

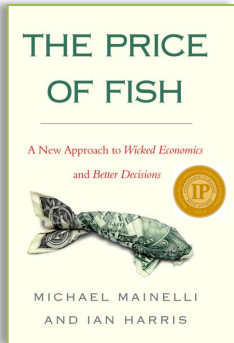


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Fraud In Finance



"Zest for Enlightenment"



Bitcoins & Blockchains Frauds, Fixes, or Future of Finance?"

Professor Michael Mainelli

Executive Chairman, Z/Yen Group Limited

19 November 2014

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www.zyen.com



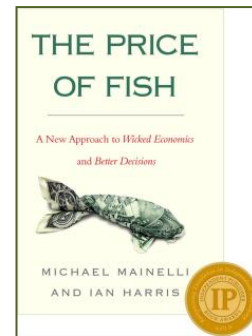


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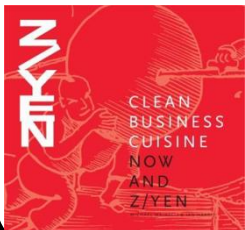
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- ◆ Special – City of London's leading commercial think-tank
- ◆ Services – projects, strategy, expertise on demand, coaching, research, analytics, modern systems
- ◆ Sectors – technology, finance, voluntary, professional services, outsourcing

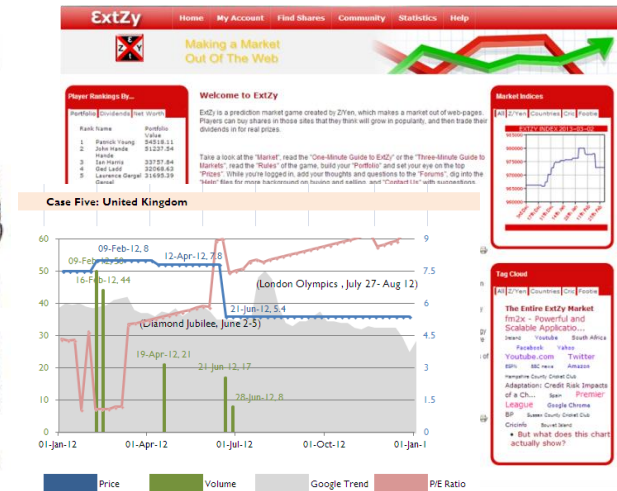
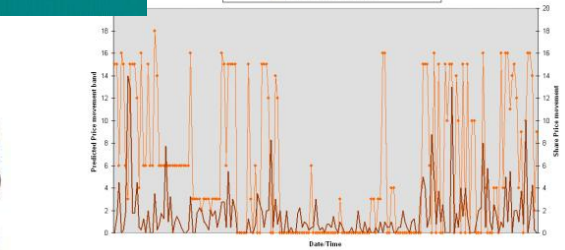


- Independent Publisher Book Awards Finance, Investment & Economics Gold Prize 2012 for ***The Price of Fish***
- British Computer Society **IT Director of the Year** 2004 for PropheZy and VizZy
- DTI **Smart Award** 2003 for PropheZy
- *Sunday Times* Book of the Week, ***Clean Business Cuisine***
-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





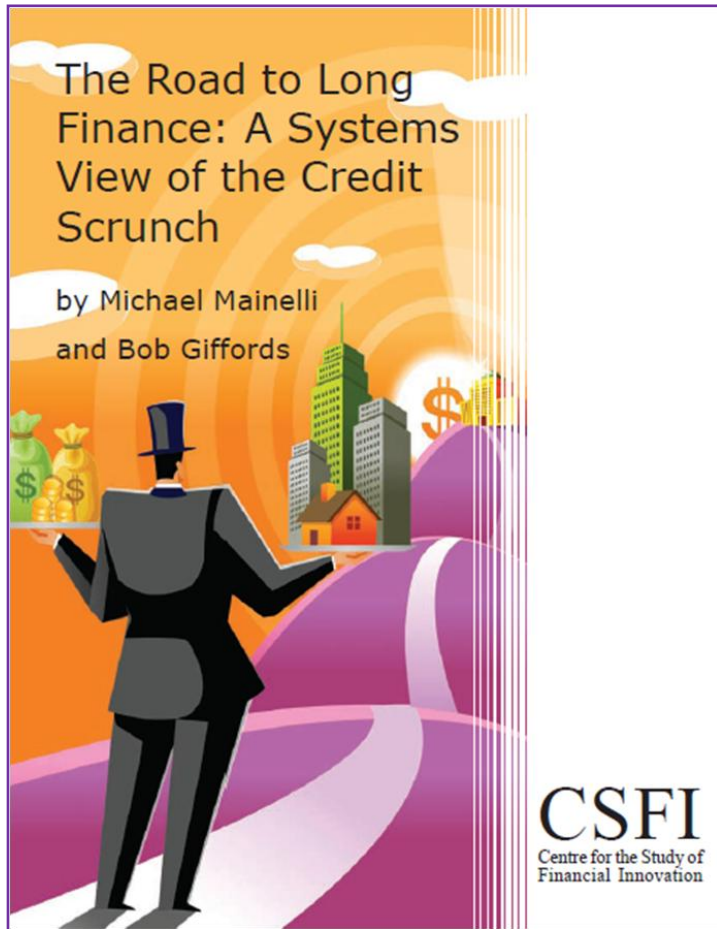
-
- 1 Axis: Non-Interpretation: Only
- 2 Axis: Actual & Predicted
The length of the yellow line represents the difference between actual and predicted values. The color of the line represents the difference between actual and predicted values.
- 3 Axis: The Difference between Actual & Predicted in Dimension 3 Axis





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About LONG FINANCE



‘When would we know our financial system is working?’

