



WHITEPAPER

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Introduction

What are incomplete financial markets?

Financial markets are referred to as incomplete when there are more random sources than there are traded assets and can occur in an infinite number of ways. Hence, there is no way to determine the fair price of the underlying asset or futures contracts. Since, by assumption, the market is incomplete, one will not be able to hedge a generic contingent claim (options). In particular, there will not be a unique price for generic derivatives (futures and options).

In a 'complete' financial market the price of any derivative will be uniquely determined by the necessary absence of arbitrage. In hedging terms, this means that the price is unique because the derivative can equally be replaced by its' replicating portfolio.

In an incomplete market the requirement of no arbitrage is no longer sufficient to determine a

unique price for the options. There are several possible martingale measures, and several market prices of risk. The reason that there are several possible martingale measures simply means that there are several different price systems for the derivatives, all of which are consistent with the absence of arbitrage.

An example of such markets may be weather options since in such a case arbitrage is impossible due to the fact that there are no underlying instruments for weather. Another consideration would be a price impact of an earnings announcement, when the news of EPS is due to come out and the date of such an event is set and well-known in advance. Such an event generally exhibits varying degrees of probability for a significant price change in stock markets.

Cryptocurrency derivatives problem

Cryptocurrency is also an example of such a market. Cryptocurrency can't be sold short, so one cannot hedge puts. In addition, a significant change in price also excludes the possibility of hedging. In an ordinary market, the option seller earns a premium by selling options and has the opportunity to hedge the options sold. In cases of cryptocurrency, hedging is impossible, which means that the premium that the seller of options will ask for will be very high since he will have to compensate for his risk in the absence of hedging opportunities in an incomplete market. A large premium causes a drop in liquidity and, as a consequence, an even higher premium and implied volatility. Nevertheless, a cryptocurrency market requires financial instruments through which it is possible to hedge high volatility in these currencies.

To solve this problem, we offer a completely new revolutionary way of trading options on cryptocurrency – reverse parimutuel.

What are reverse parimutuel financial markets?

Parimutuel is a betting system in which all bets of a particular type are placed together into a pool and payoff odds are calculated considering that the pool will be distributed amongst the winning bets. Parimutuel matching has several unique properties that distinguish it from the traditional method of matching buyers with sellers (double auction systems).

Reverse parimutuel model differs from the standard parimutuel model by establishing a fixed payoff amount at the time of the sale. Here are some key advantages:

1. Does not require a buyer to be matched with a seller for a trade to occur. In fact, reverse parimutuel matching can generate trades with only buyers of options;
2. Produces lower option prices;
3. Guarantees that payments of all participants go into a common pool (and provides a method to monitor said pool);
4. Does not require collateral, margin or initial deposit;
5. Provides decentralization of a trading system;
6. In the future, we expect to split an option contract into sub-components (elementary states) and allow the participant to trade both, the whole option and individual components of a given option.

Where can the reverse parimutuel method be used?

A reverse parimutuel method can be used outside of the cryptocurrency markets; the scope is extensive. The technique is relevant in any market where there are no correlated assets for insurance, for example:

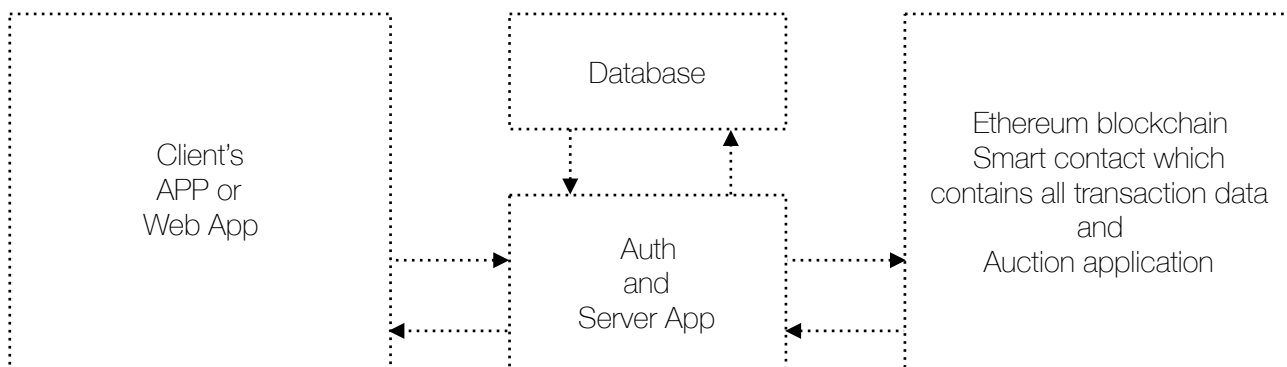
- In ordinary stock and futures markets, before release of important news that would trigger a significant change in price;
- In financial index trading prior to news of unemployment figures, CPI, etc;
- Any undetermined future outcome, even the weather;

