Distributed Futures

An open source research programme for Smart Ledgers and new technologies

Liquidity Or Leakage

Plumbing Problems With Cryptocurrencies

Report Launch – Wednesday 21 March 2018,
London

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Agenda

08:45 – 09:00	**Registration**
09:00 – 09:25	**Welcome and Introduction** *Michael Mainelli, Executive Chairman, Z/Yen Group*
09:25 – 10:00	**Liquidity Or Leakage: Report Walkthrough** *Rodney Greene, Advisor to Z/Yen Group* *Bob McDowall, Advisor to Cardano Foundation*
10:00 – 10:40	**Panel Discussion and Questions**
10.40 – 10:45	**Summary**
10:45	**Formal Close**

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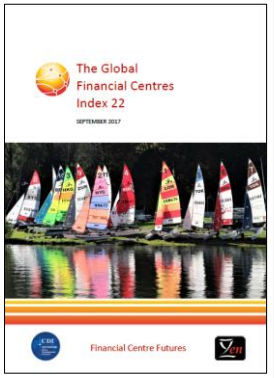
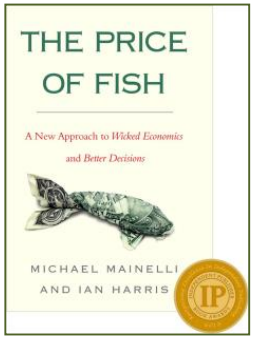
Global Green Finance Index

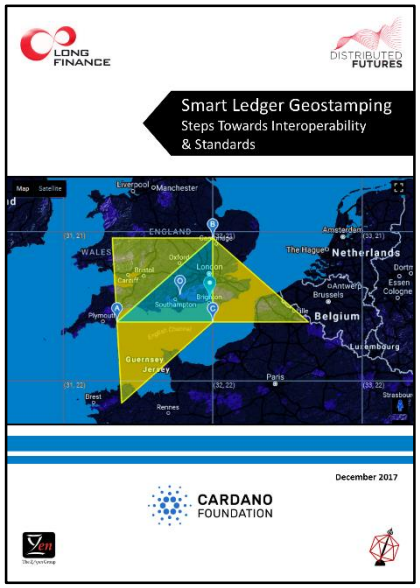
- Special – City of London's leading commercial think-tank
- Services – projects, strategy, expertise on demand, coaching, research, analytics, modern systems
- Sectors – technology, finance, voluntary, professional services, outsourcing

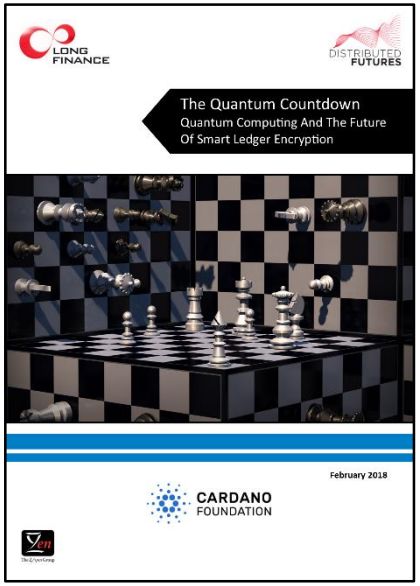
  - Independent Publisher Book Awards Finance, Investment & Economics Gold Prize 2012 for ***The Price of Fish***
  - British Computer Society **IT Director of the Year** 2004 for PropheZy and VizZy
  - DTI **Smart Award** 2003 for PropheZy
  - *Sunday Times* Book of the Week, ***Clean Business Cuisine***
  - £1.9M **Foresight Challenge Award** for Financial £aboratory visualising financial risk 1997

