



Distributed Futures



An open source research programme for Smart Ledgers and new technologies

Smart Ledgers & Collective Defined Contribution Pensions

Report Launch – Wednesday, 25 July 2018
London

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<http://www.distributedfutures.net>



@LongFinance (#DistributedFutures)



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The Z/Yen Group



Agenda

08:45 - 09:00 **Registration**

09:00 - 09:20 **Welcome, Introduction & Background**

*Professor Michael Mainelli, Executive Chairman,
Z/Yen Group*

09:20 - 10:20 **Report Walkthrough**

*Dr Con Keating, Associate Professor Iain Clacher,
and Dr David McKee*

10:20 - 10:40 **Panel Discussion, Questions & Answers**

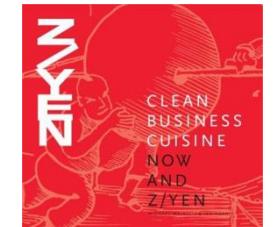
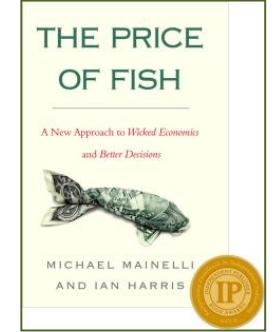
10:40 **Formal Close**



Z/Yen



- ◆ Special – City of London's leading commercial think-tank
- ◆ Services – projects, strategy, expertise on demand, coaching, research, analytics, modern systems
- ◆ Sectors – technology, finance, voluntary, professional services, outsourcing
 - Independent Publisher Book Awards Finance, Investment & Economics Gold Prize 2012 for *The Price of Fish*
 - British Computer Society IT Director of the Year 2004 for PropheZy and VizZy
 - DTI Smart Award 2003 for PropheZy
 - Sunday Times Book of the Week, *Clean Business Cuisine*
 - £1.9M Foresight Challenge Award for Financial Laboratory visualising financial risk 1997





Distributed Futures Programme



We work in partnership with many stakeholders to learn together and build the vital infrastructure needed to make Smart Ledgers a success.

Our research is structured around four themes:

- ◆ Society
- ◆ Technology
- ◆ Economics
- ◆ Politics

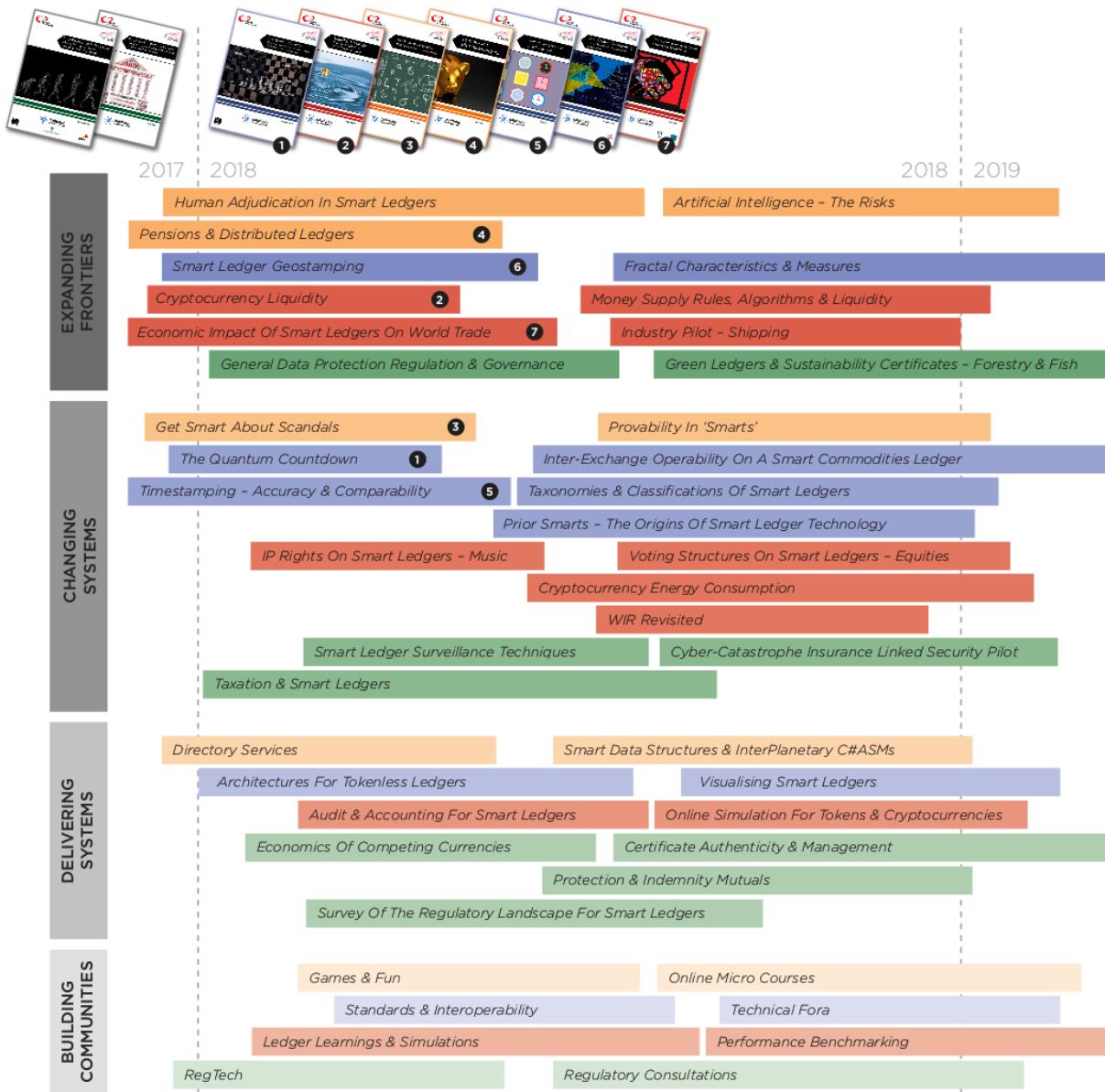
And is directed at four outcomes:

- ◆ Expanding frontiers
- ◆ Changing systems
- ◆ Delivering services
- ◆ Building communities

www.distributedfutures.net



Timeline





Distributed Futures Research

The diagram illustrates the governance of Mutual Distributed Ledgers (MDL) through a central concept of "Effective Structure Governing".