The range of applications for this tool is very wide, and the cryptocurrency market in its current state of development is ideally suited for an introduction of this technology.

APO trading platform

How does it work?

The APO option trading platform is a set of applications for iOS, Android and the Web that connect through an authentication server to a decentralized application (Dapp) in the Ethereum network.



Intermediate servers play a role of serving servers. Implementing roles of user authentication servers, API for mobile applications, and database servers for storing secondary information.

The central part of the APO platform is a smart contract on the Ethereum network. The main functions assigned to it are:

- Guarantee of protection for participants
- Conducting the auction
- Acceptance and storage of premiums until expiration
- Keeping a list of option owners
- Execution of payments at the time of expiration
- Charging a commission for operations

The role of APO Finance is to develop and maintain the platform, ongoing maintenance

and modernization. It does not have a role to play in securing funds, which distinguishes this platform from centralized exchanges where a collapse of the exchange causes default for the participants.

Trades on the platform have the following differences from centralized exchanges:

- There is no spread between bid and ask, due to the fact that there are no sellers.
- There is no risk of a stock market crash, since the common pool is on the Ethereum network and at the time of the auction exact payments are calculated in all situations.
- Purchase of new options can only be carried out during the auction.

The trading process is divided into two stages - auction and expiration. Each of the steps is described in detail in the following sections.

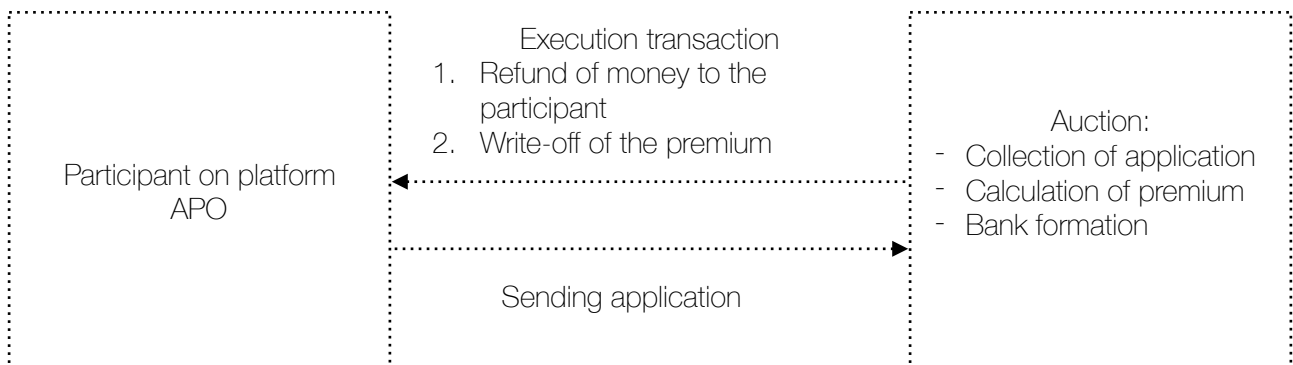
Auction

The main purpose of the auction: collection of applications/orders from the participants with a goal to determine the premium for each option, as well as the formation of a pool of payments.

The date of the auction is appointed one week before expiration. The frequency and duration of the auction will be determined during Beta testing. We intended to use the standard expiration dates for options:

- 2 weeks
- 1 month
- 3 months

Based on this, the frequency of the auctions will depend on the nearest expiring contract, such as 1 week before the expiration of 2-week options, monthly options, or 3-month options.



