MACQUARIE

Advanced analytical work & skills needed in the corporate space

Ben Odgers

Presentation to OzGrav

27 Mar 2019

Agenda

Theory & Evidence

Models & Judgement

Access & Transparency

Innovation & Education
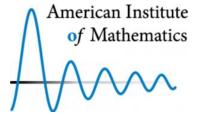
Data & Transformation

Skills & Opportunities
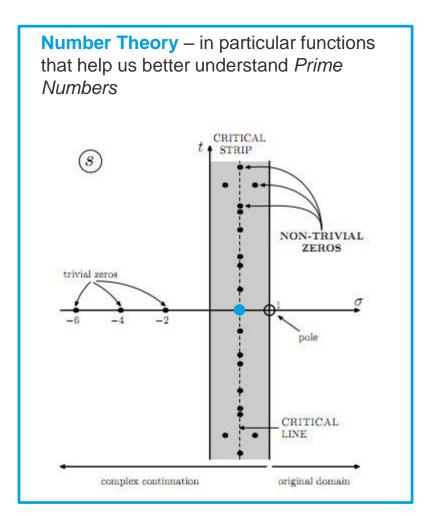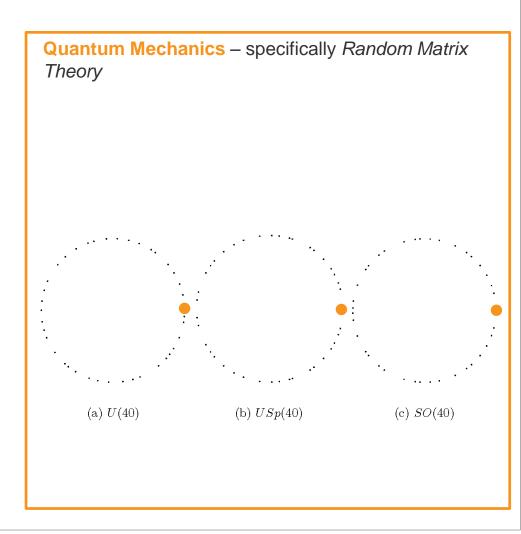
Theory & Evidence

Academia

(Up to Nov 2007)

- My PhD was on a connection between:

Number Theory – in particular functions that help us better understand *Prime Numbers*

Quantum Mechanics – specifically *Random Matrix Theory*

(a) $U(40)$ (b) $USp(40)$ (c) $SO(40)$

(a) $\phi = 0.2$ (b) $\phi = 0.4$ (c) $\phi = 0.6$ (d) $\phi = 0.8$

(e) $\phi = 1.0$ (f) $\phi = 1.2$ (g) $\phi = 1.4$ (h) $\phi = 1.6$
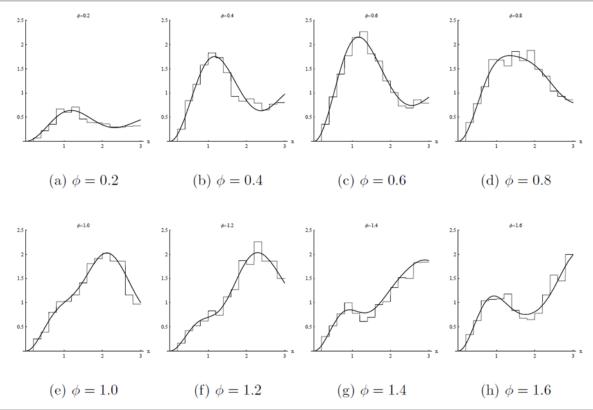
Models & Judgement

Macquarie Group
(Risk Management Group, Jan 2007 – Aug 2013)
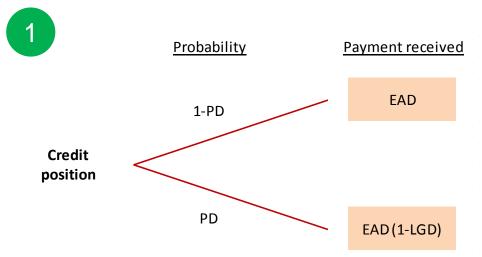
Risk & Capital Analysis Team

Macquarie Group
Risk Management Group
Prudential, Capital & Markets
Risk & Capital Analysis

