



Eternal Coin



A global discussion on the nature of money and the concept of value

Economic Simulation And Control Of Cryptocurrencies:

Simulator Development Launch

Wednesday, 19 September, 2018
London

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<http://www.longfinance.net/programmes/the-eternal-coin>



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Agenda

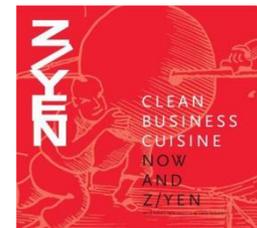
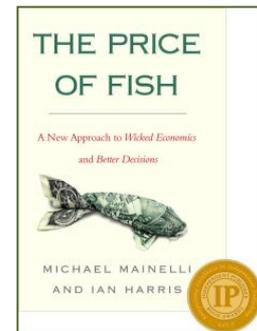
- | | |
|---------------|---|
| 08:45 – 09:00 | Registration |
| 09:00 – 09:15 | Welcome, Introduction & Background <i>Professor Michael Mainelli, Executive Chairman, Z/Yen Group</i> |
| 09:15 – 09:30 | Prototype Software Demonstration <i>Matthew Leitch, Consultant and Researcher</i> <i>Ben Morris, Developer</i> |
| 09:30 – 09:35 | Control, Not Prediction, Matthew Leitch |
| 09:35 – 10:15 | Key Choices For This Project, Matthew Leitch Choices about cryptocurrency features Choices about economic environment features Choices about human behaviour features Choices about control mechanism features |
| 10.15 – 10:30 | Questions & Answers |
| 10:30 | 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





Eternal Coin Research Programme

An educative programme teaching the theory and mechanics of currencies, and initiating discussion on the composition of a currency which would enable sustainability.

The Eternal Coin encompasses discussion on the composition of currencies which might, for example, enable sustainability. Ultimately, Eternal Coin aims to provide an online tool or "playpen" which will enable communities to design, create and transact with their own currency, whatever form that may take.

Related events

[In Search of the Eternal Coin: A Long Finance View of History, Publication Launch](#),
Long Finance roundtable in collaboration with Gresham College, 25 March 2010

Related articles

Malcom Cooper, Ian Harris and Michael Mainelli, "[Storing Value: The Eternal Coin](#)", IPE Magazine, November 2010

Michael Mainelli, "[The Eternal Coin](#)", Quintessence, BNP Paribas, Spring 2010

Michael Mainelli, "[The Eternal Coin - Made From Real Money: Risks In Fiat Currencies](#)", *Journal of Risk Finance*, volume 11, number 1, January 2010



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



Possibly Distributively Ledgerable

| Financial Instruments, Records, Models | Public Records | Private, Semi-Private/Semi-Public Records | Physical Keys, Intellectual Property, Other Records |
|--|-------------------------------------|---|---|
| Currencies | Land & Property Titles | Contracts | Home Key |
| Derivatives | Vehicle Registries | ID | Hotel Key |
| Commodities | Shipping Registries | Signature | Office Key |
| Insurance Policies | Satellite Registries | Will | Car Key |
| Trading Records | Business License | Trust | Deposit Box Key |
| Private and Public Equities | Business Ownership Records | Escrow | Mail Box Key |
| Certificates of Deposit | Incorporation / Dissolution Records | Other Classifiable Data | Internet Of Things |
| Bonds | Regulatory Records | High School / University Degrees | Copyrights & Patents |
| Voting Rights (Financial Services) | Criminal Records | Professional Qualifications | Licenses |
| Credit Data | Passport | Certifications | Digital Rights Management |
| Collateral Management | Birth / Death Certificates | Human Resources Records | Trademarks |
| Client Monies Segregation | Voting ID | Medical Records | Proof Of Authenticity / Authorship |
| Mortgage / Loan Records | Health & Safety Inspections | Accounting Records | Cultural Events |
| Crowd-Funding | Tax Returns | Business Transaction Records | Historical Events |
| P2P Lending | Building & Other Types Of Permits | Locational Data | Documentaries |
| Microfinance | Court Records | Genome & DNA | Big Data |
| Account Portability | Government / Listed Companies | Arbitration | SIM Cards |
| Airmiles / Corporate Tokens | Accounts & Annual Reports | Genealogy Trees | Archives |



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

Home About Press Contact us

Last Metro Time 2016-01-24 19:20:36.105496

Last Timestamp 14s ago

Average Duration 14s

MetroGnomo **BETA** Open-Source Distributed Timestamps

Home About News

View Live Ledger

Current Time 2016-03-26 11:17:33 AM

Last Metro Time 2016-03-26 12:15:01.964577

Last Timestamp 153s ago

Average Duration 201s

Timestamp Time (s)

Average Timestamp Duration (s)

Show 10 entries

Search:

| UUID | Metro Time | RowHash | TableHash | Tag |
|-----------|---------------|---------------------------------|-----------------------------------|--------------------------------------|
| 902053a5 | | | | |
| -5b2c-477 | 2016-03-26 1 | 47d450e098d71671e1c078648733707 | 32fdb23d0697a4a2342cf1864c9085010 | |
| e-95cb-90 | 2:15:01.96457 | 8ac1b9e0928c286fb704e522d599d0e | daee2f9337fc36fa4bef21e7e67319 | 2016-03-26T12:15:01+00:00@metape.org |
| 47577ef57 | 7 | 6 | | |

Stamp Time (s)