There are 2 types of applications in the platform:

- Market order
- Limit order

Market order - order is fulfilled in every case.
 Limit order - if the limit price is below the market price, than the order is not filled. If the limit price is above the market price, then the order is fully filled. If the order price is equal to

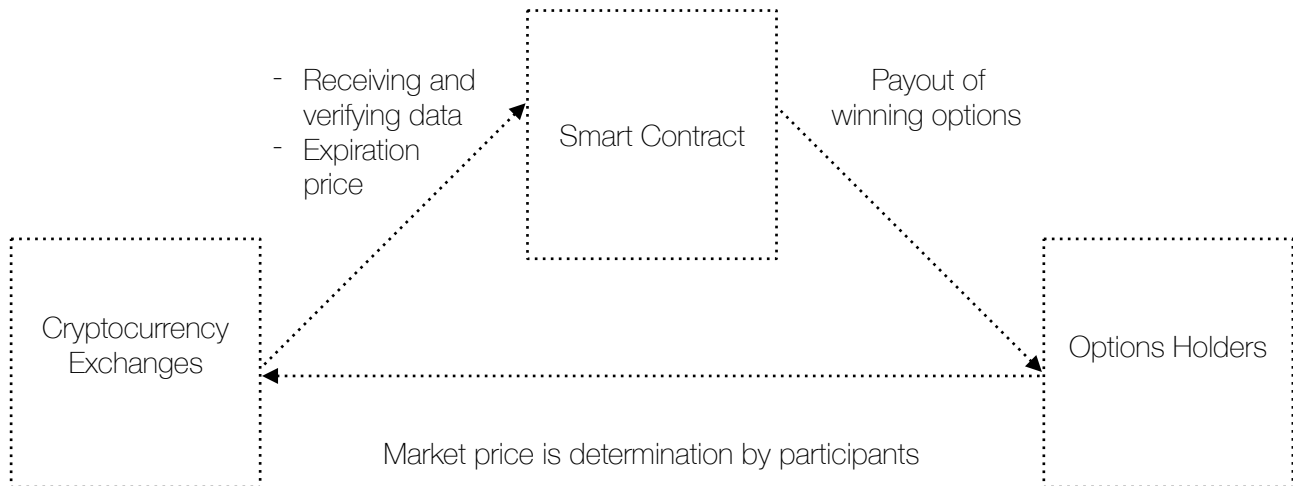
the market price, then the order is partially filled.

After the auction is over and all the submitted bids are counted, a pool is formed. After the completion of the transaction procedure, each participant using their own account through a website or mobile application, can see the options that accrued (along with their parameters) and monitor their value until expiration.

Expiration

Expiration - the moment when the contract expires, and is the date of settlement. The option execution date is indicated in advance during the auction, for example, 12 am on January 12, 2018. At the time of expiration, the price of the underlying asset is locked in (the price of BTC or ETH index is taken from

several major exchanges for determination). Based on that price, payments are made to option holders. After the procedure of execution, each participant can check the status of their account. In the first version of the platform, all payments will be made in ETH.



The expiration system is fully automatic and is built on the basis of a smart contract, which makes it transparent to the participants. Using a cryptocurrency index allows participants to avoid problems with incorrect data or manipulation of the price.

Guarantee

The pool (or the purse) is the guarantor of payments to all participants at the time of execution of the contract. All premiums paid by participants in the purchase of options are part of a smart contract and are stored there until expiration.

Market Place

After the release of the main platform, the development of a site for the secondary circulation of parts of option contracts and structures will begin. The participants will participate in pricing, in other words, the price of each contract will be determined by the market. Reaching this stage is one of the most important goals for us, because it is not only extremely useful for participants, but also very interesting from the point of view of research on financial markets. After all, the value of such tools has not been studied, and their trading in the interval between the auction and expiration can be extremely interesting and profitable.

ICO

APO Token

The APO tokens are the ERC20 specification tokens. They will be available on the exchange for secondary circulation, and can also be displayed in the user's wallet.

Use MyEtherWallet, MetaMask, Mist or other compatible wallets. to verify the contract, use etherscan.io

Token Name	APO
Token Type	ERC20
ICO Starts	April 25 th , 2018 at 10:00:00 AM
ICO Ends	May 23 rd , 2018 at 09:59:59 AM
Soft Cap	5,500 ETH
Hard Cap	12,700 ETH
Min Transaction	0.1 ETH
Token Price	1 ETH = 15,000 APO
Bounty	Yes

Tokens reserved for owners and teams are frozen for 12 months of development of the platform. They are not subject to sale of any kind.

