DELPHY®

A Decentralized Mobile Social Platform for Prediction Markets

whitepaper version 0.7.0

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Contents

1~ Executive Summary

Delphy is an open-source, decentralized, mobile prediction market platform built on Ethereum. The Delphy App is a light Ethereum node that runs on mobile devices.

Delphy uses market incentives to allow participants in a market to communicate, instantly and transparently, their wisdom regarding the outcome of upcoming events, effectively predicting the future. We designed Delphy from the start to be decentralized, which makes it difficult to manipulate prediction results.

The Delphy platform implements three of the necessary conditions for crowd wisdom put forth by James Surowiecki; diversity of opinion, independence in making opinions, and decentralization of organization.

Delphy is a mobile platform for the prediction market and an ecosystem of the Predictions as a Service (PaaS) platform. Users are able to participate in transactions in prediction markets, anytime and anywhere. They can also use the Delphy API and SDK to customize prediction markets based on different vertical field parameters. Delphy can be applied extensively to prediction markets in finance, insurance, national defense, health care, public management, sports, entertainment, and even markets within organizations.

Delphy, as indicated by Greek mythology, is the place where the oracle spoke the wisdom of Apollo, the god of light, truth and prophecy. The Delphy prediction market leverages the wisdom of crowds to forecast future events and even change the future.

2~ Prediction Markets

There are two main methods used in scientific predictions; the first is statistics and mathematical models, and the second is machine learning and data mining. In essence, these two methods use historical data and software systems to generate predictions.

In recent years, a third method, "social analysis", is increasing as a trend in the prediction market. The market uses incentives to allow the public, not just identified experts, to contribute their own experience and wisdom, pooling market information together to help make decisions and allowing the group to be more intelligent than a single individual or expert.

2.1 Theory and Operation

Scientific prediction methods have been around since the start of the Information Age. Theories underlying the prediction markets include the Efficient Capital Markets Hypothesis (ECMH) and the Hayek Hypothesis. These hypotheses help explain how information is aggregated such that market prices provide accurate estimates on the likelihood of future outcomes.

According to ECMH, capital markets are so efficient in reflecting information about individual stocks and the stock market as a whole, that no amount of analysis to forecast future stock prices can beat the market. The Hayek Hypothesis assumes that market prices are the means to aggregate disparate pieces of information. The market works even when people only have a limited knowledge about their surrounding environment and other parties involved.

In essence, the market collects the judgements and confidences of parties involved in the same event, which results in a prediction of the future outcome of the event. Similar to the stock market, which serves to assign a price to the future estimated value of a stock, “prediction markets” assign a value to a belief about the future (a prediction).

Specifically, prediction markets usually predict the outcome of an event by asking questions about possible outcomes. Each possible outcome has its own probability. The sum of the probabilities of all the outcomes is equal to 100%. The probability of an outcome represents the transaction price of the

outcome in the market. Traders buy shares of an outcome based on their confidence and judgment. For example, if a stock's value is set at one dollar and the probability of the result is now 60%, then its price is $0.60. If the predicted result actually occurs, the trader who buys the shares is the winner, earning a profit of $0.40 ($1.00 - $0.60) per share, and the people who predicted the opposite result receive no profit.

For example, "Will the China Stock Index (CSI) 300 break through 4000 points this year?"

(A) Yes. (Price is $0.60) = 60% winning probability

(B) No. (Price is $0.40) = 40% winning probability

(A) + (B) = $1.00 (100% winning probability)

In a prediction market, the probability of an event outcome represents trader judgement, the number of shares purchased represents outcome confidence, and trader comments represent the choice rationale.

James Surowiecki, a well-known financial journalist in the U.S., put forth three conditions for crowd wisdom: diversity of opinion, independence in making opinions and a decentralized organization. Similarly, prediction markets work best when market participants have different backgrounds, do not base their decisions on the opinions of others, and base their opinions on local knowledge.

Prediction markets have three characteristics:

1. Efficient collection of diverse and disparate information.
2. Effective and transparent incentive mechanisms to obtain truthful and relevant information.
3. Near real-time information updates, so that result manipulation becomes quite difficult.