Objectives:

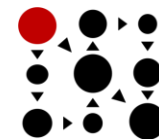
- ◆ Expand Frontiers
- ◆ Change Systems
- ◆ Deliver Services
- ◆ Build Communities



London
Accord



Financial
Centre
Futures

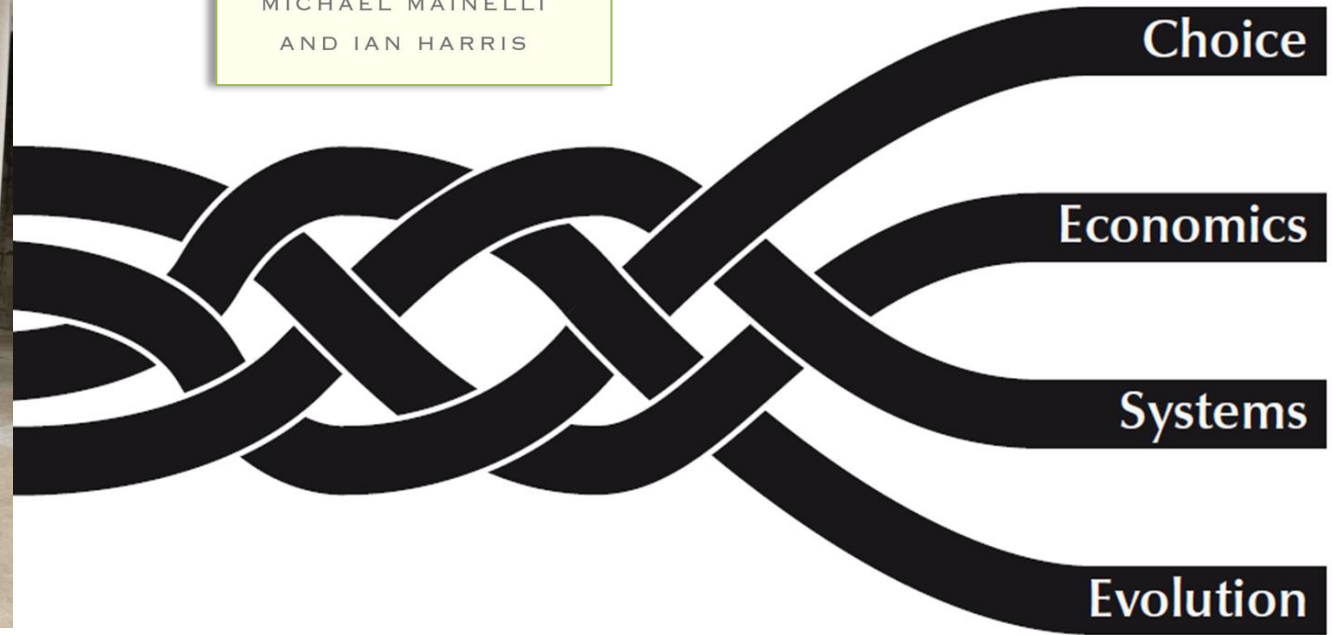
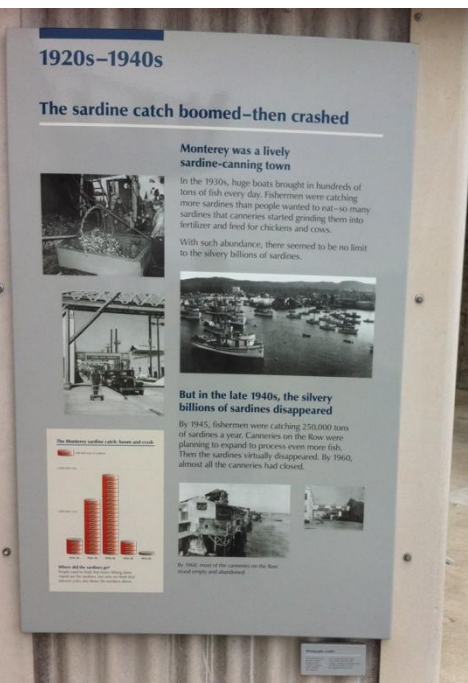
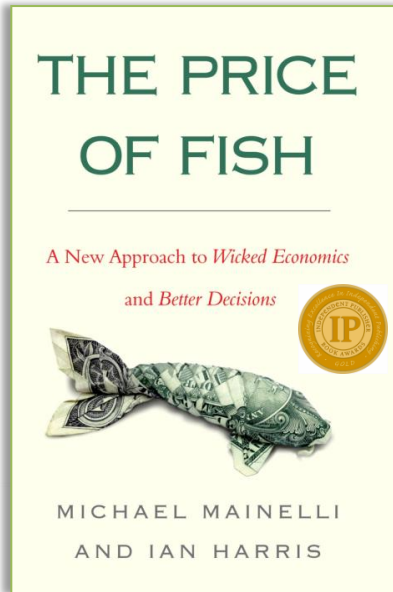


Meta-
Commerce



Eternal
Coin

2,000,000 Years of Commerce and We Still Don't Know The Price Of Fish





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Lunacy, Heresy, or Orthodoxy?

Measurement	- Confidence Accounting** - Long-Term Performance Measurement - Uses and Abuses of Discount Rates*
Financial System	- Insured Utility Banking* - Futures of Finance - Clustering* - Asset Management* - Global Financial Centres** - Emerging Markets* - Sell-Side Research
Monetary Systems	- Common Tenders* - Eternal Coin* - Cryptocurrencies (aka Alt Coins) and Blockchains*
Regulation	- Mortgages* - Voluntary Standards Markets* - Compliance Architectures
Governance	- Ethics - Ethical Banking*
Structure	- Pensions Indemnity Assurance and Internal Growth Rate Measures for Pensions** - Cyber Reinsurance*
Behaviour	Concepts of "Fairness"
Sustainability	- London Accord 2007** (24 integrated reports) & London Accord* - Burn it all?! - Policy Performance Bonds (Index-Linked Carbon Bonds & Index-Linked Forestry Bonds)*

(*) Indicates research at an active stage (**) Indicates research at an advanced stage



“Get a detailed grip on the big picture.”
Chao Kli Ning



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Bitcoins & Blockchains - Outline

- ◆ What is money?
- ◆ What are, Bitcoin, cryptocurrencies and AltCoins?
- ◆ What is blockchain technology?
- ◆ Might blockchains apply to traditional finance?
- ◆ Fraud, fix, or future?
- ◆ Discussion



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What Is Money?