Dividends

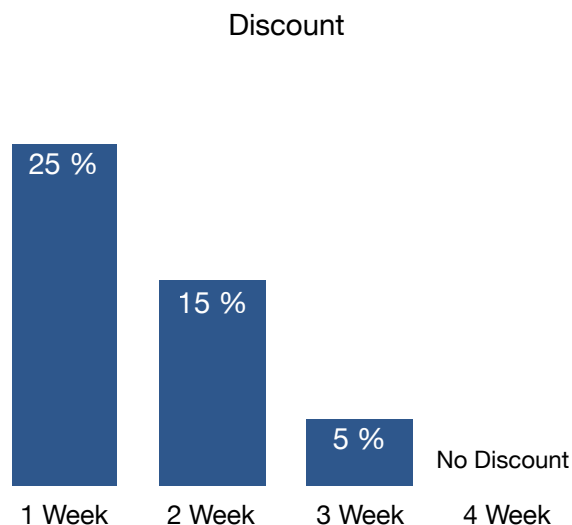
Payment of dividends to holders of tokens is one type of encouragement for investors. Payments will be pledged when a smart contract containing an auction is issued. Once a month the contract will lock-in a list of token holders, and each token holder will receive his share of the commission from the "Purse". The Purse is stored on the Ethereum network where the tokens were when the list was locked-in. All data on token holders and amounts of payments will be published on the platform's website.

ICO plan

APO Finance holds the first public ICO. Venue www.apofinance.io. The Soft Cap of APO Finance is 5,500 ETH equivalent. The Hard Cap is 12,700 ETH.

Sales will be made in 4 rounds. The discounts for each round are presented below.

A smart contract will automatically start selling tokens April 25th, 2018 (10:00:00 AM, UTC) and close on May 23rd, 2018 (09:59:59 AM, UTC). ICO participants will receive tokens from APO Finance.