- Team responsibilities:
  - Capital Adequacy
  - Economic Capital
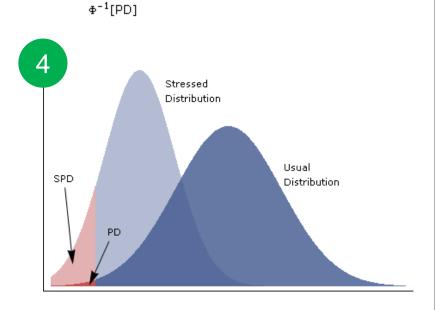 - Risk-adjusted deal metrics
  - Stress testing

Basel Credit Capital Model

1

Probability | Payment received

Credit position

1-PD → EAD

PD → EAD (1-LGD)

2

Credit Payoff Function

LGD

$\Phi^{-1}[PD]$

3 Gordy (2003):

- *Large, homogeneous portfolio?*
- *Single-factor correlation model?*
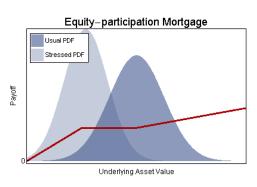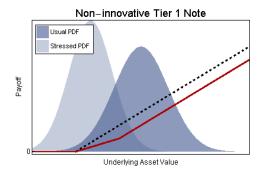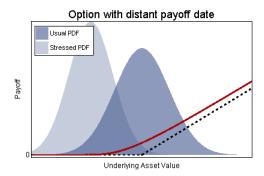- Quantile of the whole ≈ sum of conditional expectations across individual positions

4

Stressed Distribution

Usual Distribution

SPD

PD

We produced many analytical extensions to that model
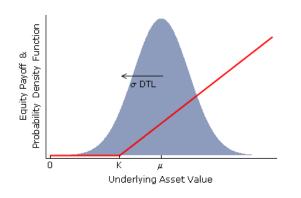
"Building Blocks" package

Equity–participation Mortgage

Non–innovative Tier 1 Note

Option with distant payoff date
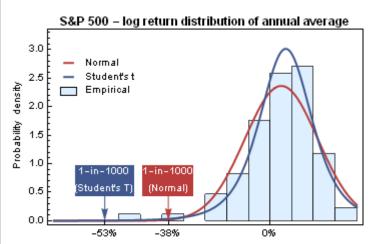
Equity capital model
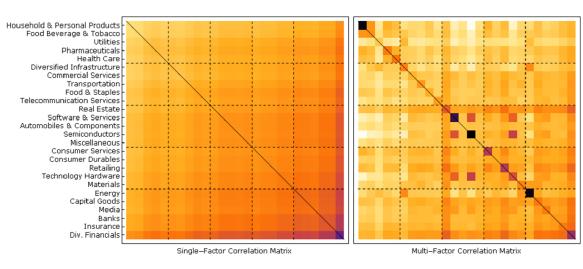
Concentration Risk Adjustment
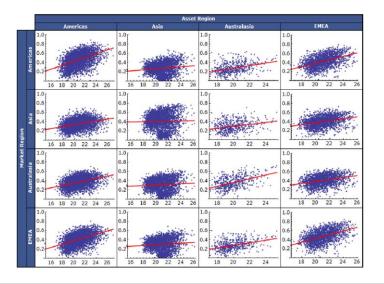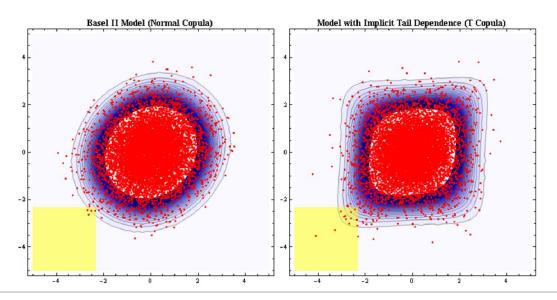
S&P 500 – log return distribution of annual average

Single–Factor Correlation Matrix

Multi–Factor Correlation Matrix

Basel II Model (Normal Copula)

Model with Implicit Tail Dependence (T Copula)

Access & Transparency

ANZ
(Institutional, Nov 2013 – Apr 2016)

Success saw our scope grow

"Capital & Analysis"	⟶	"Balance Sheet & Capital Management"	⟶	"Financial Management & Analytics"