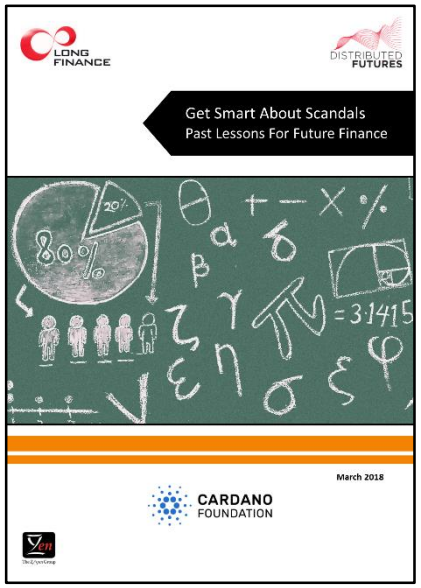


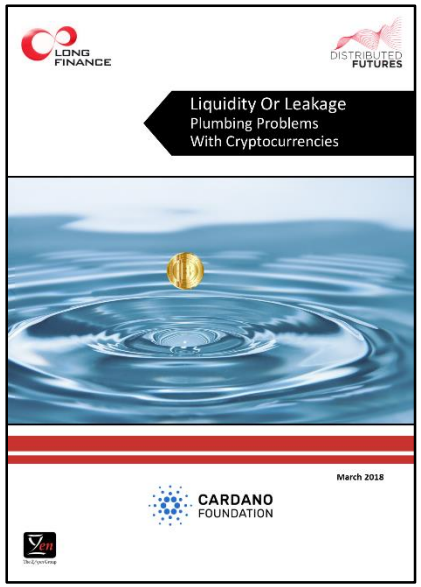


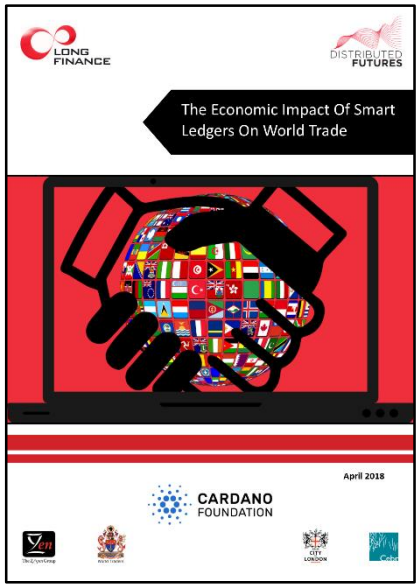
Distributed Futures Research

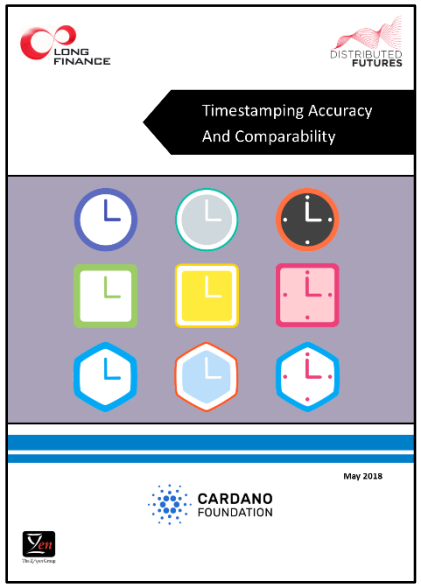












Distributed Futures Programme

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 it's directed at four outcomes:

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

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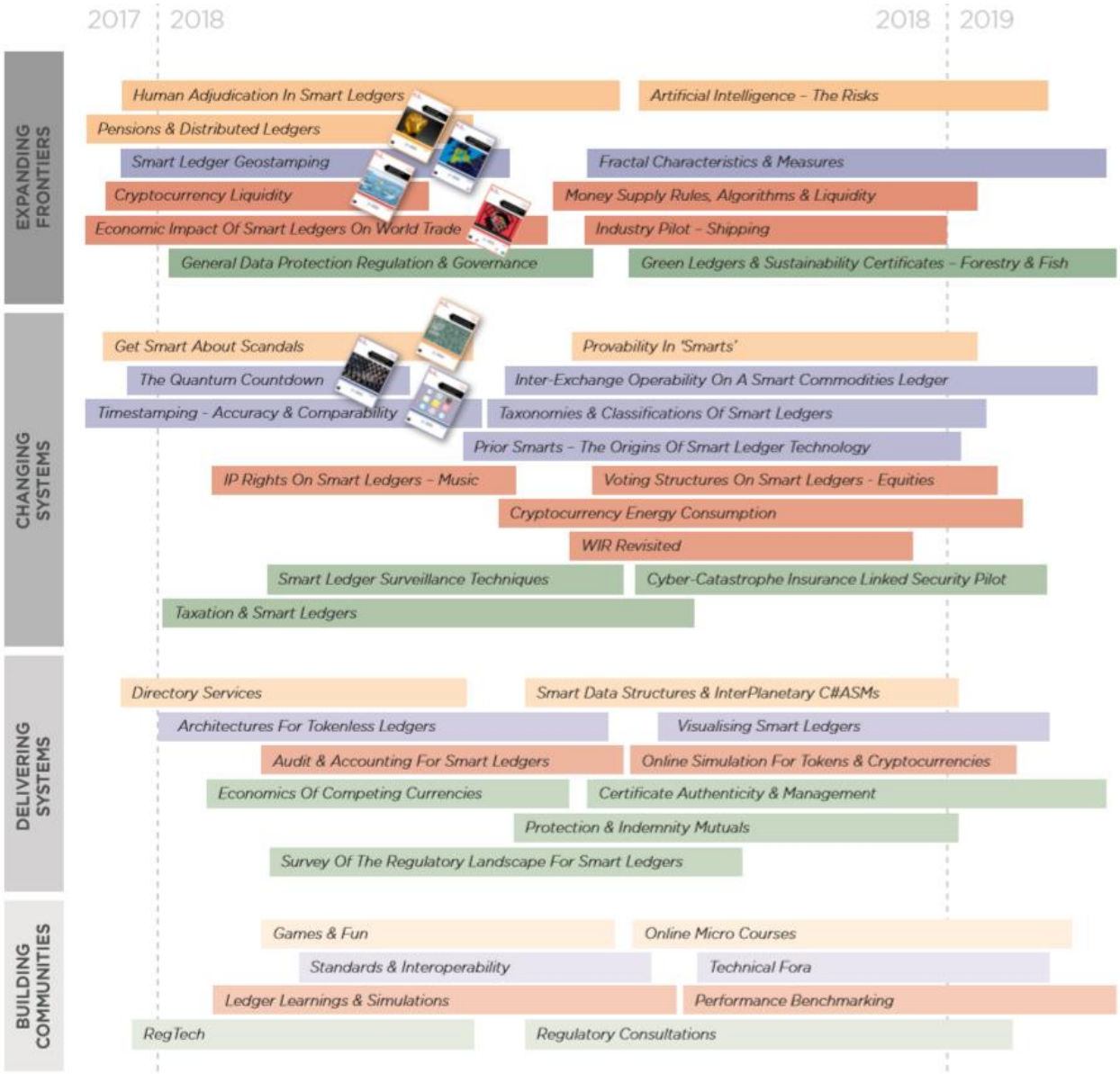
Timeline



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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

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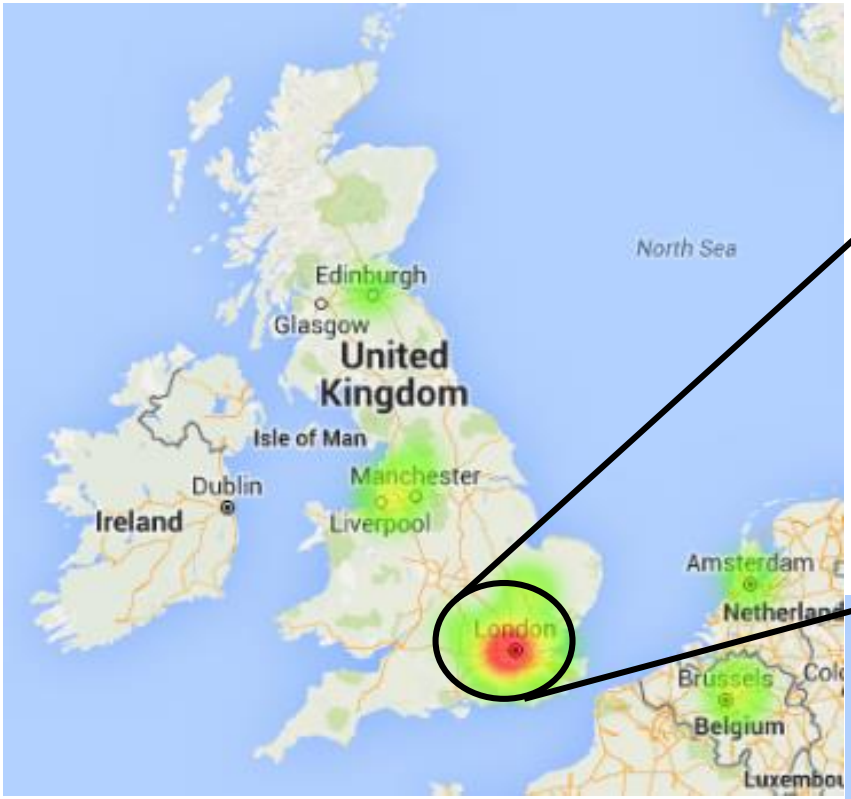
Smart Ledgers Hold Immense Promise