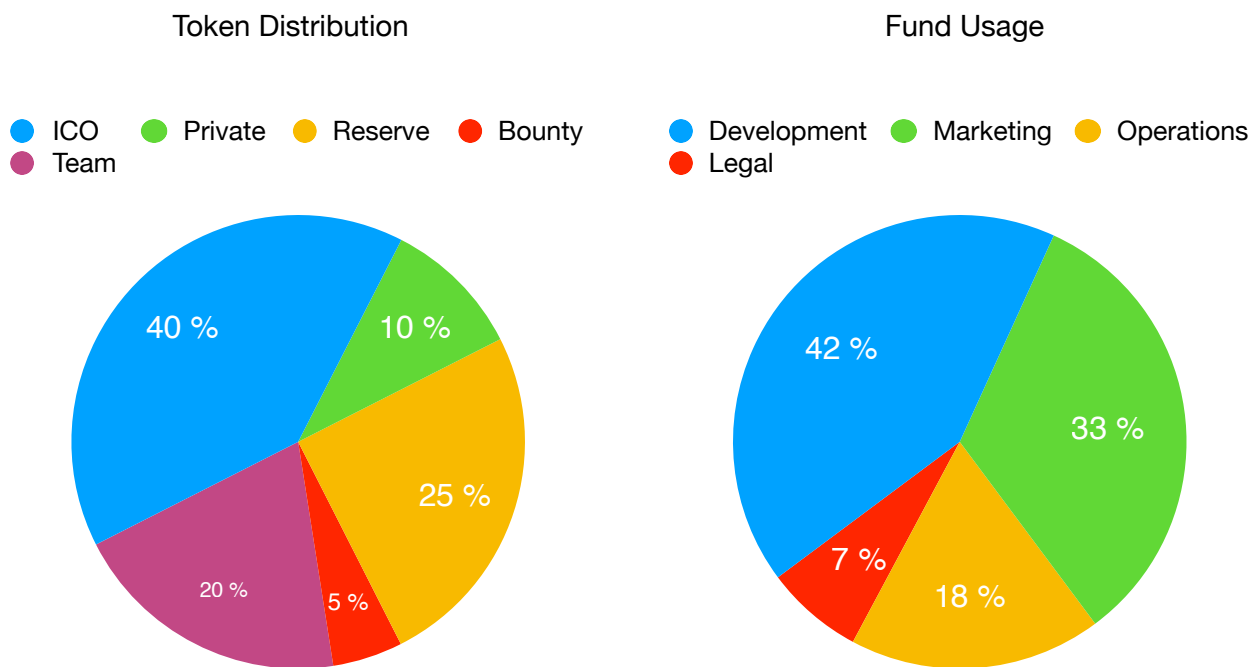


Token Listing

After the completion of the ICO phase, tokens will be placed on the exchanges for secondary circulation. This process will be conducted in parallel with development of the platform. Prior to the second circulation, only tokens sold during the ICO stage will be allowed. The rest will be blocked for 12 months, including team tokens, backup tokens.

Token Distribution and Fund Usage

Funding raised as a result of the ICO will be used to develop a platform for trading reverse parimutuel options.



Roadmap

- 3rd quarter 2017 – Theoretical development of the idea
- 1st quarter 2018 - Development of a platform for attracting investments
- 2nd quarter 2018 - First phase of ICO
- 3rd quarter 2018 - Development of an auction platform
- 4th quarter 2018 - Beginning of Beta Testing
- 1st quarter 2019 - Release of the system
- 2nd quarter 2019 - Start of development of a system for trading, in part, of options and sale of designer options (Option Marketplace)
- 3rd quarter 2019 - Beginning of Beta testing Option Marketplace
- 4th quarter 2019 - Release of Option Marketplace

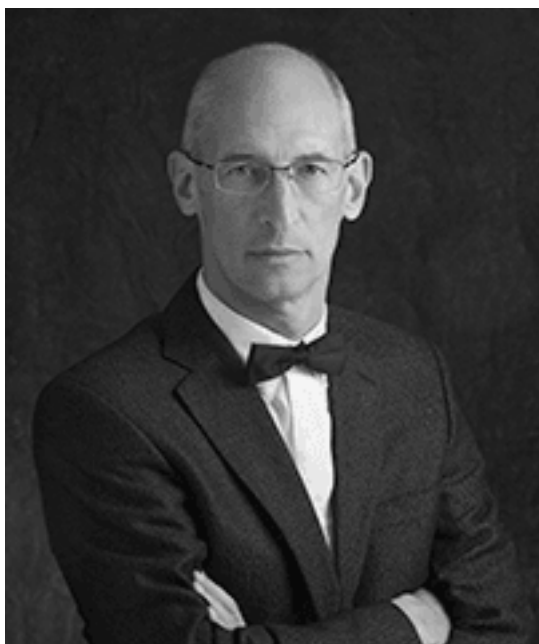
Conclusion

The circulation of derivatives is an integral part of financial markets. In the cryptocurrency market, classical instruments do not work correctly, due to the lack of opportunity for sellers and market makers to cover their risks. We have long studied the possibility of creating a platform for trading derivatives, but we came to the conclusion that such tools can lead to centralization, and also to be largely unprofitable to market participants.

After dedicating more than 6 months of analysis, research and mathematical research, we found the approach - reverse parimutuel options. This tool will help protect participants' assets considering the youth of the cryptocurrency market, and its high sensitivity to news events.

Team

Dmitry Taubman



Dmitry Taubman - Asset Managers OLTA Capital Management, Inc., works in the field of time series analysis. The result of his research in financial markets has been the development of a dynamic model for the pricing of options, as well as the creation of a portfolio of strategies that combine both futures and options. Dmitry was also engaged in research of theories of static hedging and quoting in the options market.

Publications:

1. Taubman, D., Gleyzer, B., Livshits, E., Finding option values in the eye of events. Futures Mag. #9, 2002.
2. Taubman, D., Berg, G., Hedging options with a static replicating portfolio. Futures Mag. May 19 2010.

Dmitry Filyaev



Dmitry worked for many years in the largest investment companies in Russia, working on the development of derivatives and asset management of clients and companies in the Russian and Western futures markets.

He holds a master's degree from the Moscow Engineering Physics Institute (NIUYA MEPhI), specializing in Automation. This knowledge has become a great contribution to the formation of the theory and practice base, in particular in high-frequency trade, which requires not only a deep understanding of market mechanisms, but also technical methods for implementing trade strategies. Specialist in the field of development of server applications, API for mobile applications, database-based systems. The languages used in the work: C ++, C #, Apple Swift.