- MDL** (Mutual Distributed Ledger) is at the top, connected to "Blockchain", "Network", "Enhanced", and "Faster Settlement".
- Effective Structure Governing** is below MDL, connected to "Power", "Set", "Hit", "These", "Market", "Brand", "Users", "Report", "Users", "Press", "Board", "Organisation Stakeholders", "Performance Accountable", and "The Appropriate".
- Stakeholders** include "Power", "Set", "Hit", "These", "Market", "Brand", "Users", "Report", "Users", "Press", "Board", "Organisation Stakeholders", "Performance Accountable", and "The Appropriate".
- Governing** includes "Power", "Set", "Hit", "These", "Market", "Brand", "Users", "Report", "Users", "Press", "Board", "Organisation Stakeholders", "Performance Accountable", and "The Appropriate".
- System** includes "Power", "Set", "Hit", "These", "Market", "Brand", "Users", "Report", "Users", "Press", "Board", "Organisation Stakeholders", "Performance Accountable", and "The Appropriate".
- Trust** includes "Power", "Set", "Hit", "These", "Market", "Brand", "Users", "Report", "Users", "Press", "Board", "Organisation Stakeholders", "Performance Accountable", and "The Appropriate".
- Manage** includes "Power", "Set", "Hit", "These", "Market", "Brand", "Users", "Report", "Users", "Press", "Board", "Organisation Stakeholders", "Performance Accountable", and "The Appropriate".

Legend:

- Red box: Power, Set, Hit, These, Market, Brand, Report, Users, Press, Board.
- Blue box: Organisation Stakeholders, Performance Accountable, The Appropriate.
- Green box: Blockchain, Network, Enhanced, Faster Settlement.
- Yellow box: Power, Set, Hit, These, Market, Brand, Report, Users, Press, Board.
- Orange box: Power, Set, Hit, These, Market, Brand, Report, Users, Press, Board.
- Purple box: Power, Set, Hit, These, Market, Brand, Report, Users, Press, Board.
- Grey box: Power, Set, Hit, These, Market, Brand, Report, Users, Press, Board.

Bottom Right: July 2016

The slide features a map of Europe with a yellow triangle highlighting the British Isles (Ireland, Great Britain, and surrounding islands). Overlaid on the map is a large black arrow pointing right, containing the title text. The top left corner has the 'CO LONG FINANCE' logo, and the top right corner has the 'DISTRIBUTED FUTURE' logo. The bottom right corner contains the text 'December 2017'. The bottom left corner has the 'Cardano Foundation' logo.

The image shows a standard chessboard with black and white squares. Chess pieces are placed on the board, with some pieces appearing to be in motion or blurred, suggesting a game in progress. The board is set against a dark, solid background.

The image shows a chalkboard with a pie chart divided into two segments: one labeled 80% and another labeled 20%. Below the chart is a line graph with five vertical bars of increasing height. To the right of the chart are various mathematical and scientific symbols written in chalk, including pi = 3.1415, sigma, epsilon, and Greek letters alpha, beta, gamma, delta, zeta, eta, theta, phi, rho, sigma, and tau.

A large blue rectangular image showing a gold coin with a dollar sign (\$) symbol floating in the center of a pool of water, creating concentric ripples.

The image is a red-themed collage. At the top left is the 'LONG FINANCE' logo with a stylized orange and red 'C'. To the right is the 'DISTRIBUTE FUTURE' logo with a red ribbon graphic. Below these is a black arrow pointing right containing the text 'The Economic Impact Of Smart Ledgers On World Trade'. The central focus is a large silhouette of a hand holding a smartphone. The screen of the phone is filled with a dense grid of international flags from various countries. At the bottom of the collage are several other logos: 'The Govt Group' (with a red 'G'), the 'CARDANO FOUNDATION' logo (with a blue circular icon), and the 'Royal Coat of Arms of the United Kingdom'.

The image is a collage of logos and text related to blockchain technology. At the top left is the 'Long Finance' logo with a red stylized 'C' and 'O'. To its right is the 'DISTRIBUTED FUTURES' logo with a red ribbon graphic. Below these is a dark grey arrow pointing right containing the text 'Timestamping Smart Ledgers Comparable, Universal, Traceable, Immune'. The central part of the image features a grid of nine icons arranged in three rows of three. Each icon contains a stylized letter or symbol: a blue circle with a 'L', a grey circle with a 'C', a red circle with a 'Z'; a green square with a 'L', a grey square with a 'C', a blue square with a vertical bar; a red hexagon with a 'L', a grey hexagon with a vertical bar, and a green hexagon with a 'Z'. Below this grid is a horizontal blue bar with the word 'Blockchain' written on it. At the bottom center is the 'CARDANO FOUNDATION' logo with a blue dotted hexagon and the text 'CARDANO FOUNDATION'. On the far left at the bottom is the 'ZEN' logo with the text 'Blockchain'. On the far right at the bottom is the 'Ethereum' logo with the text 'Blockchain'.