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

Application:
Clinical Trials



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Fluidity In Definition

“the probability that an asset can be converted into an expected amount of value within an expected amount of time”

liquidity = certainty (value, time)

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An Historical Perspective

- Holy Roman Empire currency 1622
- Tulips 1636
- South Sea Scheme 1720
- Northern Europe 1763
- East India Company 1772
- Emerging markets 1809-1838
- Railways 1847-1873
- Commodities 1890-1920
- Great Crash of 1929
- Bretton Woods collapse 1973
- Savings & Loans 1980

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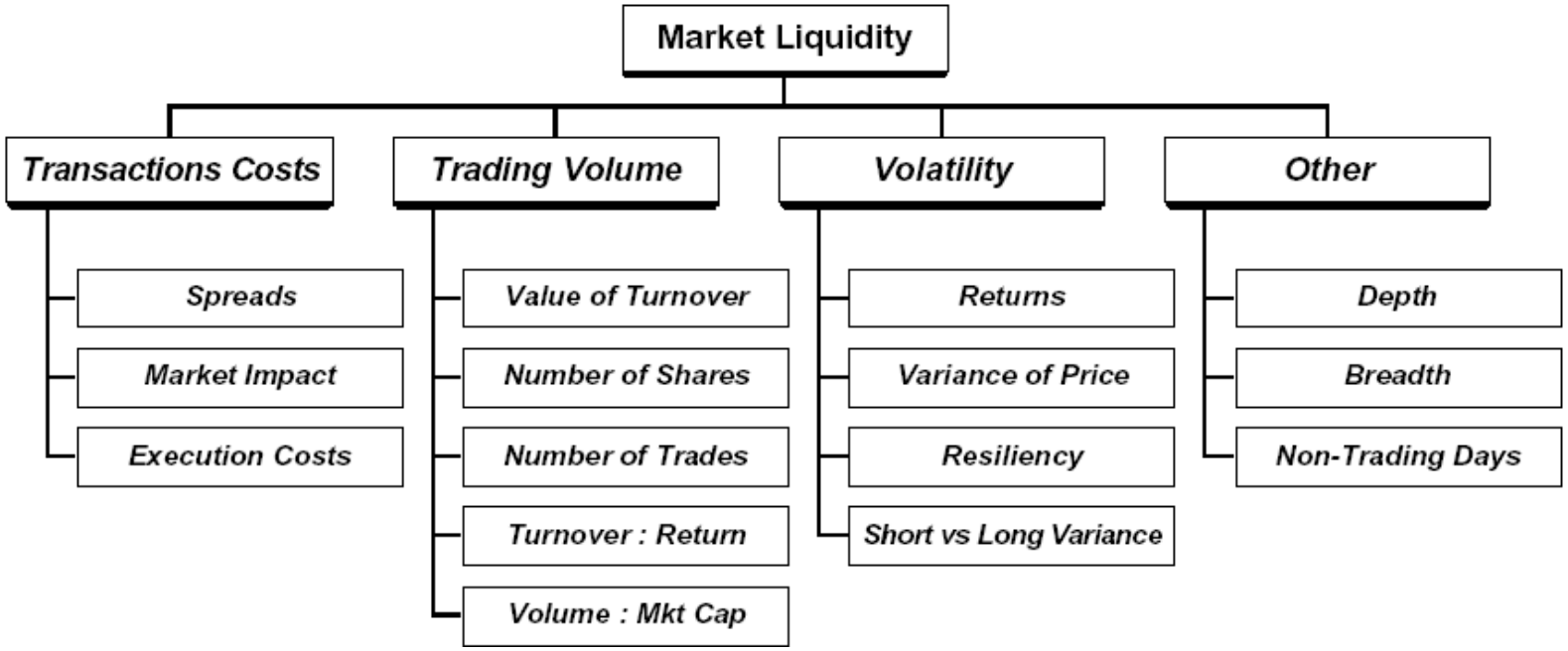
A Modern Perspective

- Third World Debt 1982
- Black Monday 1987
- Junk Bonds 1988
- Japanese Bubble 1990s
- US Bond Crash 1994
- Mexican Crisis 1995
- Asian Crisis 1997
- Russian Crisis 1998
- Long Term Capital Management 1998
- Dotcom Crash 2000
- September 11 Disruption 2001
- Argentine Crisis 2002
- Credit Crunch 2007

Liquid Measures

- Resilience
- Depth
- Tightness



[Source: Holl and Winn, 1995]

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Bull or Bear?