- ◆ “Money is a matter of functions four, a medium, a measure, a standard, a store.”
- ◆ Textbook:
 - store of value – deferred payment
 - medium of exchange
 - unit of account
- ◆ Trilemma



MS 4631
Bulla-envelope with 11 plain and complex tokens inside.
Near East, ca. 3700-3200 BC



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What Is A Community?

From anthropology:

“Communities form when people are
indebted to one another”

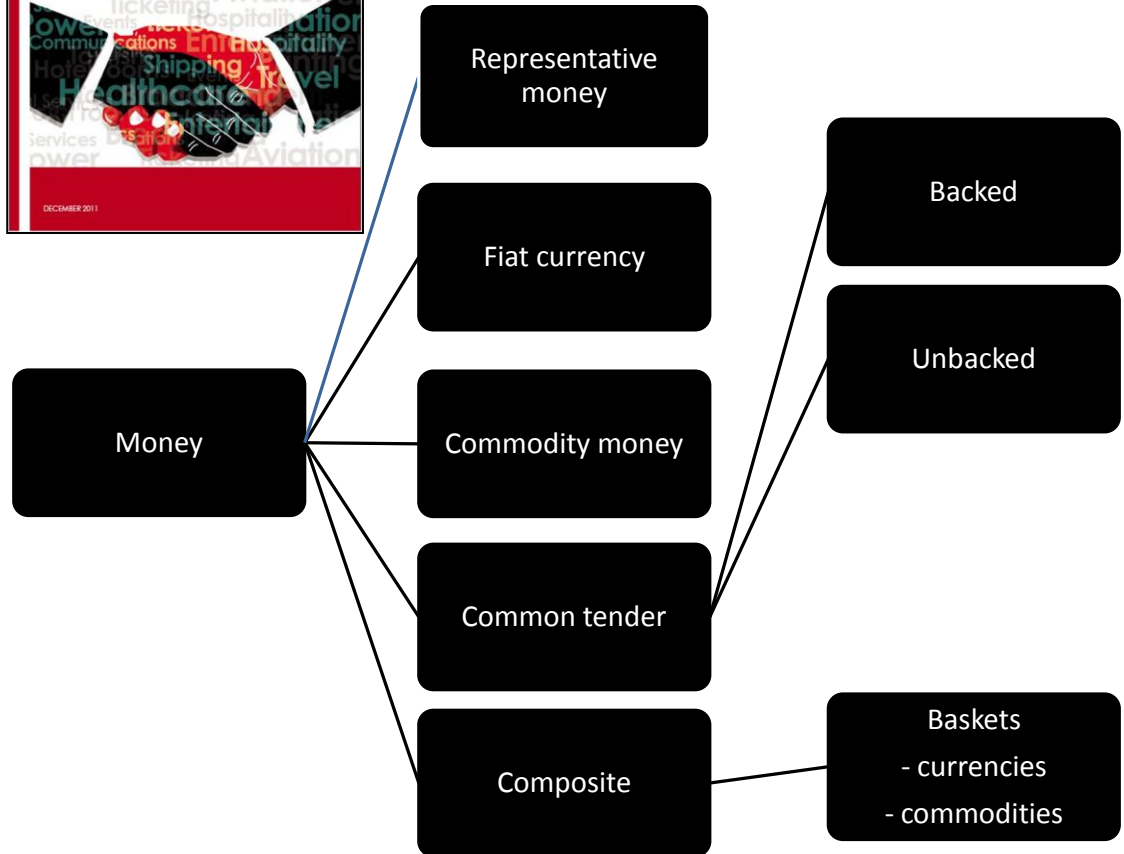
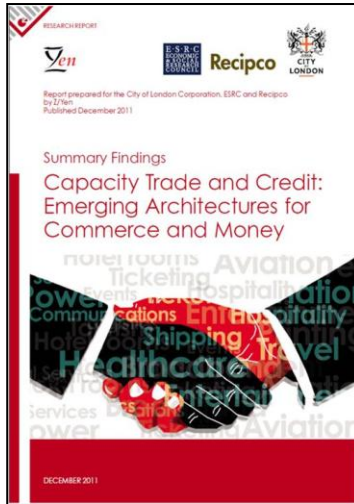
- basic membership indebtedness
- recorded indebtedness
- tradable indebtedness



Money as a Technology?

“Money is a technology people use to trade debts – typically a self-referential token-based system.”

“Tokens of indebtedness are desires frozen at a point in time – depend on the future persistence of the community and its values.”





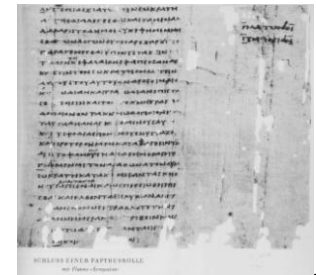
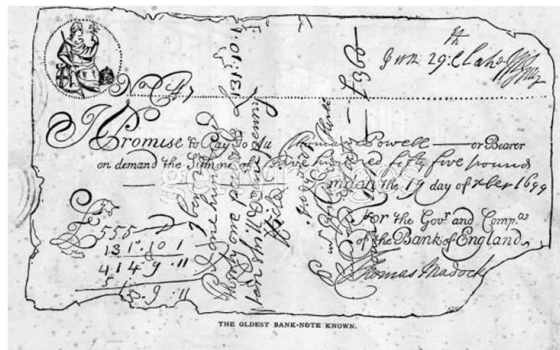
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Evolution In Time & Space



- ◆ Money 0.0 – communal village
- ◆ Money 1.0 – social tokens
- ◆ Money 2.0 – traded value, Mesopotamia
- ◆ Money 3.0 – gold & silver 1.0, Lydia
- ◆ Money 4.0 – bills of exchange, Northern Italy
- ◆ Money 5.0 – fractional reserve goldsmiths
- ◆ Money 6.0 – central banking 1.0 – cheques, 17th century
- ◆ Money 6.5 – gold & silver 2.0, 19th & early 20th century
- ◆ Money 6.0 – Richard Nixon & ultra leverage
- ◆ Money 7.0 – ?