Terminology Evolving

- ◆ **ledger** – a record of transactions
- ◆ **distributed** – divided among several or many, in multiple locations
- ◆ **mutual** – shared in common, or owned by a community
- ◆ **mutual distributed ledger (MDL)** - a record of transactions shared in common and stored in multiple locations
- ◆ **mutual distributed ledger technology** – a technology that provides an immutable record of transactions shared in common and stored in multiple locations
- ◆ **blockchain** - “a transaction database shared by all nodes participating in a system based on the Bitcoin protocol”
- ◆ **smart ledger** – MDL with embedded, executable code



Smart Ledgers Hold Immense Promise

Area	Possible Applications
Financial instruments, records, models	Currency, private and public equities, certificates of deposit, bonds, derivatives, insurance policies, voting rights associated with financial instruments, commodities, derivatives, trading records, credit data, collateral management, client monies segregation, mortgage or loan records, crowd-funding, P2P lending, microfinance, (micro)charity donations, account portability, airmiles & corporate tokens, etc.
Public records	Land and property titles, vehicle registries, shipping registries, satellite registries, business license, business ownership/incorporation/dissolution records, regulatory records, criminal records, passport, birth/death certificates, voting ID, health and safety inspections, tax returns, building and other types of permits, court records, government/listed companies/civil society, accounts and annual reports, etc.
Private records	Contracts, ID, signature, will, trust, escrow, any other type of classifiable personal data (e.g. physical details, date of birth, taste) etc.
Semi-private/semi-public records	High school/university degrees and professional qualifications, grades, certifications, human resources records, medical records, accounting records, business transaction records, locational data, delivery records, genome and DNA, arbitration, genealogy trees, clinical trials, etc.
Physical keys	Key to home, hotel, office, car, locker, deposit box, mail box, Internet of Things, etc.
Intellectual property	Copyrights, licenses, patents, digital rights management of music, rights management of intellectual property such as patents or trademarks, proof of authenticity or authorship, etc.
Other records	Cultural, historical events, documentary (e.g. video, photos, audio), (big) data (weather, temperatures, traffic), SIM cards, archives, geostamping, etc.



Application:

MetroGnomo – Timestamping & Datalogging



MetroGnomo BETA
Open-Source Distributed Timestamps

Home About News



Stamp it! Check Stamp Retrieve File

Register View Live Ledger Host Receiver

Obtaining Proof Of Existence

MetroGnomo BETA
Open-Source Distributed Timestamps

Last MetroTime 2016-01-24 19:20:38.105498

Last Timestamp 14s ago

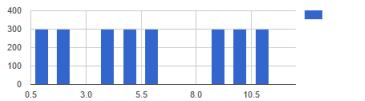
Average Duration 14s



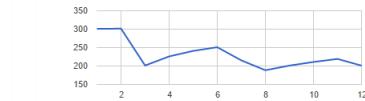
View Live Ledger

Current Time 2016-03-26 11:17:33 AM Last MetroTime 2016-03-26 12:15:01.964577 Last Timestamp 153s ago Average Duration 201s

Timestamp Time (s)



Average Timestamp Duration (s)



Show 10 entries

UUID	Metro Time	RowHash	TableHash	Tag
902053a5-592c-477 2016-03-26 1 47d450e098d7167fe1c078648733f707 8ac19e0928c286fb704e522d599d0e	32fdb23d0697a4a2342cf1864c8085010	daeee2f9337fc36fa4bef21e7e67319	2016-03-26T12:15:01+00:00@timeapi.org	
e-95cb-90 2:15:01.964577 7 6				
47577ef57 8				

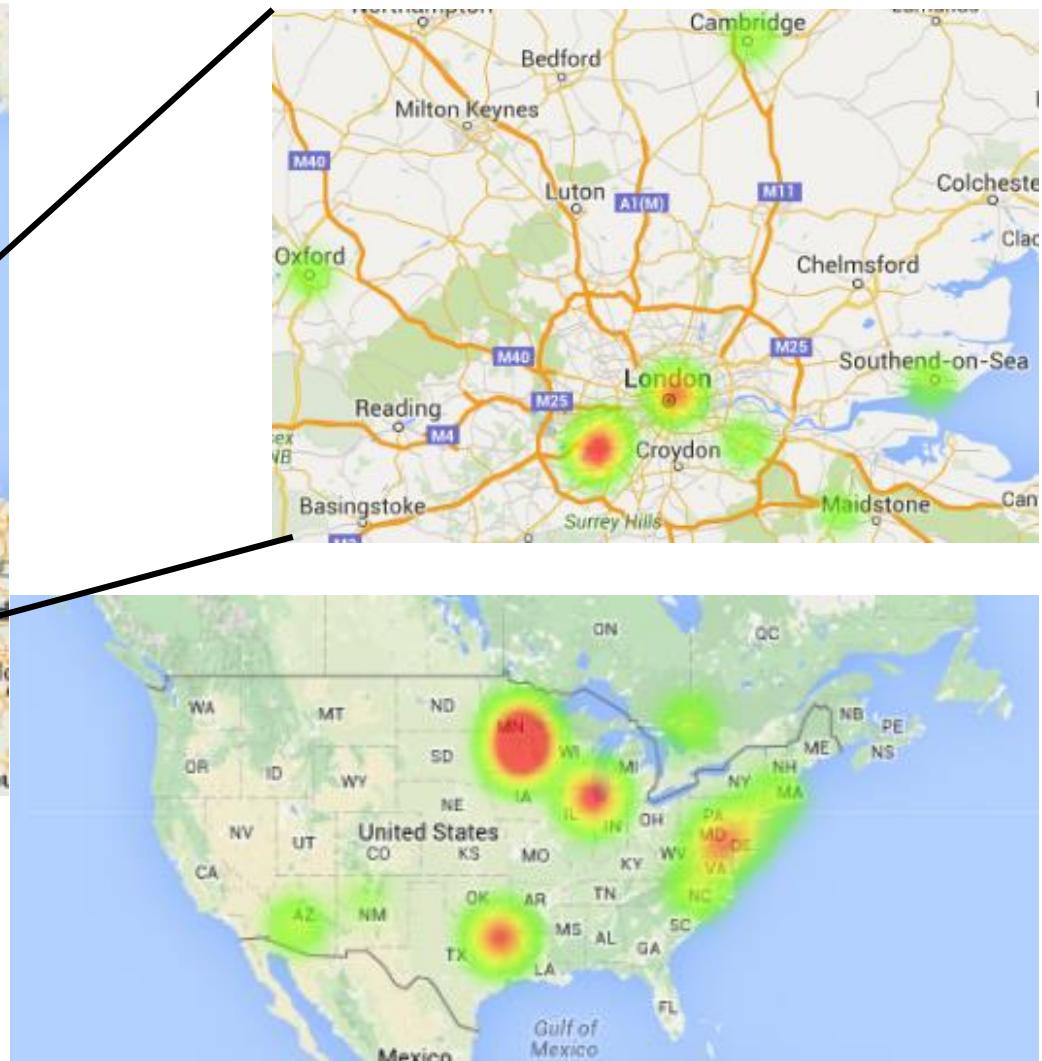
Search: []