"They chose those two animals to represent the stock market because your broker will feed you all the bull you can bear."

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Liquidity Or Leakage

Plumbing Problems With Cryptocurrencies

Rodney Greene & Bob McDowall
Authors

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Liquidity Or Leakage: Approach

- Cryptocurrency MDLs – Introduction And Security Risks
- Cryptocurrency Liquidity And Market Risk Factors
  - The Crypto Market's Liquidity Risk
  - So What's Creating Crypto Illiquidity?
  - Crypto Market Risk Factors
- Smart Contracts – The Legal Risks
- Smart Contracts – A Path To Reduce Counterparty Credit Risk
- Conclusions

Cryptocurrency MDLs – Introduction

Mutual Distributed Ledger (MDL) Defined

A mutual distributed ledger (aka *blockchain*) is a computer data structure (an ordered chain of data blocks) with the following defining attributes:

- Mutual - shared across organizations and owned equally by all members of the network
- Distributed - copies of the data are spread across multiple locations. Each user on the network keeps her own copy, thus providing resilience and robustness
- Ledger - the structure is immutable. Once a transaction is written to the data structure it cannot be erased. This mean's the ledger's integrity can be easily proven.

Another way to think of mutual distributed ledgers is as permanent timestamping engines for computer records. Timestamps can be used to prove that data elements were entered at or before a certain time and have not been altered.

Mutual Distributed Ledger Security Vulnerabilities

- 51% Attack - a mining pool that controls 51% of an MDLs mining power can hard fork at will, potentially appending false transactions to the main chain of blocks
- Selfish Mining Attack – as described by [Eyal and Sirer, 2013], this attack requires just 33% of the total mining power

A quick look at the mining power of the major mining pools, Figure 2, suggests that two large pools could potentially collude to launch a successful selfish mining attack.

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Liquidity And Market Risk Factors

What Is Asset Liquidity?

- An asset is said to be liquid if one may transact it without materially impacting its prevailing market price
- We expect the rate of return for illiquid assets to exceed the rate of return for liquid assets (recall Figure 3). The rationale is an investor must be compensated for taking on liquidity (i.e., transaction) costs in an illiquid asset.
- Given the outlandishly high crypto-returns we expect to measure low levels of liquidity (conversely, high illiquidity) in this market

What Does The Index Of Martin Tell Us (Figure 4 – Figure 6)?

- The Bitcoin markets are all at least two orders of magnitude more illiquid than the large-cap equity market ETFs. This would help explain the outsized returns (due to the illiquidity premium) observed in the Bitcoin markets.
- Bitcoin illiquidity increased at least an order of magnitude from 2016 to 2017. Again, this illiquidity uptick contributed to the massive 2017 Q4 returns observed in the Bitcoin markets.
- There are material liquidity gaps between the different crypto trading venues

Liquidity And Market Risk Factors

The Crypto-Liquidity Black Hole

- Per [Mainelli 2007], to say that an asset market resides in a liquidity black hole means there is a positive feedback between trading and asset price – an increase in price causes more purchases whereas price reductions cause more sales
- Homogeneity of the incentives of the few large crypto-market participants (hoarders and miners) breads this illiquidity

- There is evidence of crypto-exchange hacking activity causing intra-exchange illiquidity 'pops'
- Illiquidity pops are correlated with dramatic changes in crypto-exchange rates
- The recent equity market decline occurs as there is moderate to high correlation between crypto-exchange rates and equity indexes

The Liquidity and Market Risk Headline Is…

The liquidity and market risks are quite substantial in the crypto-markets. To a large extent they are not hedge-able. Hence an investor must thoughtfully assess her appetite for assuming these types of risks. The number of vendors that transact in cryptos will be small until the exchange rate volatility becomes manageable and hedge-able.