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Semi-coercive Currencies

Fiat Currency = Tax Scrip

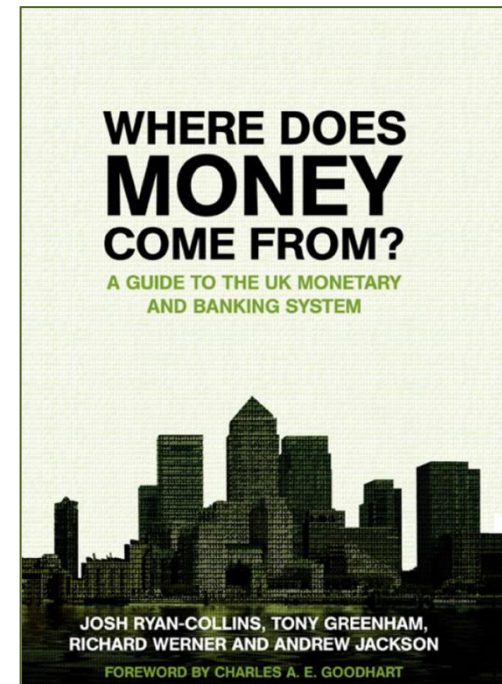
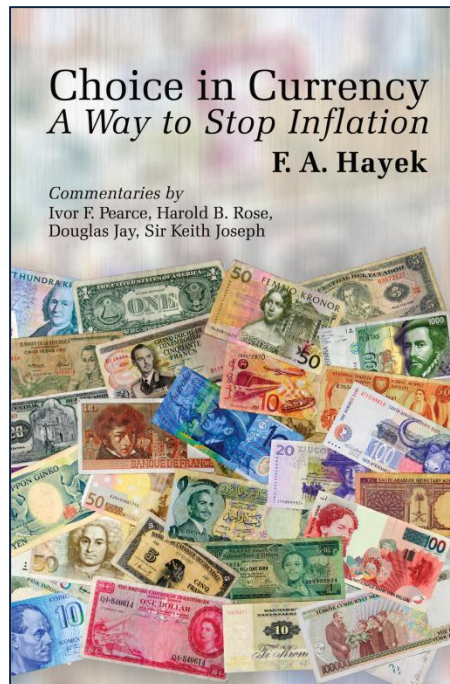
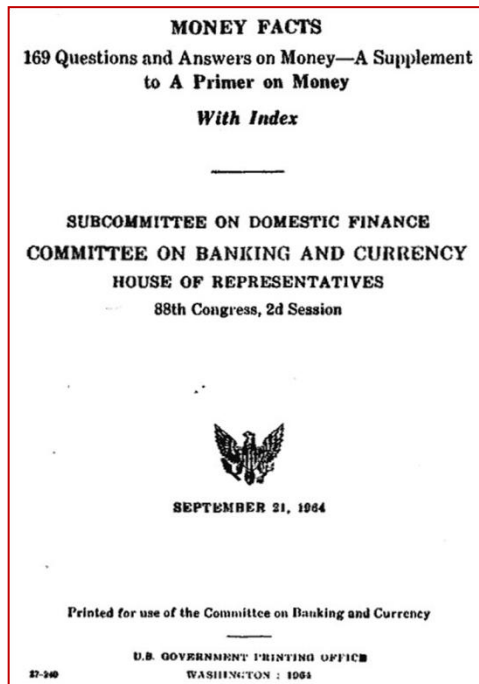




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Current Monetary Assumptions

- ◆ Fiat currency: semi-coercive, monopolist monies
- ◆ Fractional reserve = leveraged banking
- ◆ Tax scrip supply + bank debts = money demand





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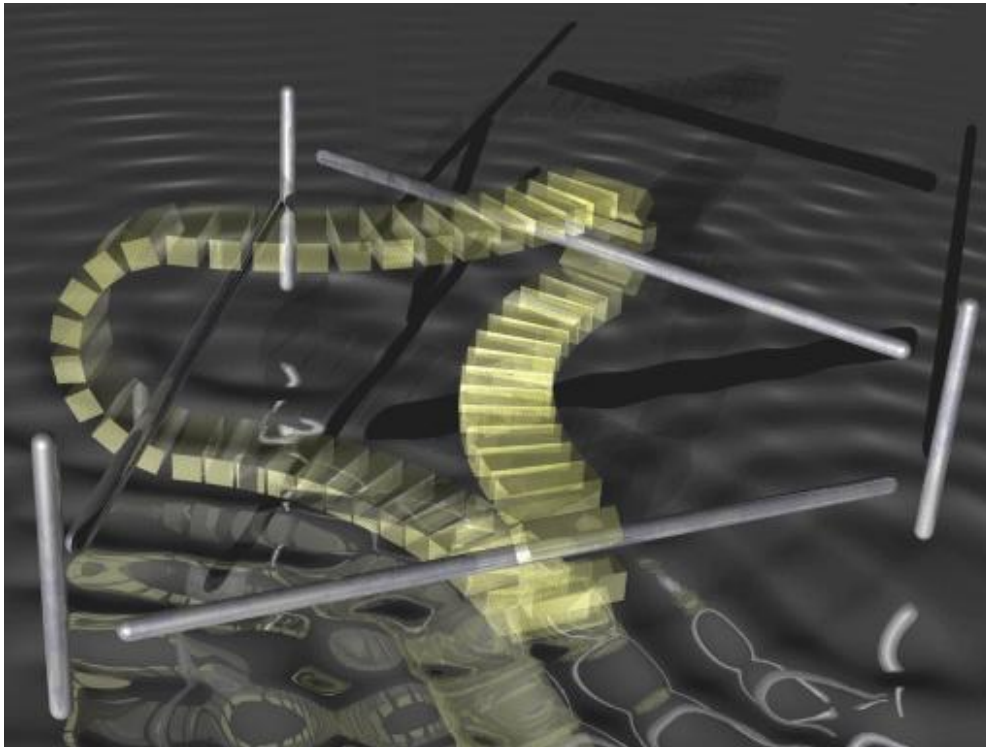
Thought Experiments On Fiat Currency As Tax Scrip