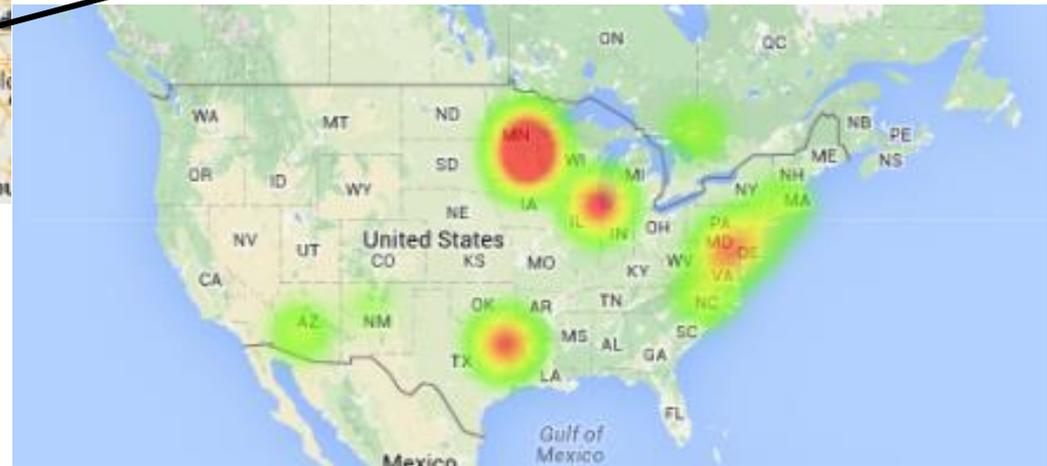
Average Timestamp Duration (s)

Search:

| RowHash | TableHash | Tag |
|---|--|---|
| 450ff4031de277cebdabd67838d8 418b24ad998093fc1ecb9d4ce2a85c | 4eb384a98d13c03592881cc0f3cdbe10c50 e2d4659fe9b629bfb36d01b97709 | 186.223.80.46 |
| df44895a0a225ab9a938a411993192 265d85c106d4fe319ce4784cd495d | 6ec8845f38c3b1647ac8faf2f652318be585 aad7d42338ec8aaf7ce09e490d53 | The+seular+cooling+hat+must+someday+overtake+our+planet+has+already+gone+far+in+deed+with+our+neighbor. |
| 07f104e5ba0d3eb88859e90904f0 c055bf6e208cbf5774dde2cd2a885 | 772f534b6ca60d138ab7e87780c0dc16c84 dc089728bc808967eb5c0ed88aff | 63+Jackson+Blvd, Northleach,+MT,+61794 |
| 64850903967119b0702b09ead9fa0 5680b00b7e6a143d8894101810b2 | c9364abae46b5062756e20703b79874337 4aca5c3e2a32281e6289d290a4e31c | Jackson+Ave |
| 4b059cc2aef68cb8cf4c18e40305 9492bf9ab8ebd48020bc3783d580a | ce7c928eddb0a2e3d6a1c0300e7110f75eb 38319dab8c4e9d1cc7be91bce72f1 | San+Martin |
| 0185e888-4a74-49fb-8c0 c-cb55cc4f417f | 2016-01-24 19:20:26.909764 | |
| cbc804ae874c8872a6115e2fa43f437f3 d404d2e3d0945872ebfb809f1585d2 | b7242a10e501cf4fd7647ef5a5385058ba26 e592fd82bfb800ef0daa4bafade | elizabethmiller@test.com |