Steven Markov



Steve has a long career as an application developer and a database architect. He has been involved with multiple industries and disciplines. Within the financial sector, Steve designed and implemented autonomous data communication systems, real-time data gathering systems, trading and charting software. In other fields, projects included web-based assessment and administration tools, payroll, accounting, inventory, CRM systems, and other proprietary data management systems. Steve is applying his knowledge and experience in database and user interface design to decentralized applications.

Genadij Gerstein



Genadij Gerstein has a Master in Computer Science and over 19 years of experience in software engineering and architecture.

As a Senior Software Architect Genadij Gerstein designs low latency and high throughput payments software.

Range of skills from software architecture to development, security, quality assurance, documentation, training and much more. Able to play a leading role throughout the software architecture, development and support life cycle of a project to ensure that quality solutions meets business objectives using classical and agile development.

Advisor

Emmanuel Livshits



Ph. D. degree in Computer Science (1969)
Department of Computer Science, Research
Institute of Theory and Applications of Low
Temperature Physics, Ukrainian Academy of
Sciences, Kharkov, USSR

Master's degree in Mathematics (1962)
Kharkov University, Kharkov, USSR

Citizenship:

Citizen of the United States.

My professional interests encompass two distinct types of activity. The first is theoretical: I am interested and have obtained some results in several theoretical areas of Discrete Mathematics and Computer Science. The second is the development of software systems for solving applied problems. My applied work usually also involves developing the mathematical models, designing the algorithms and providing the architecture for the final software implementation to solve a particular problem. When necessary, I also participate in the programming.

In addition to purely theoretical work, much of the research I have performed in Theoretical Computer Science and Discrete Mathematics, including Computational Complexity Theory and Combinatorics, was motivated by the problems I have encountered in applications. The theoretical research in, turn, has often helped me in solving practical problems. Of my thirty or so publications, about half are theoretical and half are applied.

Applied problems that I have worked on have come from a wide variety of fields, including Optimal Scheduling, Physics, Engineering, Medicine, Biology, Data Processing, Pattern Recognition, CAD, Artificial Intelligence, Image Processing, Manufacturing and Process Control and Automation. The unifying features of the aspects of the problems I participated in are the complex discrete structure at their core and the fact that the most effective solutions used methods of Discrete Mathematics and Computational Geometry.

One of the many Publications:

- Automated design of gear boxes. (With V. M. Borshevskiy). Machine Tools and Instruments, No. 5, (1977), Kiev.
- Algorithms for design of connected networks. (With V. Vainer and N. D. Zaicev). Journal of Automatic Control, No. 7, 153-162, Moscow, (1977).
- The influence of fluctuations on electro-magnetic properties of Josephson's tunnel junctions. (With L. I. Kalashnik, I. S. Kulik, K. V. Maslov and A. A. Motornaja). Journal of Engineering Physics, Vol. 42, No. 6, Moscow, (1972).
- Statistical analysis of arrhythmia in thyrotoxicosis patients. (With V. M. Kirzhner and E. S. Rom-Boguslavskaja). Journal of Cardiology, No. 2, (1973), Moscow.

Recent articles (not included in the list) are devoted to optimization of operational mode of compressor stations in gas networks and modeling of stock market (some formulas for options pricing were established).

Contacts

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apofinance.slack.com

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Dmitry Taubman

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Steven Markov: <http://linkedin.com/in/stevenmarkov>

Genadij Gerstein: <https://linkedin.com/in/gennadij-gerstein-3b35951b>

Emmanuel Livshits: <https://www.facebook.com/emmanuel.livshits>
<https://www.linkedin.com/in/emmanuel-livshits-9228bab3>

YouTube:

<https://www.youtube.com/watch?v=IMfqUkc01Fc>

Forums:

English: <https://bitcointalk.org/index.php?topic=3207939.0>

Russian: <https://bitcointalk.org/index.php?topic=3215888.0>

Dutch: <https://bitcointalk.org/index.php?topic=3243923.0>

Japanese: <https://bitcointalk.org/index.php?topic=3284641.0>