- ◆ What is the value of money if one person holds all the cash?
- ◆ What happens if you call your tax authority and tell them you just don't feel part of the community but will call in the future when you're back in the mood?
- ◆ What is the value of £1 in France versus a pound in the Shetlands?
- ◆ Why can't you go to your central bank and ask for a 'bucket' of GDP?
- ◆ If your nation won the 'put your feet up for a century' lottery – in what currency would you take your winnings?



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Time – Store of Value

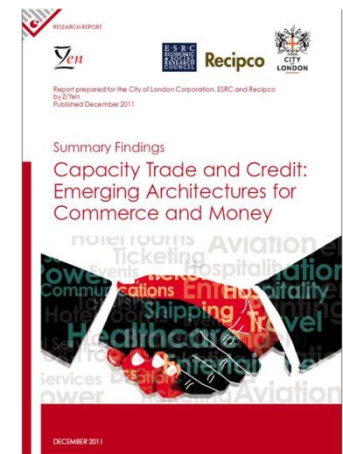
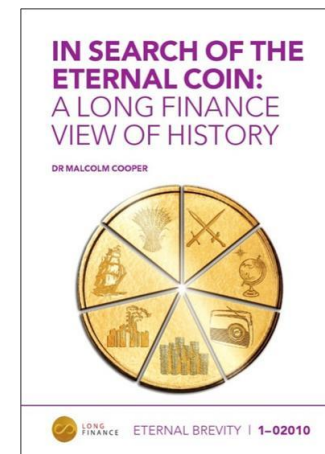


Self-referential system
upon which all our
analysis is based:

- ◆ What does GDP mean?
- ◆ Are competing currencies good or bad?
- ◆ Should money be a long term store of value?



[Source: <http://illusionsetc.blogspot.com/2005/08/moving-mobius-strip.html>]





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Money 7.0?

The Pembury Tavern
90 Amhurst Road
London E8 1JH
Tel. 020 8986 8597

Milton Pegasus (4.1% ABV) pint
£3.00
Subtotal £3.00
Bitcoin 0.0474 £3.00

Individual Pubs Limited
Pegasus House
Pembroke Avenue
Waterbeach
Cambridge
CB25 9PY

VAT reg no. 783 9983 50
A: £2.50 net, £0.50 VAT @
20.0% Total £3.00

Receipt number 721636
2013-06-25

[Courtesy of Michael Parsons,
@BitcoinByte]



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What Is bitcoin ?

1) *A new Bitcoin transaction is made.*



2) *It is added to a block of other pending transactions.*

Sender	Recipient	Amount
Elena	Joseph	5

3) *A miner checks each transaction for validity.*

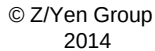
Sender	Recipient	Amount
		✓
		✓
		✓
Elena	Joseph	5 ✓