RowHash	TableHash	Tag
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5fd4805a0a225ab9a038a41093192295d85c108d4fe310ce4784cd495d	6ec8845f38c3b1847ac8faf2f652318be585aad7d42338ec8aa7ce80e400d53	The+secular+cooling+hat+must+someday+overtake+our+planet+has already+gone+far-in-deed+with+our+neighbor.
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0165e888-4a74-49fb-8c0c-cb56cc4f417f 2016-01-24 19:20:26.909764

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Application: Clinical Trials

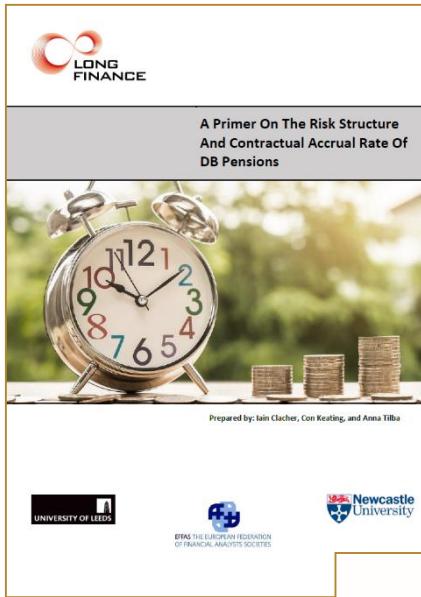


Not Funny?



"Well, if it isn't the chap who sold me my personal pension!"

Long Finance & Pensions



LONG FINANCE

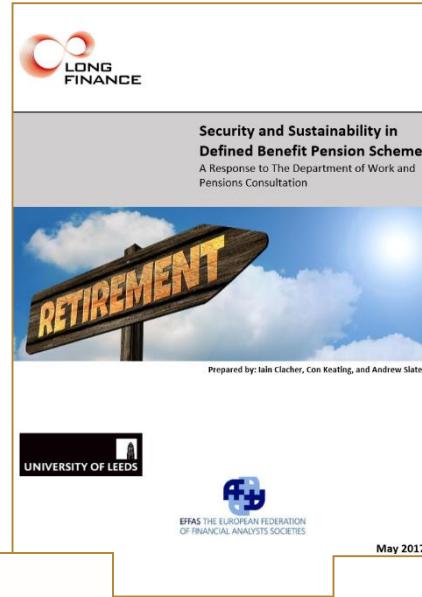
A Primer On The Risk Structure And Contractual Accrual Rate Of DB Pensions

Prepared by: Iain Clacher, Con Keating, and Anna Tilba

UNIVERSITY OF LEEDS

EFFAS THE EUROPEAN FEDERATION OF FINANCIAL ANALYSTS SOCIETIES

Newcastle University



LONG FINANCE

Security and Sustainability in Defined Benefit Pension Schemes

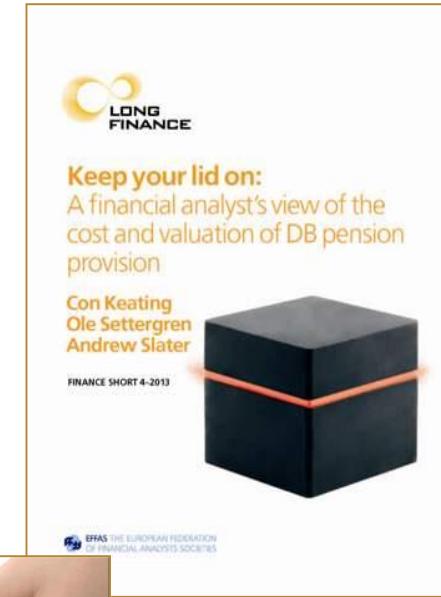
A Response to The Department of Work and Pensions Consultation

Prepared by: Iain Clacher, Con Keating, and Andrew Slater

UNIVERSITY OF LEEDS

EFFAS THE EUROPEAN FEDERATION OF FINANCIAL ANALYSTS SOCIETIES

May 2017



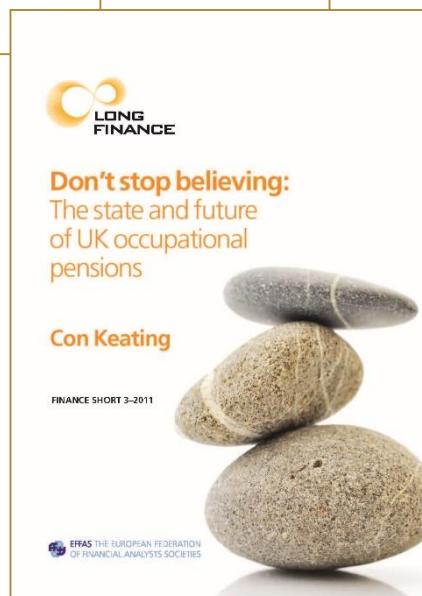
LONG FINANCE

Keep your lid on:
A financial analyst's view of the cost and valuation of DB pension provision