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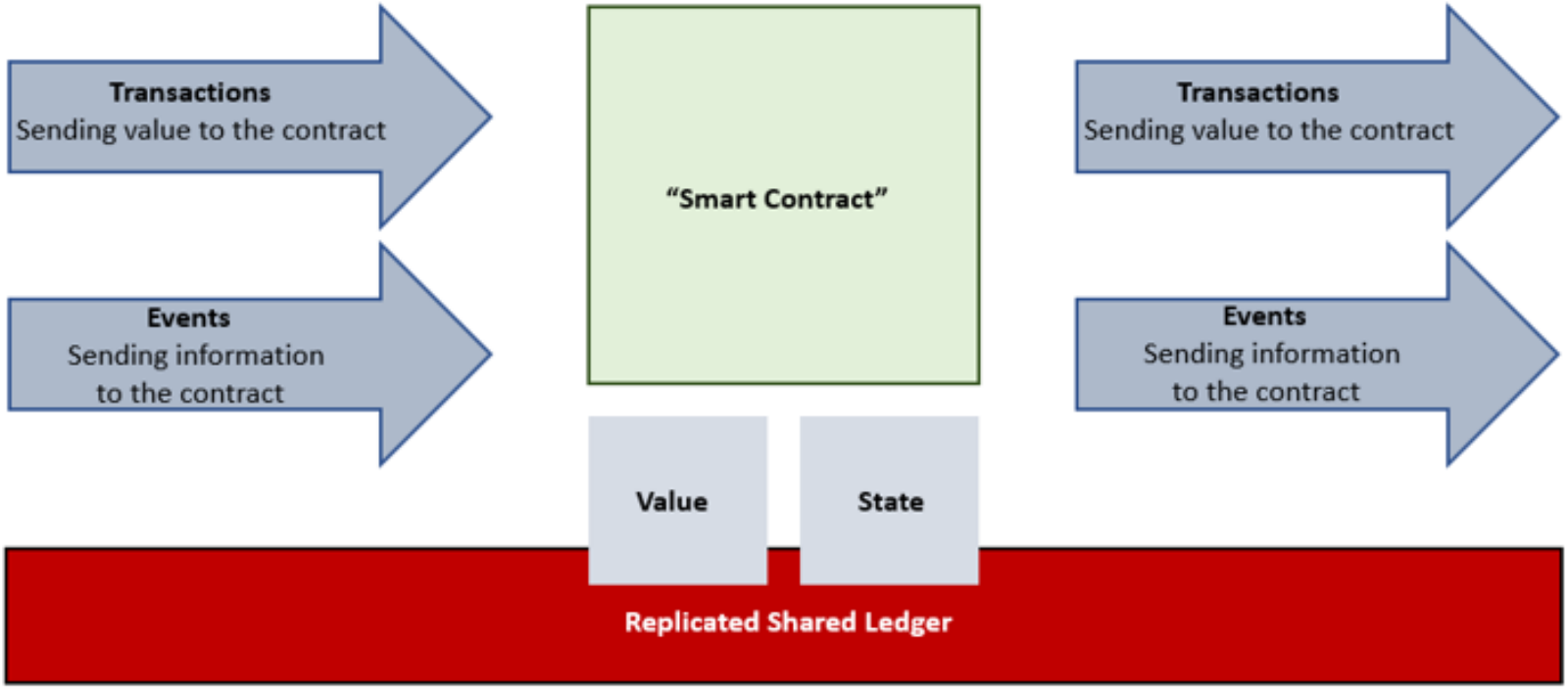
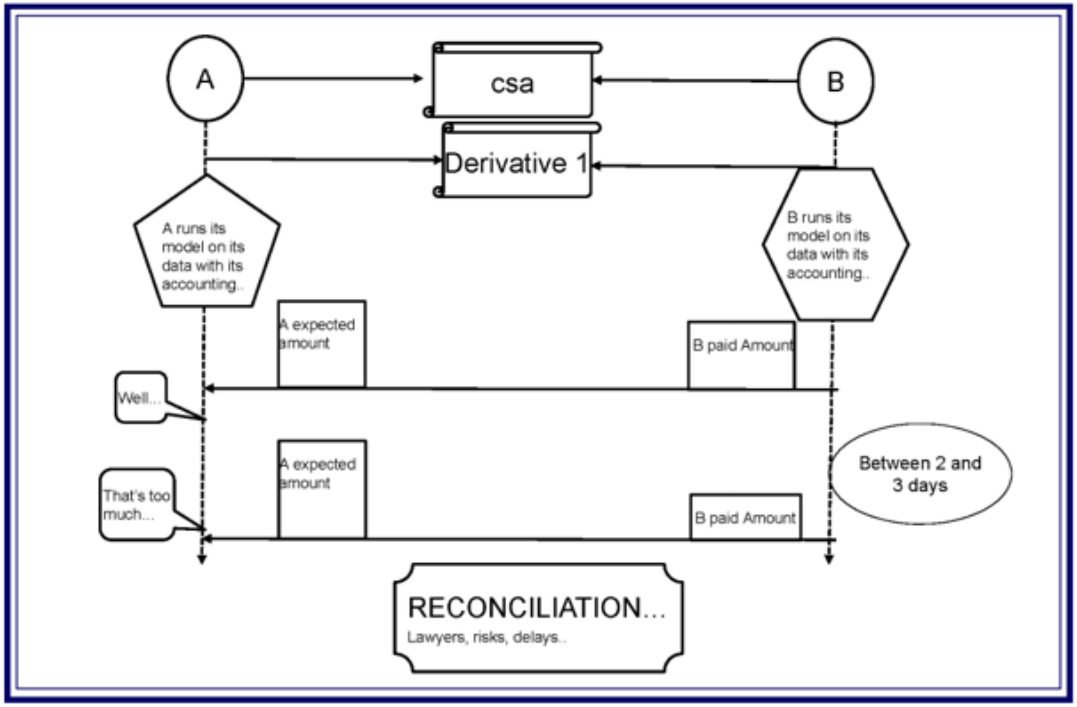
Smart Contracts – The Legal Risks