4) *The new block is added to the blockchain.*

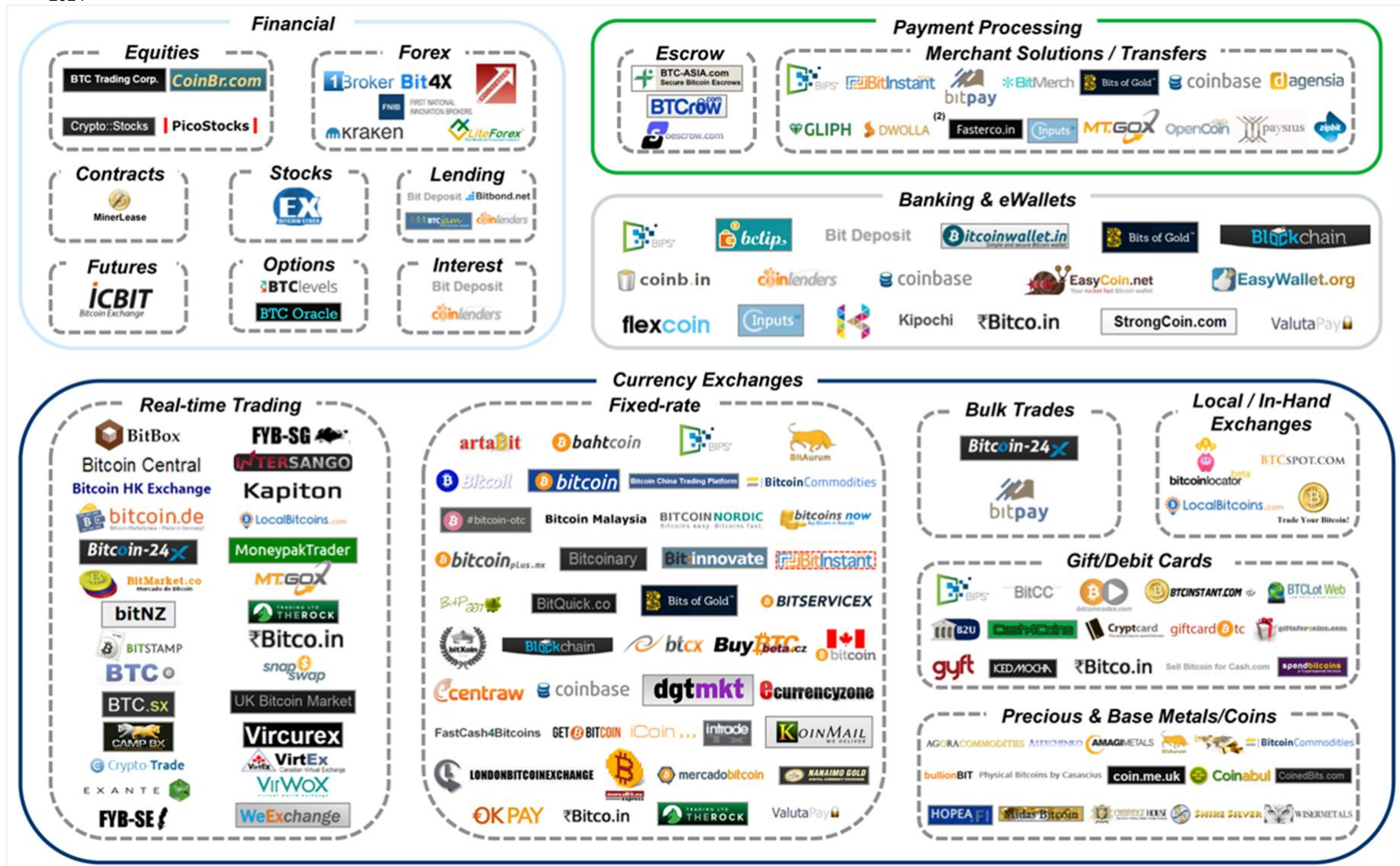


The whole process takes approximately 10 minutes.

Satoshi Nakamoto,
January 2009 launch



Enriching System



[Source: The Finanser - http://www.phplight.com/wp-content/uploads/2013/11/Bitcoin_Ecosystem_1170.png]



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Mining Is Hard Work – Bitcoin Preponderant

Crypto Currency	Current Difficulty	Est. Coins	Exchange Rate BTC	Exchange Volume	Revenue / Profit	Earn 1 BTC	Profit Ratio vs. BTC
Current Profitability Position	14 Day Difficulty Chart	(Current / 24 Hr Avg)	14 Day Exchange Rate Chart		(per day)	(in days)	(Current / 14 Day Average)
1 NeoCoin-SHA-256 (NEOS) Network Hashrate: 7 Block Reward: 50.00 Blocks: 18,663 Block Time: 5.00 minute(s)	 5,611,385.3759 -53.76 %	157,7380 / 72.9348	 0.00018020 (Bitfinex) -1.24 %	15.10 BTC 82,755.72 NEOS	\$9.30 / \$7.62 \$1.88 for electricity	35.18 0.02842440 BTC / day	 305.08 % / 41.52 %
2 Casinocoin (CSC) Network Hashrate: 101.64 MH/s Block Reward: 10.00 Blocks: 672,777 Block Time: 30.00 second(s)	 0.7967 -64.32 %	10,100.3085 / 3,603.7425	 0.00000204 (Cryptolay) 0.00 %	0.02 BTC 11,012.99 CSC	\$8.74 / \$4.34 \$2.40 for electricity	48.53 0.02060463 BTC / day	 173.83 % / -4.30 %
3 42 (42) Network Hashrate: 1.02 GH/s Block Reward: 0.000042 Blocks: 354,454 Block Time: 42.00 second(s)	 11.0481 -27.60 %	0.0031 / 0.0022	 6.41722318 (Cryptolay) -2.29 %	1.78 BTC 0.27 42	\$8.42 / \$4.02 \$2.40 for electricity	50.94 0.01963016 BTC / day	 161.06 % / 75.74 %
4 Starcoin (STR) Network Hashrate: 55.76 MH/s Block Reward: 50.00 Blocks: 1,346,563 Block Time: 30.00 second(s)	 0.5974 -46.75 %	67,346.2228 / 35,658.6308	 0.00000027 (Cryptolay) 0.00 %	0.06 BTC 235,246.70 STR	\$5.95 / \$3.55 \$2.40 for electricity	54.99 0.01618348 BTC / day	 142.11 % / 46.59 %
5 CHNCoin (CNC) Network Hashrate: 474.72 MH/s Block Reward: 88.00 Blocks: 551,504 Block Time: 1.00 minute(s)	 5.5559 +2.05 %	12,744.0717 / 13,012.0892	 0.00000138 (Bitfinex) +7.97 %	0.07 BTC 51,243.28 CNC	\$5.78 / \$3.36 \$2.40 for electricity	56.88 0.01758806 BTC / day	 134.31 % / 53.75 %
6 Myriadcoin-Script (MYR) Network Hashrate: 7 Block Reward: 1,000.00 Blocks: 650,233 Block Time: 2.50 minute(s)	 29.9072 +1.69 %	26,905.3049 / 27,366.5822	 0.00000058 (Cryptolay) +3.45 %	0.41 BTC 738,093.07 MYR	\$5.11 / \$2.71 \$2.40 for electricity	64.08 0.01560508 BTC / day	 108.34 % / 47.32 %
7 Franko (FRK) Network Hashrate: 234.68 MH/s Block Reward: 0.25 Blocks: 1,107,260 Block Time: 30.00 second(s)	 1.6459 -20.11 %	122,2250 / 97,6488	 0.00012506 (Cryptolay) +2.32 %	0.54 BTC 4,395.71 FRK	\$5.00 / \$2.60 \$2.40 for electricity	65.42 0.01528546 BTC / day	 104.15 % / 47.00 %
8 Lycancoin (LYC) Network Hashrate: 150.25 MH/s Block Reward: 2,570.00 Blocks: 127,388 Block Time: 2.50 minute(s)	 4.7463 0.00 %	503,518.8780 / 503,238.3787	 0.00000003 (Cryptolay) 0.00 %	0.04 BTC 1,209,644.16 LYC	\$4.94 / \$2.54 \$2.40 for electricity	66.20 0.01510557 BTC / day	 101.80 % / 71.29 %
9 Spots (SPT) Network Hashrate: 52.59 MH/s Block Reward: 24.00 Blocks: 246,249 Block Time: 1.17 minute(s)	 0.8500 -2.61 %	22,719.5938 / 22,126.1450	 0.00000066 (Cryptolay) 0.00 %	0.01 BTC 9,139.69 SPT	\$4.91 / \$2.51 \$2.40 for electricity	66.89 0.01499493 BTC / day	 100.35 % / 34.14 %
10 Bitcoin (BTC) Network Hashrate: 320.44 PH/s Block Reward: 25.00 Blocks: 323,527 Block Time: 10.00 minute(s)	 34,661,425,923.9769 0.00 %	0.0128 / 0.0128	 1.00 (spot \$327.28) +0.33 %	48,740.63 BTC	\$4.18 / \$2.50 \$1.88 for electricity	78.32 0.01276821 BTC / day	 100.00 % / 100.00 %
11 Emerald (EMD) Network Hashrate: 188.62 MH/s Block Reward: 5.00 Blocks: 1,746,047 Block Time: 20.00 second(s)	 0.8889 -4.28 %	4,525.9898 / 4,332.2722	 0.00000330 (Cryptolay) +0.30 %	0.05 BTC 14,272.18 EMD	\$4.89 / \$2.49 \$2.40 for electricity	66.95 0.01493577 BTC / day	 99.57 % / 46.13 %
12 DNotes (NOTE) Network Hashrate: 1.23 GH/s Block Reward: 25.00 Blocks: 328,548 Block Time: 1.00 minute(s)	 16.6442 -2.05 %	1,208.6229 / 1,183.7330	 0.00001226 (Bitfinex) -0.89 %	1.19 BTC 96,048.91 NOTE	\$4.85 / \$2.45 \$2.40 for electricity	67.49 0.01481772 BTC / day	 98.02 % / 69.29 %

