Expected shortfall

- The average beyond VaR



Liquidity horizons



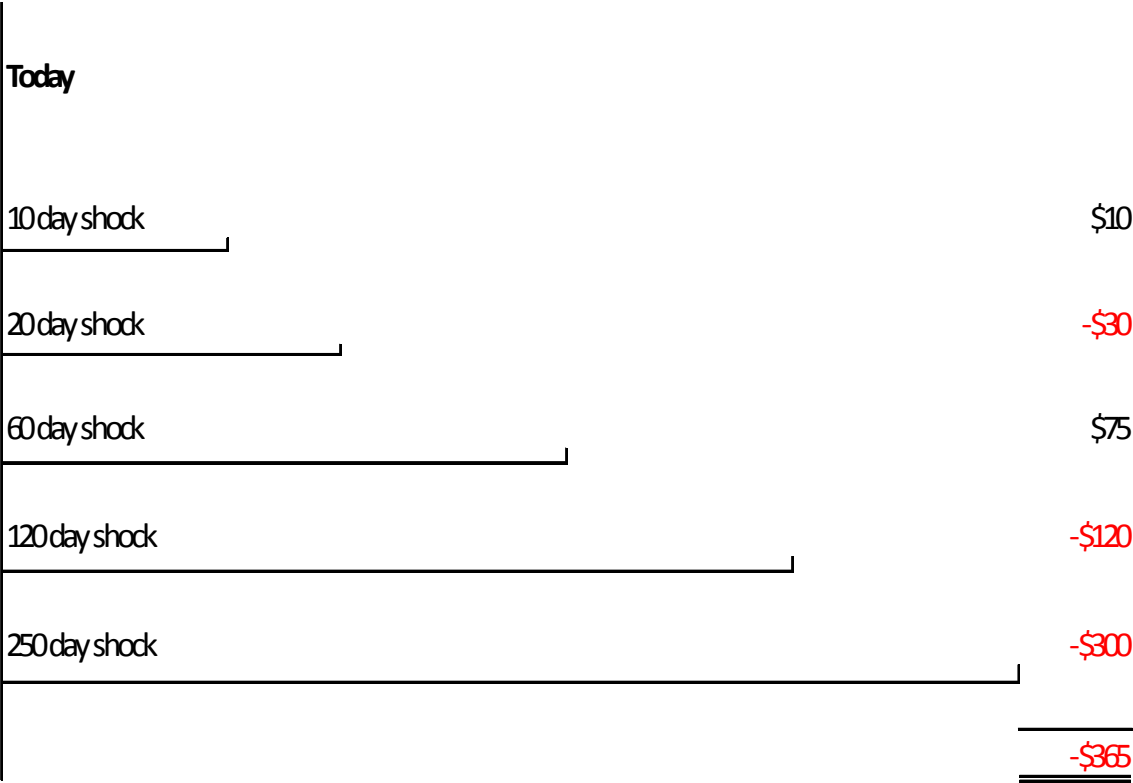
Liquidity horizons

Liquidity horizons of broad risk factor categories						Table 2
Risk factor category	10 days	20 days	60 days	120 days	250 days	
Interest rate		X				
Interest rate ATM volatility			X			
Interest rate (other)			X			
Credit spread – sovereign (IG)		X				
Credit spread – sovereign (HY)			X			
Credit spread – corporate (IG)			X			
Credit spread – corporate (HY)				X		
Credit spread – structured (cash and CDS)					X	
Credit (other)					X	
Equity price (large cap)	X					
Equity price (small cap)		X				
Equity price (large cap) ATM volatility		X				
Equity price (small cap) ATM volatility				X		
Equity (other)				X		
FX rate		X				
FX ATM volatility			X			
FX (other)			X			
Energy price		X				
Precious metal price		X				
Other commodities price			X			
Energy price ATM volatility			X			
Precious metal price ATM volatility			X			
Other commodities price ATM volatility				X		
Commodity (other)				X		



**Institutional
Bank**

Liquidity horizons - Aggregation



Backtesting (courtesy of NAB)

Required on 1 day VAR at 99% and 97.5% thresholds at desk level.