Con Keating
Ole Settergren
Andrew Slater

FINANCE SHORT 4-2013

EFFAS THE EUROPEAN FEDERATION OF FINANCIAL ANALYSTS SOCIETIES



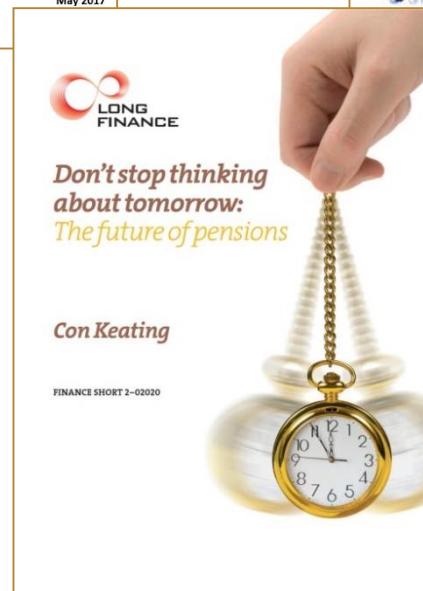
LONG FINANCE

Don't stop believing:
The state and future
of UK occupational
pensions

Con Keating

FINANCE SHORT 3-2011

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LONG FINANCE

Don't stop thinking
about tomorrow:
The future of pensions

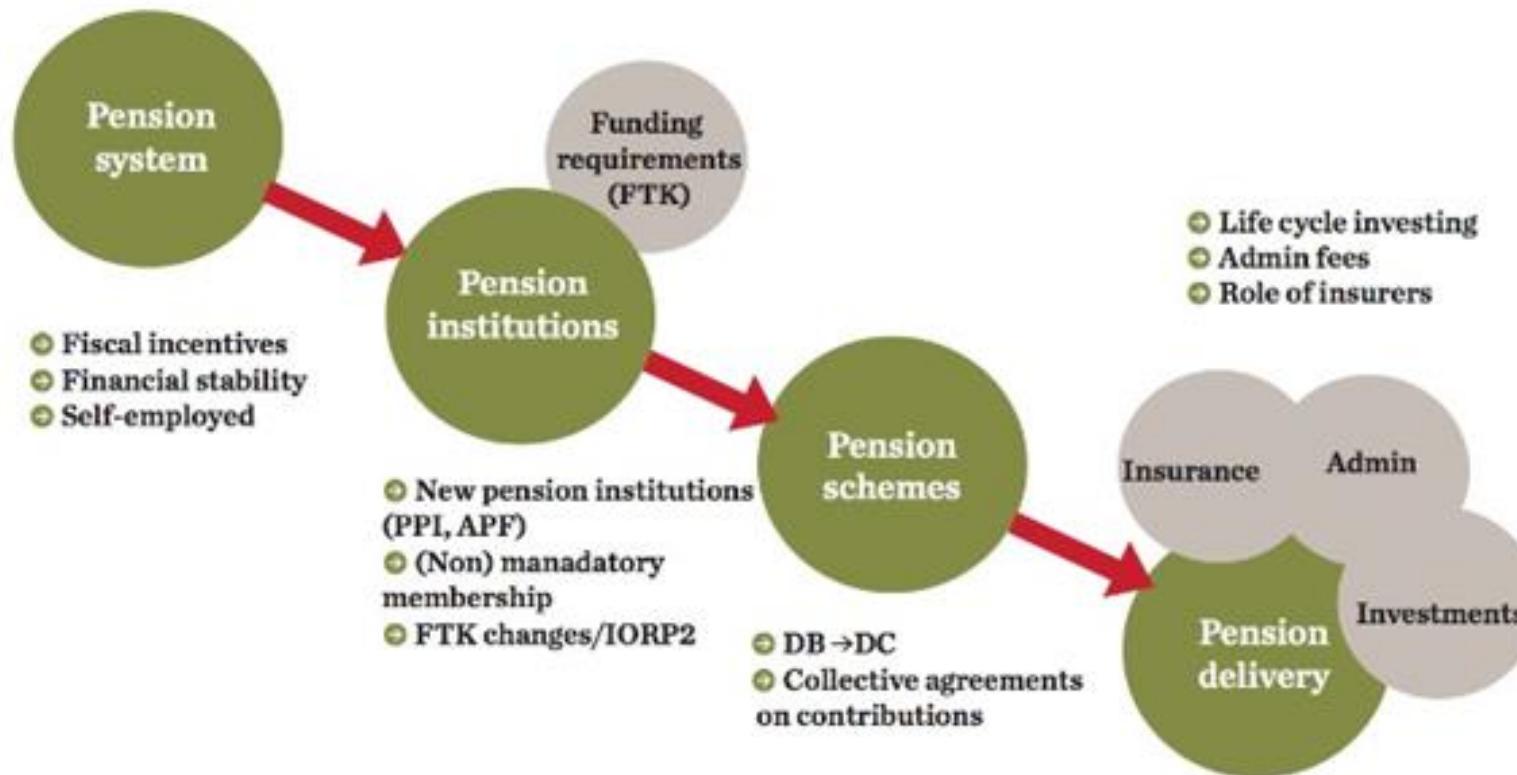
Con Keating

FINANCE SHORT 2-2020

EFFAS THE EUROPEAN FEDERATION OF FINANCIAL ANALYSTS SOCIETIES

Dutch Courage

National Pensions Dialogue: fundamental changes under way in four distinct areas



Source: Robeco

<https://www.ipe.com/pensions/country-reports/netherlands/dutch-pensions-policy-in-the-balance/10006877.article>

Report Walkthrough

Smart Ledgers & Collective Defined Contribution Pensions



Iain Clacher



Con Keating



David McKee



Collective Defined Contribution Pensions

- ◆ These are collective schemes which offer, but do not guarantee, targeted pensions.
- ◆ Pensions may be cut.
- ◆ DC “pensions” are simply savings schemes, with an income conversion issue at retirement.
- ◆ CDC schemes resolve this problem by indicating the retirement income equivalence of the capital sum accrued – they complete the DC offering.
- ◆ The terms on which pensions are awarded are set annually by trustees. For each award there is an implicit investment return on the contribution made. (Contractual Accrual Rate - CAR).
- ◆ The contribution and the scheme CAR determine a member’s equitable interest in the scheme, and most importantly the scheme’s fund.
- ◆ Equitable interest is a pseudo-liability. This is a division of the fund agreed among members.
- ◆ Members may transfer at any time at the NAV of their equitable interest.
- ◆ The scheme is DC – there is no recourse to any sponsor. The fund is all there is.