[Source:
<http://www.coinwarz.com/cryptocurrency#>]



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Bitcoin - Medium Of Exchange?

- ◆ Lower transaction costs
 - No third party to financial transactions
 - Alternative to cash
- ◆ Public ledger of transactions (history)
 - Secure and transparent e-commerce and money transfer
 - No counterfeiting
- ◆ Design depends on public key cryptography – ‘forged’ (sic) in a tough environment – wallet thefts only ‘break’
- ◆ Design depends on ‘mining’ – who pays? regulation needed?
- ◆ High price volatility to date encourages speculation and hoarding
- ◆ Fixed BTC supply will limit inflation, possibly lead to deflation and hoarding
- ◆ Lack of consumer/user protection
- ◆ Capital controls? Inter-currency?



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How To Evaluate: Fixed or Flexible *Element*?

Pecunium

Periodic Table of the Elements



1 1IA 11A	2 IIA 2A											13 IIIA 3A	14 IVA 4A	15 VA 5A	16 VIA 6A	17 VIIA 7A	18 VIIIA 8A
1 H Hydrogen 1.0079																	2 He Helium 4.00260
3 Li Lithium 6.941	4 Be Beryllium 9.01218											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.00674	8 O Oxygen 15.9994	9 F Fluorine 18.998403	10 Ne Neon 20.1797
11 Na Sodium 22.989768	12 Mg Magnesium 24.305	3 IIIB 3B	4 IVB 4B	5 VB 5B	6 VIB 6B	7 VIIB 7B	8 VIII 8	9 VIII 8	10 VIII 8	11 IB 1B	12 IIB 2B	13 Al Aluminum 26.981539	14 Si Silicon 28.0855	15 P Phosphorus 30.973762	16 S Sulfur 32.066	17 Cl Chlorine 35.4527	18 Ar Argon 39.948
19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.95591	22 Ti Titanium 47.88	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938	26 Fe Iron 55.847	27 Co Cobalt 58.9332	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.732	32 Ge Germanium 72.64	33 As Arsenic 74.92159	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80
37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.90585	40 Zr Zirconium 91.224	41 Nb Niobium 92.90638	42 Mo Molybdenum 95.94	43 Tc Technetium 98.9072	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.9055	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.71	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.90447	54 Xe Xenon 131.29
55 Cs Cesium 132.90543	56 Ba Barium 137.327	57-71 Lanthanide Series	72 Hf Hafnium 178.49	73 Ta Tantalum 180.9479	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.9665	80 Hg Mercury 200.59	81 Tl Thallium 204.3833	82 Pb Lead 207.2	83 Bi Bismuth 208.98037	84 Po Polonium [208.9824]	85 At Astatine 209.9871	86 Rn Radon 222.0176
87 Fr Francium 223.0197	88 Ra Radium 226.0254	89-103 Actinide Series	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [269]	109 Mt Meitnerium [268]	110 Ds Darmstadtium [269]	111 Rg Roentgenium [272]	112 Cn Copernicium [277]	113 Uut Ununtrium unknown	114 Uuq Ununquadium [289]	115 Uup Ununpentium unknown	116 Uuh Ununhexium [298]	117 Uus Ununseptium unknown	118 Uuo Ununoctium unknown
		57 La Lanthanum 138.9055	58 Ce Cerium 140.115	59 Pr Praseodymium 140.90765	60 Nd Neodymium 144.24	61 Pm Promethium 144.9127	62 Sm Samarium 150.36	63 Eu Europium 151.9655	64 Gd Gadolinium 157.25	65 Tb Terbium 158.92534	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93032	68 Er Erbium 167.26	69 Tm Thulium 168.93421	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967	
		89 Ac Actinium 227.0278	90 Th Thorium 232.0381	91 Pa Protactinium 231.03588	92 U Uranium 238.0289	93 Np Neptunium 237.0482	94 Pu Plutonium 244.0642	95 Am Americium 243.0614	96 Cm Curium 247.0703	97 Bk Berkelium 247.0703	98 Cf Californium 251.0796	99 Es Einsteinium [254]	100 Fm Fermium 257.0951	101 Md Mendelevium 258.1	102 No Nobelium 259.1009	103 Lr Lawrencium [262]	
		Alkali Metal	Alkaline Earth	Transition Metal	Basic Metal	Semimetals	Nonmetals	Halogens	Noble Gas	Lanthanides	Actinides						



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Bitcoin – Store Of Value?