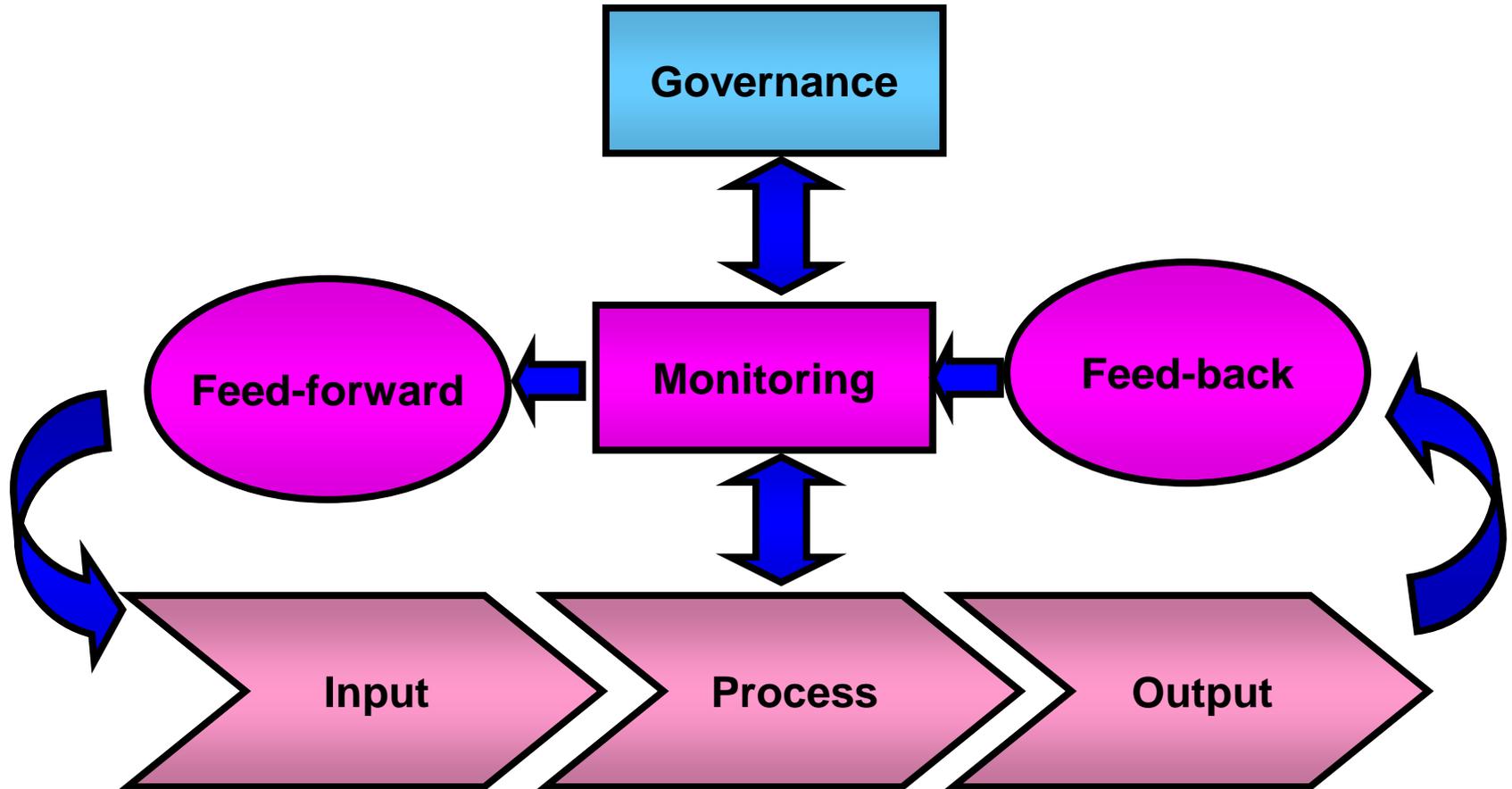


Application: Clinical Trials





Viable Systems Model





Economic Simulation And Control

Prototype Software Demonstration



**Matthew
Leitch**



**Ben
Morris**



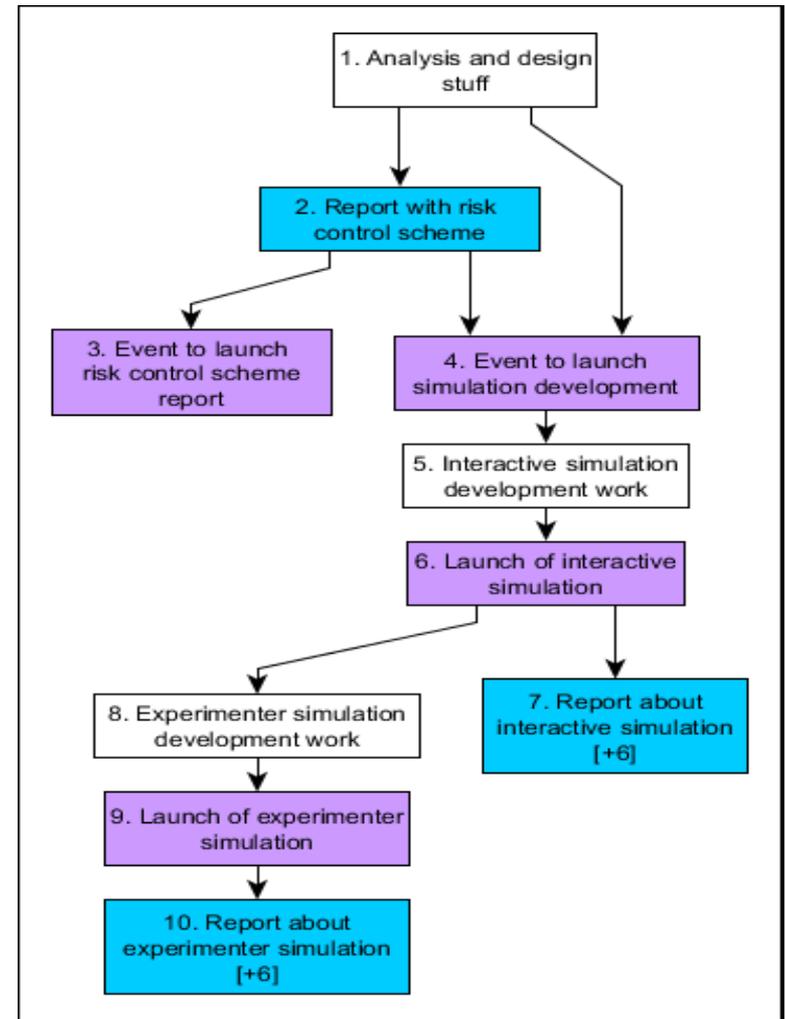
Overall Project Objectives

- ◆ To develop an economic simulator capable of simulating characteristics of hypothetical cryptocurrencies, their users, environment, exchanges, etc.
- ◆ To be freely available to use online.
- ◆ Supporting design, development, control, and perhaps also regulation of cryptocurrencies.
- ◆ With the goal of making them genuinely useful and competitive as currencies and electronic payment systems, in the long term too.
- ◆ The first version of the simulator will be an interactive one. In future there will also be an 'experimenter' for more rigorous and automated explorations.



What Comes Next?