Global Markets	International & Institutional Banking

- Focus areas
  - Capital efficiency
  - Performance measurement and initiatives
  - Education and transparency of information

We needed to give the right people transparent access to their information…

Revenue, AUDk		YTD	cf. PCP		cf. YTD Plan		FY15*	cf. FY14		cf. FY15 Plan	
		Sep15	Sep14_{FX}	Δ	Sep15_{FX}	Δ	Sep15	FY14_{FX}	Δ	FY15_{FX}	Δ
		(a)	(b)	(a−b)	(c)	(a−c)	(d)	(e)	(d−e)	(f)	(d−f)
Net Interest Income	Net External Interest Income	154,250	139,283	14,967	0	154,250	154,250	139,283	14,967	0	154,250
	Net I/G Interest Income	(119,200)	(101,183)	(18,017)	0	(119,200)	(119,200)	(101,183)	(18,017)	0	(119,200)
	Total	35,050	38,100	(3,050)	0	35,050	35,050	38,100	(3,050)	0	35,050
Capital Funding Adjustment		4,046	4,171	(125)	1,877	2,169	4,046	4,171	(125)	1,877	2,169
Non-Interest Income	Fee Income	0	(0)	0	0	0	0	(0)	0	0	0
	Foreign Exchange Earnings	(4,466)	(2,731)	(1,735)	0	(4,466)	(4,466)	(2,731)	(1,735)	0	(4,466)
	P/L on Sale of Trading Sec	1,285	2,817	(1,533)	40,325	(39,041)	1,285	2,817	(1,533)	40,325	(39,041)
	Net Income from Wealth Mgmt + Invest	0	0	0	0	0	0	0	0	0	0
	Other Income	18,132	14,036	4,096	0	18,132	18,132	14,036	4,096	0	18,132
	Total	14,951	14,122	828	40,325	(25,375)	14,951	14,122	828	40,325	(25,375)
Revenue		54,046	56,393	(2,347)	42,202	11,844	54,046	56,393	(2,347)	42,202	11,844
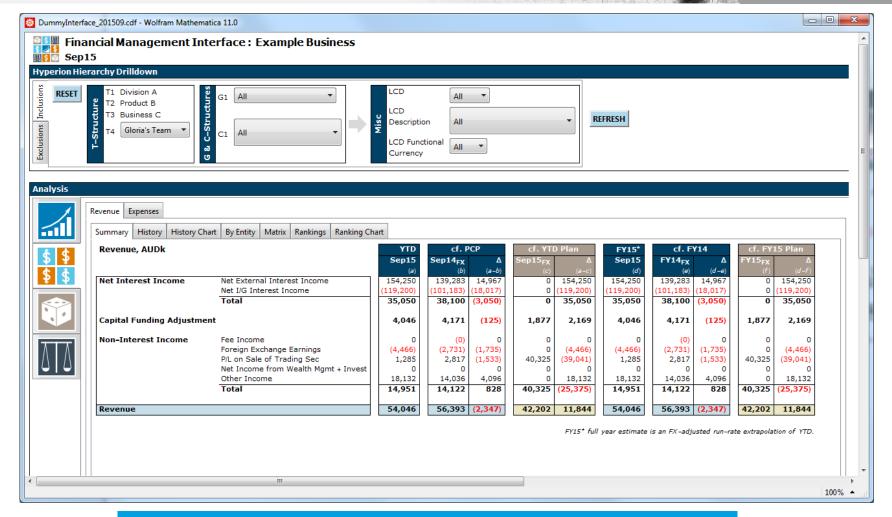
FY15 full year estimate is an FX-adjusted run-rate extrapolation of YTD.*

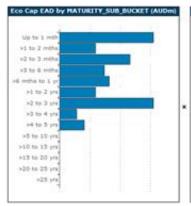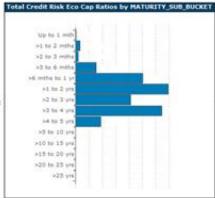# …so we built the "Financial Management Interface"