Sustainability and Management

- ◆ To be sustainable over time, a scheme must be and operate equitably among all members.
- ◆ This eliminates the possibility of intergenerational inequity.
- ◆ Scheme rules can ensure this – they can be encoded as smart contracts.
- ◆ In essence, smart ledgers reduce these key issues to matters of administration, rather than trustee discretions.
- ◆ The rules encompass both risk-pooling and risk-sharing.
- ◆ These rules admit longer investment horizons – no member is faced by the at retirement de-risking of DC – and higher total returns.
- ◆ The member has the option to transfer out, and to manage their pension pot in drawdown.
- ◆ Many other countries have forms of pension where benefits may be cut – all have significant design flaws.

Risk -Sharing

- ◆ Risk-sharing among members substitutes for the buffers and capital adequacy requirements of other financial institutions.
- ◆ The decision criterion is the solvency ratio – assets relative to total equitable interests.
- ◆ If the scheme finds itself in deficit, then a support mechanism is applied.
- ◆ This is a self equilibrating system.
- ◆ If deficits arise because the trustees were over-optimistic in their awards, the rules system will cut these back to that which has been achieved.
- ◆ If pensions in excess of those just by the level of funding are paid, and a rule determines the extent and duration to which those excess payments are permitted, then the equitable interests of all non-pensioner members are increased to maintain equitable balance.
- ◆ With these rules automated, member confidence and trust in CDC pensions should follow.
- ◆ Members may see in near real time both the net asset value and the pension income equivalent of their equitable interest.

Data Requirements

- ◆ Usual static data requirements for members – age, pensionable salary, marital status...
- ◆ Assumptions used by trustees in setting contributions. Longevity, Indexation...
- ◆ Contribution and CAR awards histories. A form of individual “pot” – a member’s equitable interest - though part of a collective enterprise.
- ◆ Pension fund, with a scheme specific mandate – a target return on average – where the average is determined by the extent of risk-sharing utilisation.
- ◆ Operations of the risk-sharing rules over time.
- ◆ Administration requirement – for the receipt of contributions, payment of pensions and operations of the risk-sharing rules.

Smart Ledgers for CDC

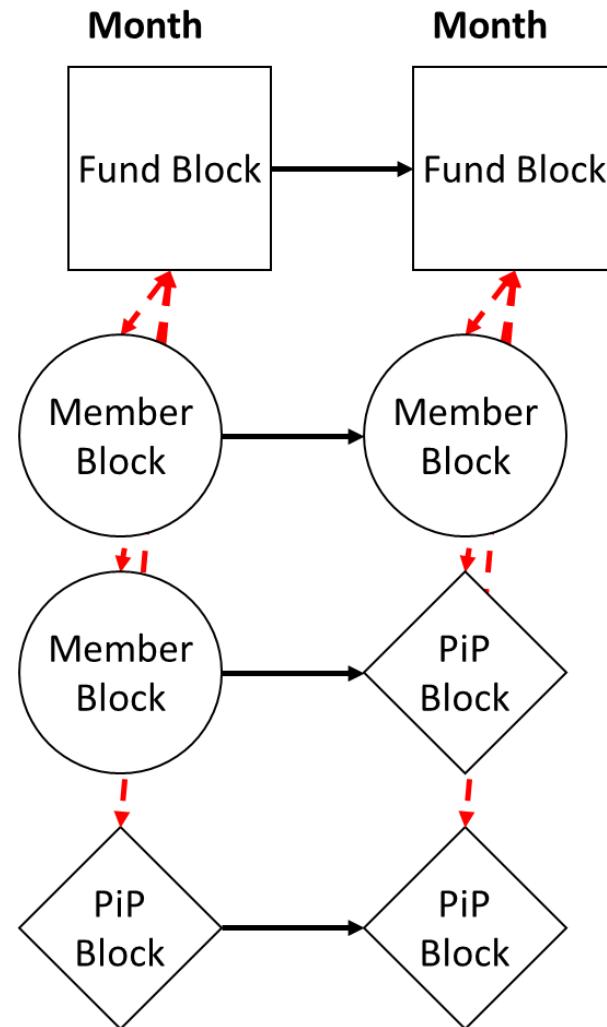
Assuming the existence a Smart Ledger platform

Key considerations:

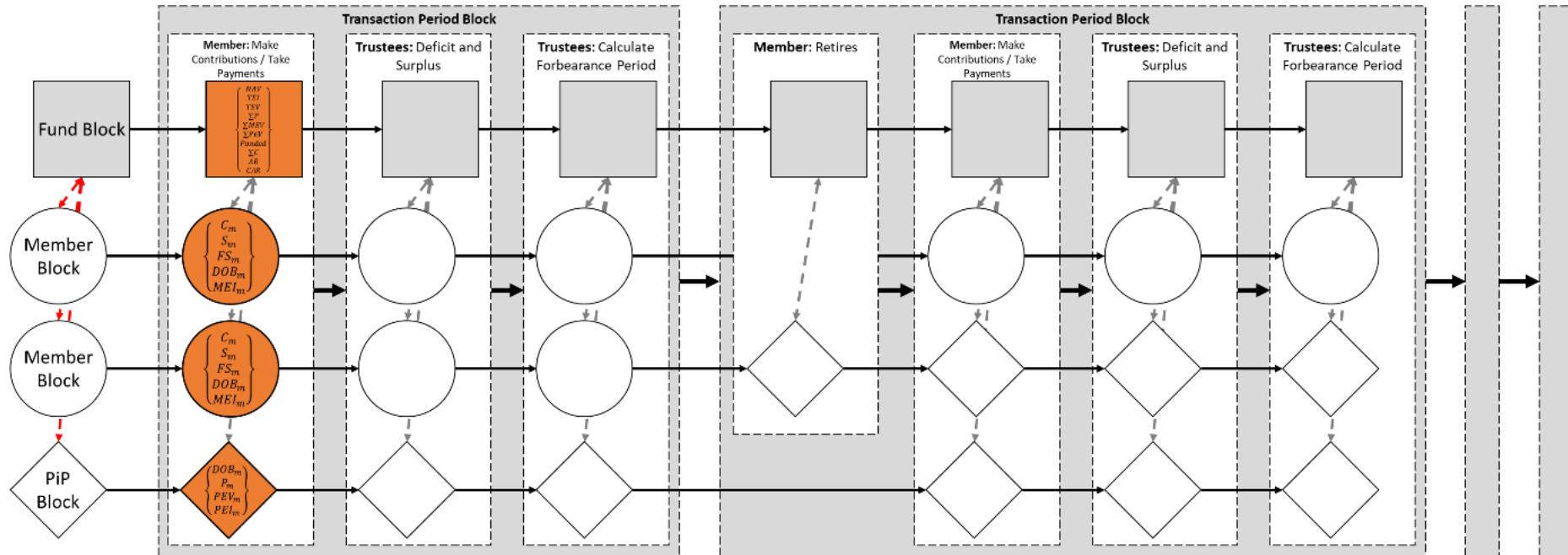
- ◆ Multi-chain structure
- ◆ Strongly permissioned system
- ◆ Managed through Smart Contracts

Multi-Chain Structure - Overview

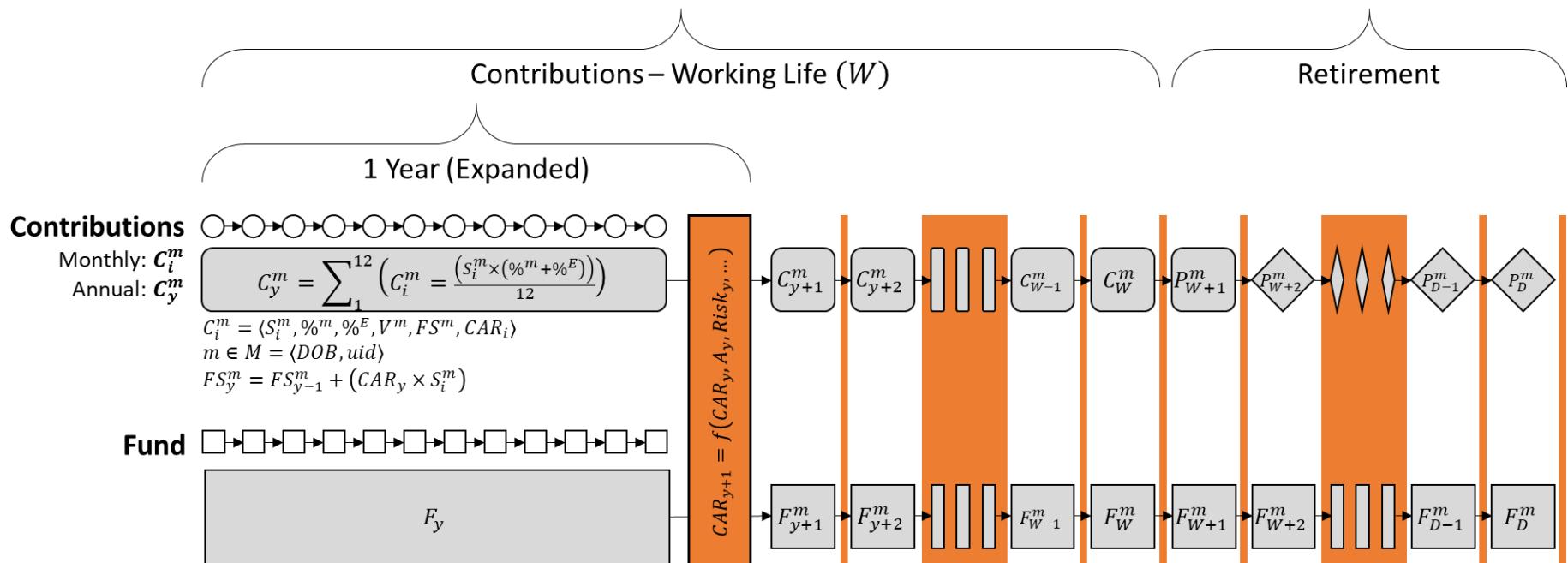
- ◆ Chain types
- ◆ Fund
- ◆ Members
 - Active
 - Deferred
 - In-payment