- ◆ Get some input on what to include in the simulator (Today)
- ◆ Launch an interactive simulator (November 2018)
- ◆ Launch a more powerful experimenter system (Q1 2019)





This Meeting And Demonstration

- ◆ We must invent and prioritise the features of the simulation and hope you can help us today.
- ◆ We already have more ideas than we can build.
- ◆ The prototype shows the overall look and idea, but has almost none of the simulation details built in.
- ◆ Some things to see:
 - Choose a simulation and view trials so far
 - Run a trial in stages
 - The same trial settings again but different results
 - Try increasing the promotional effort



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Control, Not Prediction



A Realistic Goal For Simulation

- ◆ Real markets and currencies are unpredictable; they are largely efficient markets where almost everything predictable is already built into the price.
- ◆ Prediction of cryptocurrency prices, or even their overall rise or fall, is unlikely to be possible.
- ◆ Analysing the decisions of the agents in the simulation only reinforces this assessment. They are very complex and influenced by many details.
- ◆ But exploring control is possible.



Illustrating The Principle

- ◆ The path of a sheep is hard to predict.





Illustrating The Principle

- ◆ But if we model its tendency to flock and back away when scared by a dog we can model the effect of control, to some extent.





Illustrating The Principle

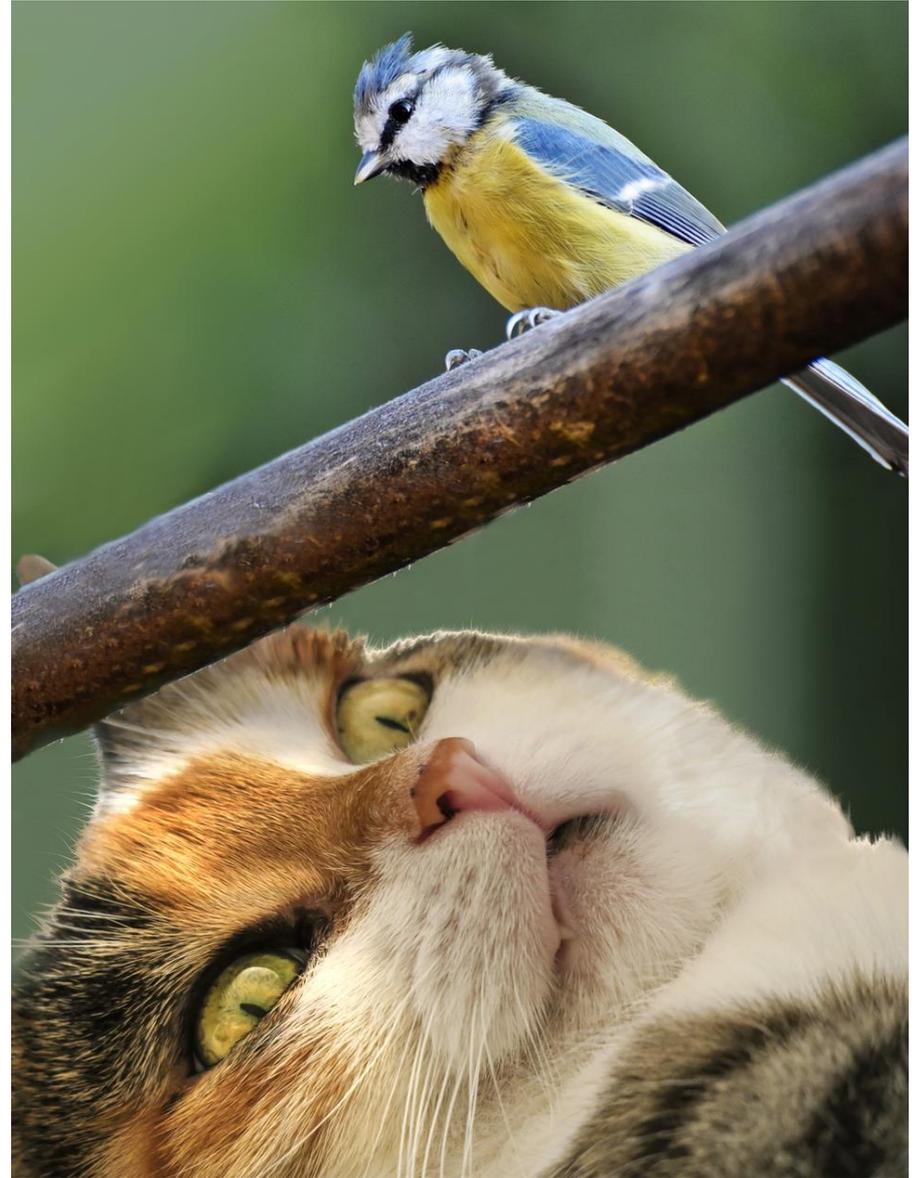
- ◆ Different types of animal (cryptocurrency user) have different psychology so the same controls don't always work.





Illustrating The Principle

- ◆ So we need to find other controls that will work better.





A Realistic Goal For Simulation

- ◆ Our goal is to explore control mechanisms/actions:
 - Simulate potential problems by simulating realistic market features.
 - Simulate the effects of control features/actions – some of which are predictable.
 - Improve understanding of potential problems and solutions.



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Key Choices For The Project



Our Questions

- ◆ We will step gently through the feedback document; tell us just what you want to say.

- ◆ About you just:
 - Type of interest
 - Background

- ◆ Six areas: each time...
 - Priority of ideas we *might* include.
 - Ideas we have missed completely.
 - Features we intend that actually are not worthwhile.
 - Other potential mistakes in our reasoning so far.