At peak we were rolling out tailored interactive reporting to 65 different businesses and regions across the whole of ANZ
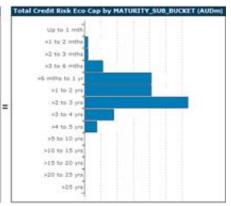
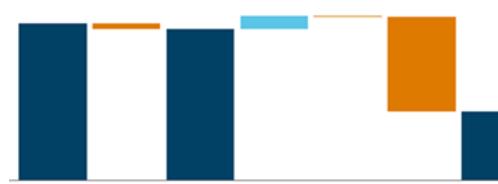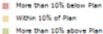# Transparency meant designing visualisations tailored to the information

Access was also bringing together different data sets and drawing insights from the union
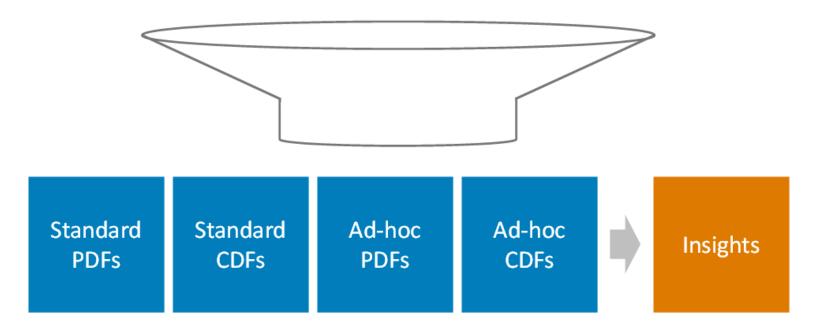
Hyperion

(Group-wide aggregated Financial data) – we extract 12,500 account/date/scenario combinations automatically each month across all 5,500 LCDs

Risk Analytics

(Group-wide Credit Risk exposure-level data) – a 4Gb extract is automatically processed twice monthly and distilled into ~21,000 smaller summary files.

Standard PDFs	Standard CDFs	Ad-hoc PDFs	Ad-hoc CDFs	Insights

"Innovation & Education"

Macquarie Group
(Group Treasury, May 2016 - Sep 2018)
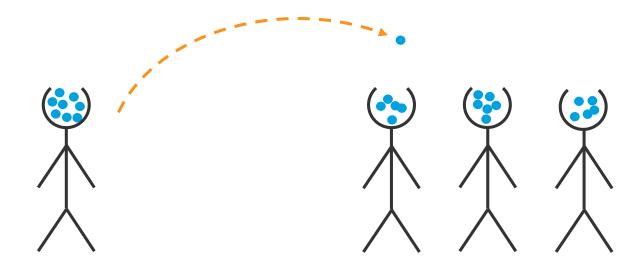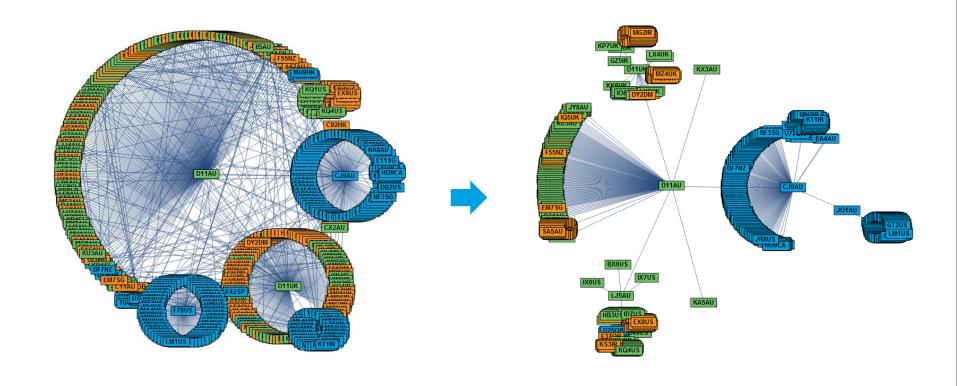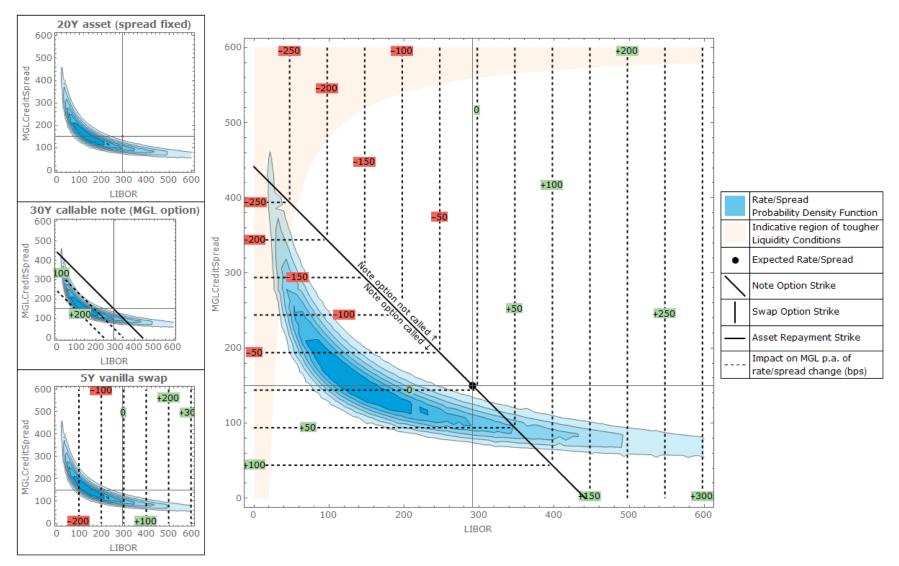
Scenario analysis