Smart Contracts - A Path To Reduce Counterparty Credit Risk

Exchange Name	Domicile	Derivatives Listed
Quedex	Gibraltar	1,2,3, month futures and European-style options on USD/BTC FX rates
Deribit	Netherlands	1,2,3, month futures and European-style options on USD/BTC FX rates
Digitex	Seychelles	BTC/USD, ETH/USD & LTC/USD future. 2018 – Q4 planned start
Teraexchange	USA	USD/BTC forwards, overnight to 2Y delivery tenor



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Conclusions

- Mutual Distributed Ledgers should employ best practice software development processes and information security protocols
- The impact of Meltdown and Spectre on MDLs and crypto-wallets has yet to be quantified but may be quite severe
- The extreme illiquidity and hyper-volatility make cryptocurrencies compelling assets for speculators but diminish their value proposition for vendors and regulated financial service firms
- The Index of Martin is a simple liquidity monitoring metric that can indicate the occurrence of 'illiquidity pops' in the cryptocurrency markets
- ISDA standardization of smart legal contracts will support scalability of these digital contracts, helping to cement their adoption by global investment banks
- The United Kingdom's common law system is inherently flexible enough to facilitate smart legal contracts and to quickly respond to the opportunities and challenges that they may present (including the question of enforceability)
- The OTC derivatives market must embrace transformational change to realise the cost-saving benefits of smart derivative contracts

The underlying mutual distributed ledger technology is evolving rapidly – it's reasonable to expect that given these factors, the conclusions in this paper may have to be amended in the near future

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Liquidity Or Leakage

Plumbing Problems With Cryptocurrencies

Panel Discussion

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Liquidity Or Leakage: For Discussion

1. The volatility of cryptocurrencies reflects the emotional trust of the human psyche, rather than any rationale analysis of their purpose and structure.

2. Liquidity is the critical prerequisite to providing credible value to cryptocurrencies. Without liquidity, they are no more than contemporary, highly prized collectibles.

3. Efficient, competent, competitive and cost effective exchange services (“good plumbing”) by credible providers are the source of the purest hygienic liquidity.

4. If cryptocurrencies behave, perform and compete like financial assets, they must be treated like financial assets, from a risk, reporting, regulation and taxation perspective.

5. National jurisdictional digital currencies will soon supplant the private cryptocurrency.

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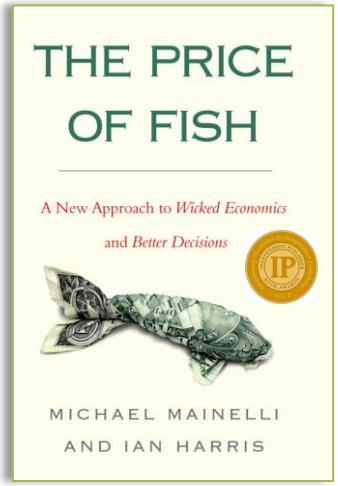
When Would We Know Our Commerce Is Working?

"Get a big picture grip on the details."
Chao Kli Ning



Thank you!

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