Cryptocurrency Control Objectives

Already intended:

- The stability of the exchange rate with major fiat currencies.
- The overall efficiency of the cryptocurrency system (e.g. cost per transaction).
- The number of users of the cryptocurrency.
- The number of node operators/miners participating.

Is it important to add?:

- The extent to which real goods and services are bought using the cryptocurrency.
- The extent to which real goods and services have stable prices advertised in cryptocurrency.
- The distribution of cryptocurrency use; more even is better and super-concentrated is a problem.



Cryptocurrency Features

Already intended:

- How and when new cryptocurrencies are created and who gets them first. (Mining/operation rewards, direct sale, indirect sale, various schedules)
- Cost of transactions, with and without mining, but not details of consensus algorithms.
- Benefits to node operators (and miners if relevant).
- The cryptocurrency having one or two types of token.
- Tying the cryptocurrencies to an asset.
- Different starting points: none minted, some minted, hard fork.

Is it important to add?:

- Throughput of transactions; is it relevant economically?



Economic Environment Features

Already intended:

- At least 2 fiat currencies – for ‘international’ payments.
- Competing payment systems with their costs.
- At least one currency exchange.
- At least order-driven, continuous time currency exchange and quote-driven exchange (with a market maker).
- A varying level & type of buzz around cryptocurrencies generally.
- Goods for sale priced in fiat currency, fiat and cryptocurrency, and just cryptocurrency.
- Catastrophic events (e.g. hacks, arrests, security scares)

Is it important to add?:

- Other, competing cryptocurrencies.
- Loans and their interest rates.



Human Behaviour Features

Already intended:

- A large population of people, only a few of whom are interested in cryptocurrencies.
- Varying interest in cryptocurrencies generally.
- Varying interest willingness to participate in new cryptocurrencies.
- Unequal distribution of wealth and consumption.
- Agents taking more than one role (e.g. speculator + merchant, speculator + miner) from: speculator, customer, merchant, exchange operator, miner/node operator.
- Agents opting in or out of the various roles.
- Sensitivity to publicity/sales effort/news/etc – ‘buzz’ or ‘sentiment’.
- Sensitivity to exchange fees and transaction fees.

Continues



Human Behaviour Features

Already intended (continued):

- Contrarian trading on the currency exchange(s).
- Market following trading on the currency exchange(s).
- Varying levels of short termism and reactivity to new information.

Is it important to add?:

- Speculators who 'pump and dump'.
- Speculators who try to exploit predictable regulatory actions (e.g. buying cryptocurrency to support the price).
- Burstiness (sporadic interest in using the cryptocurrency).



Control Mechanism Features

Already intended:

- Providing information about the use and value of the cryptocurrency.
- Controllable level of promotional effort.
- Small rule variations for order-driven exchanges that may have an effect on price evolution.
- Rule variations for quote-driven exchanges that will affect price evolution.

Is it important to add?:

- Direct transaction controls of some kind.
- Deals that motivate users to hold cryptocurrency and not use it.
- Derivatives that can be used to hedge.
- Providing an online catalogue of goods or services advertised with cryptocurrency prices.



Other Choices

Already intended:

- Viewing the simulation day by day or in more or less detail.
- Some way to test some aspects of performance against real world data.
- 'Presets' to make it easier to set up simulation parameters that match typical cryptocurrency situations.

Is it important to add?:

- Ability to set up groups of people with access to the same simulations.



Conclusion

- ◆ We hope you found that interesting and thank you for your contribution.
- ◆ Please pass on some links to anyone you know who should be aware of this work.
- ◆ It is a somewhat pioneering project and will need at least a couple of months of design and development.
- ◆ There will be information updates in future from Long Finance.



Eternal Coin

Questions And Suggestions?



Eternal Coin Research

IN SEARCH OF THE ETERNAL COIN: A LONG FINANCE VIEW OF HISTORY

DR MALCOLM COOPER



LONG
FINANCE

ETERNAL BREVITY | 1-02010



Control Frameworks For Cryptocurrencies:
An Initial Evaluation





Demonstration Stills - Logon

Matthew Leitch - Outlook x Economic Simulation of C x

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Apps Bayesian First Aid - P Gif Generator - GifsF pages.ucsd.edu/~arc Google Scholar Imported Cantor's Paradise Lo Outlook Web App Fallacy Watch: Famili Green / Eco living Dr. Lee Jussim



Economic Control of Cryptocurrencies Interactive Simulator

Please sign in

[Register](#)



Load Existing Simulation

Matthew Leitch - Outlook x Economic Simulation of C x

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ECC Interactive Simulator Menu Sign out

Economic C e Simulator

Use the menu to c

Load simulation

Select the simulation to load from the list below.