“If any given desk experiences either more than [12] exceptions at the 99th percentile or [30] exceptions at the 97.5th percentile in the most recent 12-month period, all of its positions must be capitalised using the standardised approach”

Maximum threshold for P&L differences between accounting P&L and risk system on a monthly basis:

“P&L attribution requirements are based on two metrics:

** mean unexplained daily P&L (ie theoretical P&L minus actual P&L) over the standard deviation of actual daily P&L, and*

** the ratio of variances of unexplained daily P&L and actual daily P&L.*

If the first ratio is outside of the range of [-10% to +10%] or if the second ratio were in excess of [20%] then the desk experiences a breach.

If the desk experiences four or more breaches within the prior 12 months then it must be capitalised under the standardised approach.”

Westpac

**Institutional
Bank**

Backtesting (courtesy of NAB)

Reconciling Actual PnL to Theoretical PnL is not straightforward

The Actual PnL must be cleaned: new and expired trades must be removed from the analysis, as well as things like brokerage fees, & payments. This relies on systems outside middle office.

The Maximum threshold Requirement is very hard to satisfy!

Let $\sigma(\text{Actual})$, $\sigma(\text{Theo})$, and $\sigma(\text{Theo} - \text{Actual})$ be the respective PnL Vols. Then

$$\sigma(\text{Theo} - \text{Actual}) = \sqrt{\sigma^2(\text{Theo}) - 2\rho\sigma(\text{Theo})\sigma(\text{Actual}) + \sigma^2(\text{Actual})}$$

Assuming $\sigma(\text{Actual}) = \sigma(\text{Theo})$, factorising and re-arranging we have:

$$\frac{\sigma(\text{Theo} - \text{Actual})}{\sigma(\text{Actual})} = \sqrt{2 - 2\rho}$$

So to ensure that we have $\left(\frac{\sigma(\text{Theo} - \text{Actual})}{\sigma(\text{Actual})}\right)^2 < 20\%$, we would thus require $\rho > 90\%$.

Calculations

Market risk capital is calculation as follows (para 194):

$$ACC = (C_A + IDR) + C_U$$

with

ACC	Aggregate capital charge for Market Risk,
C_A	Aggregate charge associated with approved desks,
IDR	Incremental default risk charge, and
C_U	Regulatory charge associated with unapproved desks.

Note that $C_A + IDR$ is referred to as the aggregate capital requirement for eligible trading desks.

Westpac

**Institutional
Bank**

Calculations

C_U is defined as (para 193):

$$C_U = \sum_{l=1}^{N'} SM_l$$

with

SM_l Standardised charge for desk l , and

N' Number of unapproved desks.

Calculations

IDR is to be computed weekly, with number employed for capital computed as (para 186d)

$$IDR = \max\{IDR_{t-1}, IDR_{avg}\}$$

where the subscript avg refers to an average over the last 12 weeks of weekly observations of IDR_t.

The IDR is defined as a 1-year 99.9% VaR due to defaults, incremental to any mark-to-market losses taken prior to default. It is to be calculated using a two-factor model factoring in default correlations (computed from equity prices) and state-dependent recovery rates. and must capture default risk, concentration risk, and basis risk (between long and short exposures in different names).

Westpac

**Institutional
Bank**

Calculations

C_A is defined as (para 189):

$$C_A = \max\{IMCC_{t-1} + SES_{t-1}, m_c (IMCC_{avg} + SES_{avg})\}$$

with

IMCC Aggregate capital charge for modellable risk factors,

SES Aggregate regulatory capital measure for unmodellable risk factors in model-eligible desks, and

m_c Regulatory multiplier – set by regulator, subject to a floor of 3, and includes a ‘plus factor’ based on the outcome of backtesting.