- Approach 1 – ARIMA (RBA Cash Rate – Last 20 Years)
- Approach 2 – Conditional probs (RBA Cash Rate – Last 20 Years)
- Approach 3 – Brownian Motion (BBSW1M – Last 20 Years)
- Approach 4 – Geometric Brownian Motion (BBSW1M – Last 20 Years)
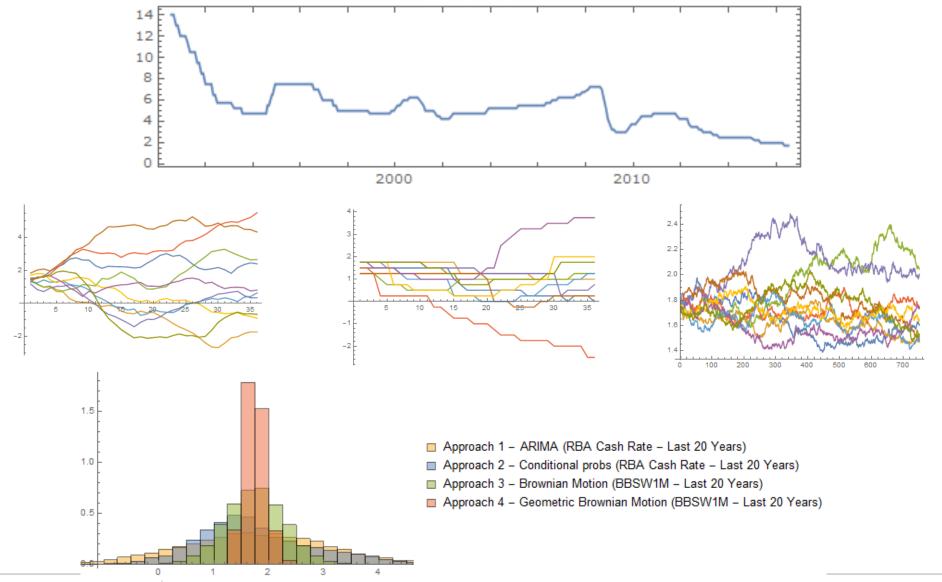
Data & Transformation

Macquarie Group
(Data & Transformation, Oct 2018 on)