- Hypothecoin
- FruityCoin

Load Simulation Cancel



Simulation Trials List



> TRIALS LIST

> DESCRIPTIONS

SIMULATION DEFAULTS

> TIMING

> CRYPTOCURRENCY

> AGENTS

> EXCHANGE(S)

> ENVIRONMENT

> CONTROLS

Hypotheticoin / Trial List

Share Export

Description:

Imaginary cryptocurrency with quite typical features.

| # | Trial Name | Trial Description | Trial Date | Progress |
|---|-------------------------|-------------------|---------------------------|--|
| 1 | Trial 1 | First trial | Sept. 14, 2018, 1:14 p.m. | <div style="width: 100%;"><div style="width: 100%;"></div></div> |
| 2 | Trial 2 | Second trial | Sept. 14, 2018, 1:16 p.m. | <div style="width: 100%;"><div style="width: 100%;"></div></div> |

Save Simulation Defaults

Delete Simulation

Save Defaults & Create New Tr



Trial Overview

Matthew Leitch - Outlook x Economic Simulation of C x Matthew

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ECC Interactive Simulator Menu

Sign out

> TRIAL OVERVIEW

> DESCRIPTION

CURRENT TRIAL SETTINGS

> TIMING

> CRYPTOCURRENCY

> AGENTS

> EXCHANGE(S)

> ENVIRONMENT

> CONTROLS

TRIAL CHARTS

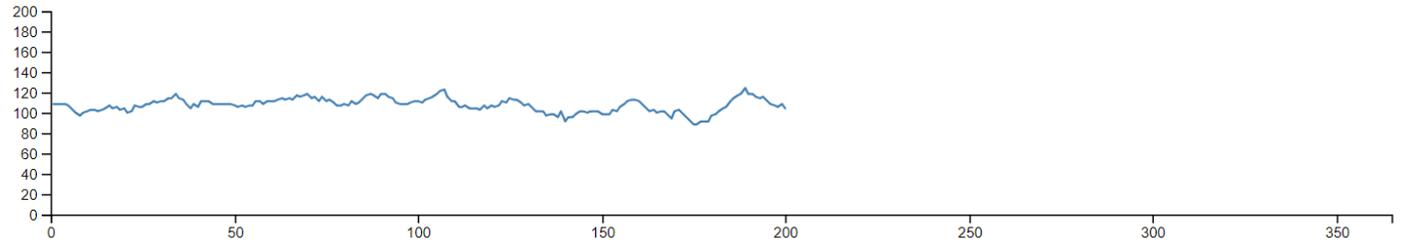
> PARTICIPATION

> EXCHANGE RATES

Hypothecoin / Trial 1 / Trial Overview

Share Export

PARTICIPATION OVER TIME



Current Trial Progress



Save Trial Settings

Continue Trial

Restart Trial

Delete Trial



Participation Charts

Matthew Leitch - Outlook x Economic Simulation of C x Matthew

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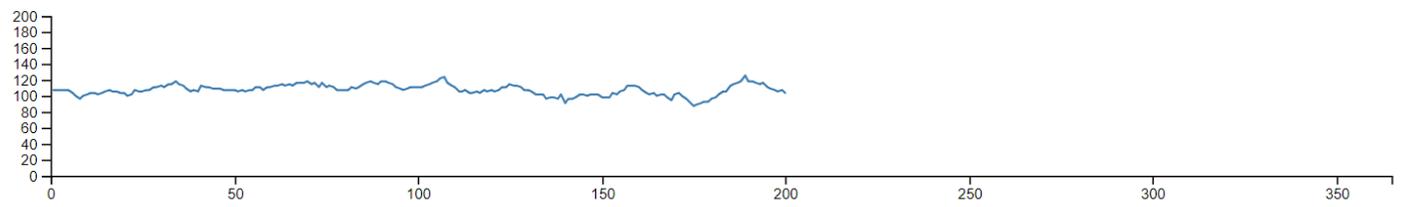
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Hypothecoin / Trial 1 / Participation

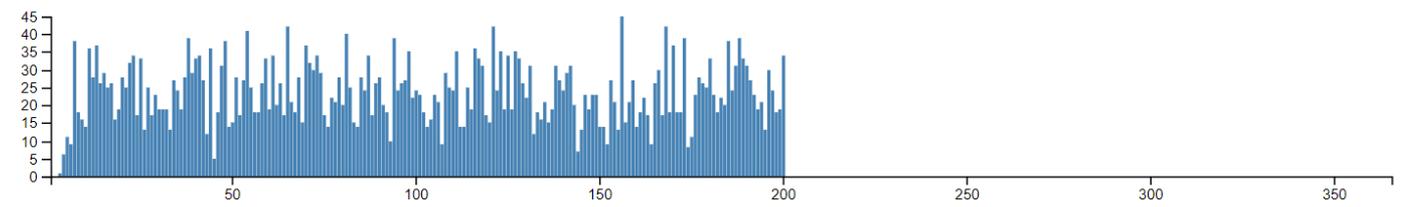
Share Export

- > TRIAL OVERVIEW
- > DESCRIPTION
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- > CRYPTOCURRENCY
- > AGENTS
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- > EXCHANGE RATES

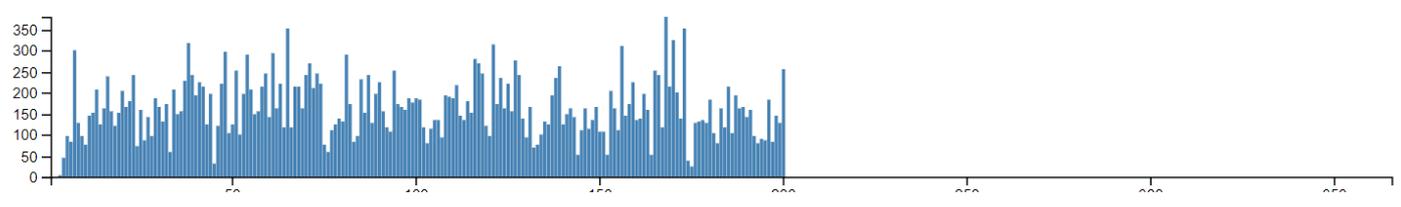
PARTICIPATION OVER TIME



NUMBER OF TRANSACTIONS



TOTAL CRYPTOCOINS TRANSACTED





Exchange Rate Chart

Matthew Leitch - Outlook x Economic Simulation of C x Matthew

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ECC Interactive Simulator Menu Sign out