The subscript $t-1$ refers to the most recent observation, while avg refers to a weighted average of the previous [12] weeks.

Calculations

IMCC is given by:

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

with

ρ Relative weight for the bank's internal model,

R The number of risk factor classes (=5, interest rates, equity, foreign exchange, commodity and credit risk),

and

$$IMCC(C_i) = ES_{R,S,i} \frac{ES_{F,C,i}}{ES_{R,C,i}}$$

$ES_{R,S,i}$ Expected shortfall with a reduced risk-factor set, computed over the stressed period, moving only rates in risk factor class i ,

$ES_{F,C,i}$ Expected shortfall with the full risk-factor set, computed over the current period, moving only rates in risk factor class i ,

$ES_{R,C,i}$ Expected shortfall with a reduced risk-factor set, computed over the current period, moving only rates in risk factor class i .

Expected shortfall is defined at the 97.5% level (i.e. the average beyond the 97.5th percentile) based on 1 year of history. Where there is a subscript i , only the rates in risk-factor class i are shocked with all other rates kept constant. Where there is no subscript, all the risk-factor

Calculations

SES is defined as (para 190)

$$SES = \sum_{j=1}^K SES_{NM,j}$$

SES_{NM,j} Stress scenario capital charge for non-modellable risk j

K The number of non-modellable risks.

The non-modellable risks are treated as stand-alone add-ons that are computed based on a 97.5% ES equivalent stress scenario at the liquidity horizon appropriate for the risk factor.

Note, there is also the need to compute modelled charges at the desk level, which, while analogous to the calculations above, would require a different cut again of the data (para 183d).

Reporting

- Desk structure
- Instrument types
- Policies for designation as internal model
- Exceptions to the general presumptions
- Re-designations
- Desks on standardised approach
- Standardised capital charges
- Standardised default risk charge
- Credit spread risk and IDR charge
- The RAT score
- Total standardised charge for all positions
- Portfolios covered by internal models
- Discussion of capital adequacy soundness
- Description of all models, stresses, and back-testing protocols
- Scope of regulatory acceptance
- IDR methodology and validation results
- Stress period used and the definition of those stresses
- Numerous statistics on ES calculations and outcomes, down to risk factor level.

Impacts

Response	Expected Impacts
- Rework the capital framework from the ground up	- Capital to go up
- Considering using the standard method as a floor on capital	- Limits the benefits that can be gained from model accreditation
- Introducing an additional leverage ratio measure	- Additional constraint on trading and/or capital?
- Introduce expected shortfall (ES) as the average beyond the 97.5 th percentile	- Pretty neutral, except for strongly skewed portfolios
- Introduce the concept of different liquidity horizons for different risk factors	- Capital to go up
- Employ data from a period of stress relevant for the bank's portfolio	- Like our current <u>SVaR</u> (capital to drop because of removal of double counting) - Rates impact – need to have market rates back to 2005 - Large increase in computational demand (10yr ES)
- Restrict recognition of diversification across risk factors	- Capital to go up
- Structured credit products to be treated via standard method	- Capital to go up
- It will be more difficult to obtain approval for complex/illiquid products	- Capital to go up
- More prescriptive standards	- n/a
- Greater alignment between regulators	- n/a
- Need to compute standard method as well for comparison purposes	- New models to build, operate, validate, maintain. Greater cost, work required, <u>etc</u>
- Much greater and more detailed reporting requirements	- More work, overhead, administration, oversight, reporting
- New incremental default risk model (IDR) to resemble banking book model	- Capital to go up? - New model to build, operate, validate, maintain <u>etc</u>
- Thought to introduce interest rate and credit spread risk to banking book capital	- Capital to go up
- Movement between books effectively locked down - No capital decreases can be realised from shifting between books	- More restrictive
- Accreditation will be at the desk level - Tighter controls over accreditation – <u>backtesting</u> & P/L analysis - Standard method to be used as the fall-back	- More work, overhead, administration, reporting, need to enhance systems - Harder to achieve accreditation