US Military

*"**Data to decisive action** includes a wide range of domains and technologies that share a common goal:*
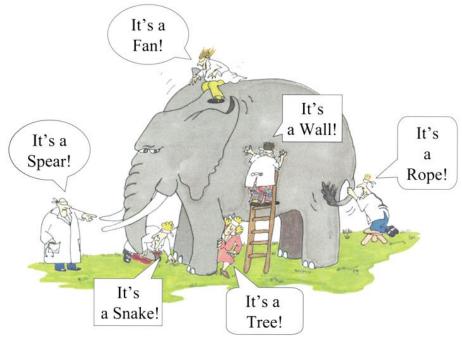
- *to decrease the time it takes to **gather data**,*
- *transform them into **high-quality information**,*
- ***validate** them and*
- ***present** them in a way that best **supports operational decisions**."*
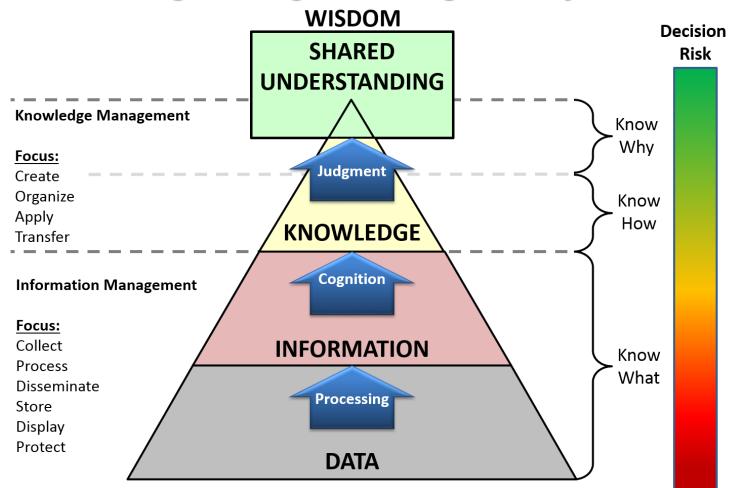
- "Shaping the Army Network - 2015-2040",

March 2016

Semantics

Knowledge Management Cognitive Pyramid

Source: "US Army Knowledge Managers" via Wikipedia

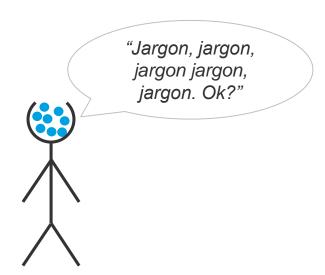# Skills & Opportunities

1.) Subject matter expertise

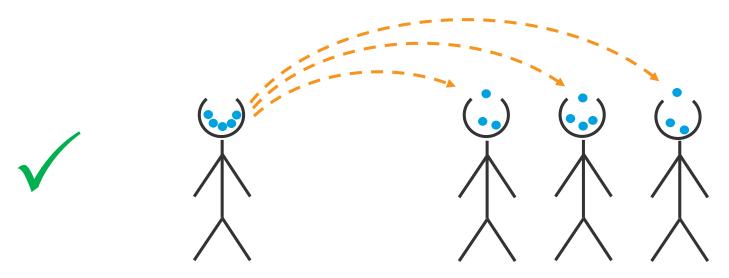If you want to work in a field, you should know something about the field

Exposure to & comfort with:

— different **technologies**,

— **programming languages**,

— **AI** concepts,

— **machine learning** approaches etc

3.) Communications
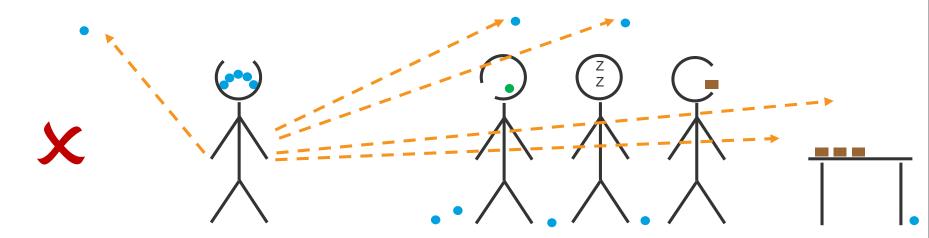
It's not enough to get the answer, you have to be able to explain it and influence decision-making

4.) Entrepreneurial

What unique skills do you have?

How have you leveraged them to drive change?

Conclusions

Conclusions

Theory & Evidence

- *It's not enough to get the answer, **you have to convince people it's the right answer***

Models & Judgement

- ***Models must be simple** enough to be accessible*
- ***Judgement should have the final say***

Access & Transparency

- *Great things happen when you **bring together unconnected data** and **have a close look at it***

Innovation & Education

- *Determine how you **add value**, and **take others on the journey***

Data & Transformation

- ***Data Science** is the new black*

Skills & Opportunities

- ***Subject matter***
- ***Technology***
- ***Communications***
- ***Entrepreneurial***