Hypothecoin / Trial 1 / Exchange Rates Share Export

EXCHANGE RATE

| Time (x) | Exchange Rate (y) |
|----------|-------------------|
| 0 | 100 |
| 10 | 280 |
| 25 | 250 |
| 50 | 150 |
| 75 | 300 |
| 100 | 180 |
| 130 | 200 |
| 150 | 150 |
| 180 | 350 |
| 200 | 180 |

Save Trial Settings Continue Trial Restart Trial Delete Trial



Timing

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> CONTROLS

TRIAL CHARTS

> PARTICIPATION
> EXCHANGE RATES

Hypothecoin / Trial 1 / Current Timing

Share Export

Number of days

Number of days to run in each step of trial

Save Trial Settings Continue Trial Restart Trial Delete Trial



Some Agent Settings

Matthew Leitch - Outlook x Economic Simulation of C x Matthew

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ECC Interactive Simulator Menu Sign out

Hypothecoin / Trial 1 / Current Agents Share Export

| | | | |
|---|------------------------------------|--|---------------------------------|
| Agent Population Size | <input type="text" value="200"/> | Average wait time before an agent reviews their position | <input type="text" value="10"/> |
| Average starting holding of fiat currency | <input type="text" value="10000"/> | Average starting holding of cryptocurrency | <input type="text" value="10"/> |

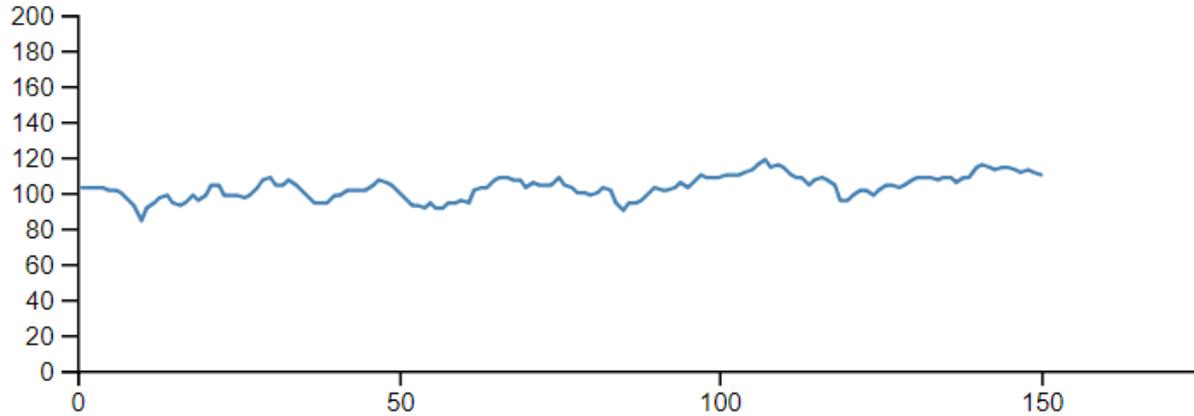
Save Trial Settings Continue Trial Restart Trial Delete Trial

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 - > PARTICIPATION
 - > EXCHANGE RATES

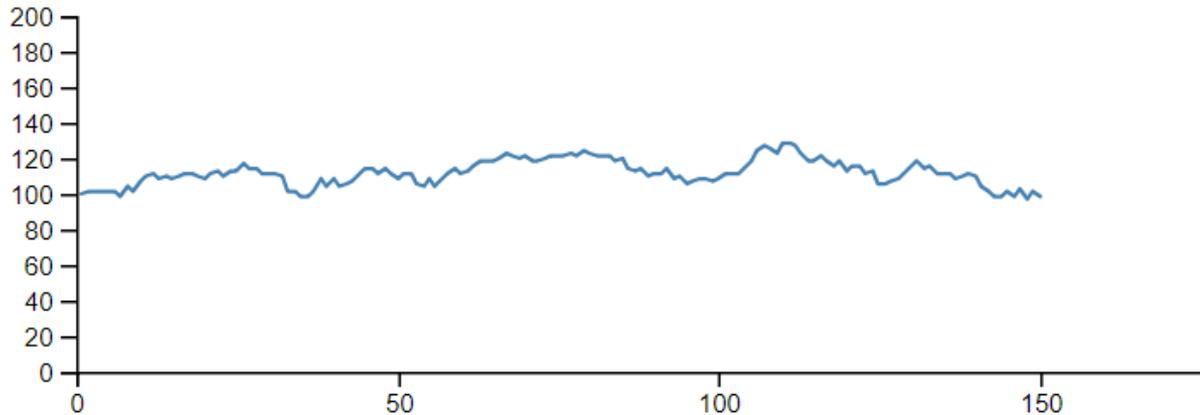


The (Pseudo)random element

PARTICIPATION OVER TIME



PARTICIPATION OVER TIME





Changing Promotional Effort

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ECC Interactive Simulator Menu Sign out