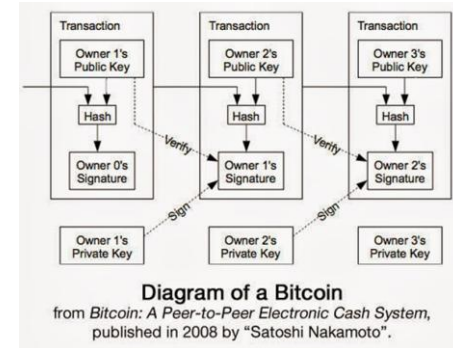
- ◆ Virtual Element - modeled after gold - no interest, limited supply - where's the community? – no backing
- ◆ Uncertainty around long-term value - high price volatility leads to speculation
- ◆ Mining centralisation (51%) - though new blockchain protocols try to address that
- ◆ How to incentivise block validation if not currency-based protocol?
- ◆ Compatibility with, and enforceability within, existing legal frameworks, e.g. smart contracts, DAOs
- ◆ Future evolution of money? Stores versus Exchange?



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What Is Blockchain Technology?

- ◆ Blockchain = a database
 - Aka 'chain of blocks of transactions'
 - A publicly accessible ledger of all transactions that have ever occurred in a protocol
 - Fully decentralized and accessible to every node of the system (protocol)
- ◆ Requires 'proof of work' to verify blocks
- ◆ Technology emerged with the creation of Bitcoin in 2009
 - Other protocols exist e.g. Ethereum
- ◆ Can host applications e.g. smart contracts, decentralised autonomous organisations

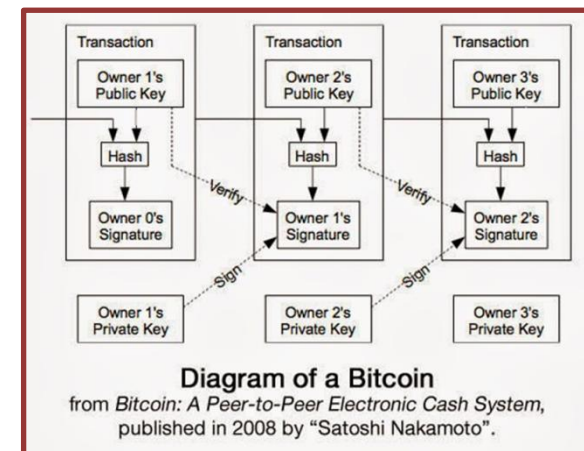




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What's Interesting About Blockchains?

- ◆ Displaces two roles of trusted third parties:
 - **No double transactions*** - can't sell the same thing twice
 - **Public history*** - one unified, unalterable state of the transaction ledger shared by all nodes
 - Trusted identity – initial entry requires high degrees of trust but then system operates on a trustless basis
- ◆ Decentralised - robust, no central control or authority required to coordinate behaviour or interaction





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Might Blockchains Apply To Traditional Finance?

- ◆ Registries – ships, aircraft, artworks, tax, ...
“crypto custodians”
- ◆ Trade reporting, consolidated tapes
- ◆ Personal insurance or data blockchains with smart insurance contracts
- ◆ Identity blockchains for anti-fraud protection or anti-money laundering
- ◆ Persistent exchanges
- ◆ Corporate voting
- ◆ Accounting registries
- ◆ Multi-entity contracting, virtual contract companies





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Smart Contracts & Decentralised Autonomous Organisations

Blockchain	Smart Contracts	Decentralised Autonomous Organisations (DAOs)
Bitcoin	Counterparty (P2P financing on Bitcoin)	EIRIS (platform for creating DAOs)
Agora Voting	Proof of Existence (notary system)	Bitshares ('banking' community of DAOs and investment)
Ethereum (platform for creating coins)	Monegraph (art registry)	Hyperledgers and Sidechains
Twister (decentralised microblogging)	Smart Property (still conceptual, e.g. Intellectual Property)	Atomic



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Blockchains - Socially Useful?

Theme	Service	Question
Trust	Identities	communities
Space	Transactions	services
Time	Debts	value-added

Thoughts – Fraud, Fix, or Future?

- ◆ Fraud –unlikely to be riskier than current, just new
- ◆ Fix – innovations exploding
- ◆ Future:
 - Any technology that reduces product costs radically, here “trusted third party” costs, proliferates the product, e.g. the printing press and publishing
 - AltCoins will proliferate but may or may not flourish as independent currencies
 - Government AltCoins are inevitable – Peru, Iceland,...
 - Corporate AltCoins are exciting – shipping container miles? Air Miles versus Chair Miles?
 - Blockchain technology will be used for many financial applications

“Money isn’t everything but it sure keeps you in touch with your employees.”
[children] – to paraphrase John Paul Getty



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Do We Know What We're Doing?

Ben Bernanke



What Congress thinks I do



What Keynesian Economists think I do



What Austrian Economists think I do



What I tell people I do



What I actually do



How history will remember me



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When Would We Know Our Commerce Is Working?

- ◆ When we're equitable - space?
- ◆ When we're sustainable - time?
- ◆ When we're happy?