Multi-Chain Structure - Detail

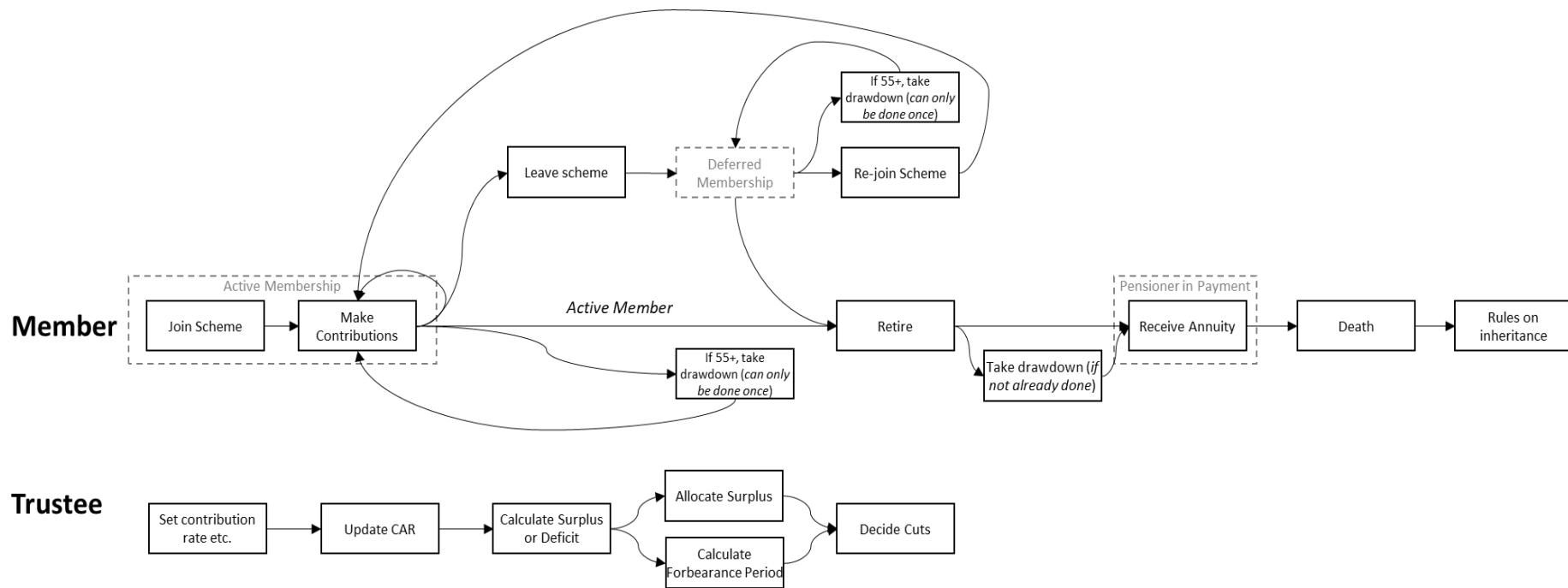


Single Member Chain



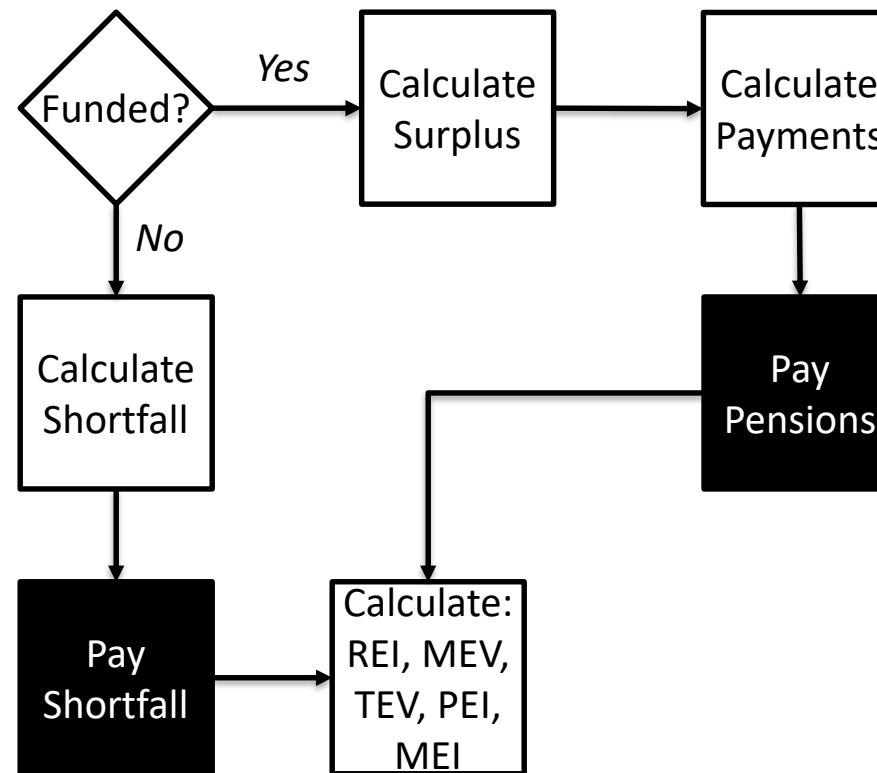
Automated Process Flow

Steps can then be automated using Smart Contracts



Example Smart Contract

Deficit & Surplus Calculation



Conclusions - CDC

- ◆ Member mutual collective
- ◆ Embed the contractual accrual rate
- ◆ Target retirement outcome
- ◆ Scheme members have an equitable interest in the scheme
- ◆ Members are accountable to each other and pensions are ‘best efforts’ endeavours

Conclusions - Smart Ledgers

- ◆ Administration over the very long-term
- ◆ Governance and transparency
- ◆ Adjustment rules
- ◆ Embed risk pooling and risk sharing
- ◆ ‘Dashboards’



Smart Ledgers & Collective Defined Contribution Pensions

Panel Discussion

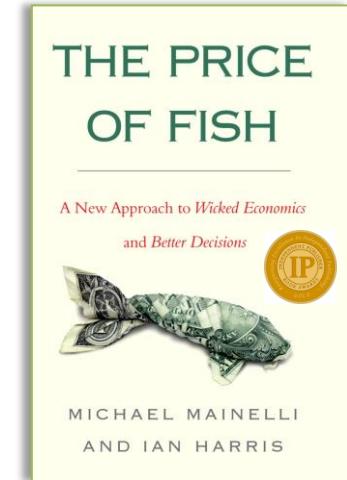


When Would We Know Our Commerce Is Working?



“Get a big picture grip on the details.”

Chao Kli Ning



Thank you!