Hypothecoin / Trial 2 / Current Controls Share Export

Promotional Effort



Save Trial Settings Continue Trial Restart Trial Delete Trial



Effect On Participation

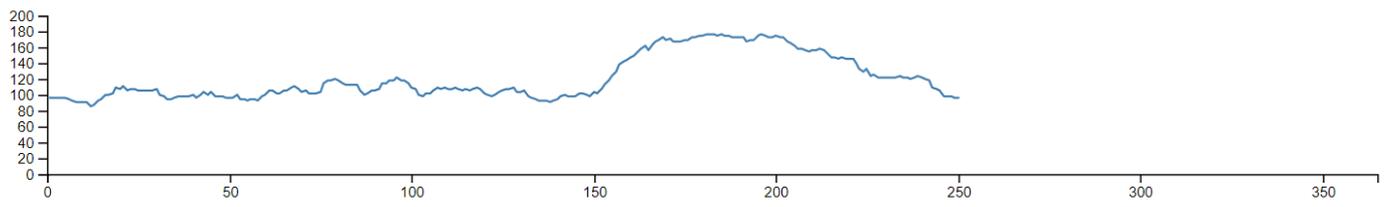
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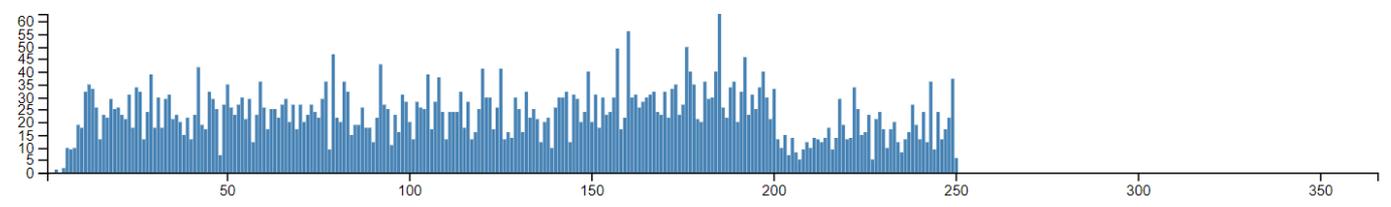
Hypotheticoin / Trial 2 / Participation

Share Export

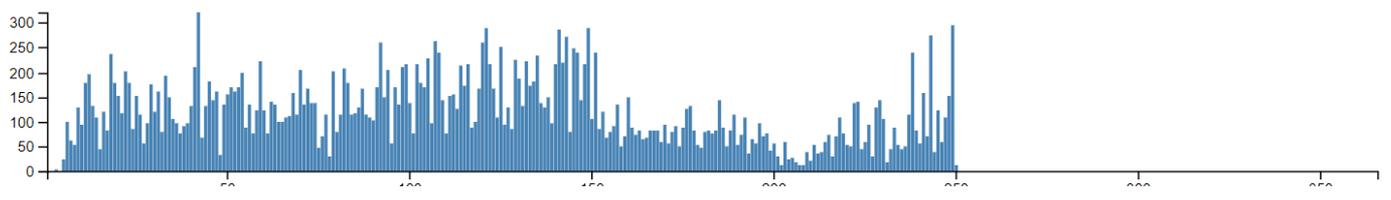
PARTICIPATION OVER TIME



NUMBER OF TRANSACTIONS



TOTAL CRYPTOCOINS TRANSACTED



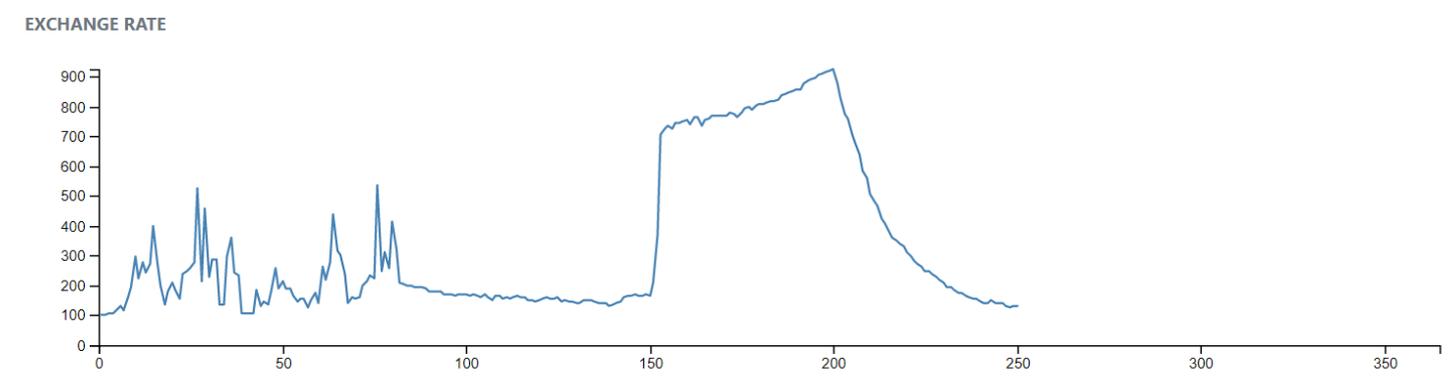


Effect On Exchange Rate

- > TRIAL OVERVIEW
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 - > EXCHANGE RATES

Hypotheticoin / Trial 2 / Exchange Rates

Share Export



Save Trial Settings Continue Trial Restart Trial Delete Trial