Prediction markets are widely used in many sectors, including but not limited to finance, insurance, national defense, healthcare, public management, sports, entertainment, and even within companies.

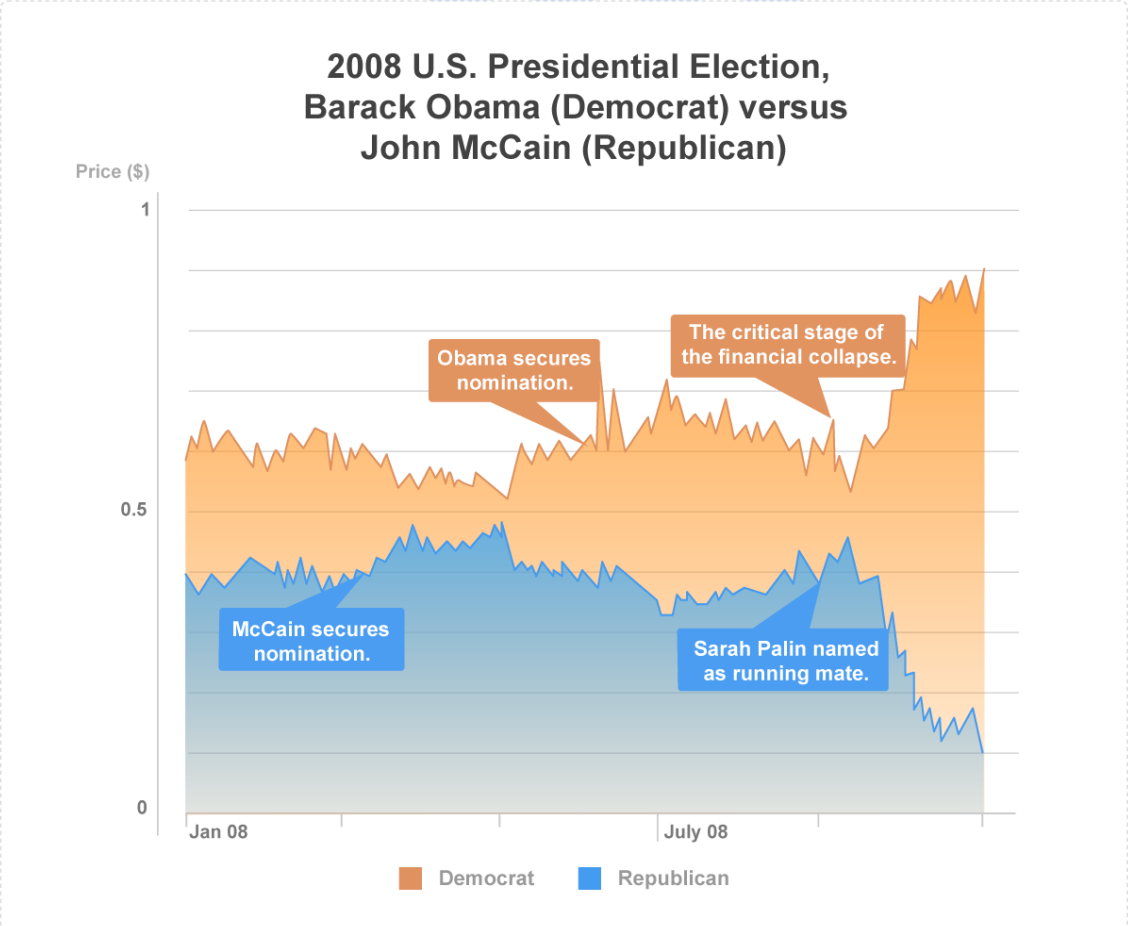
For example, in 1996, HP Labs and the California Institute of Technology co-chaired a three-year prediction market experiment. The study conducted 12 different predictions with 20 to 30 employees from different HP Labs departments (business, finance, marketing, etc.) Experiments showed that

more than 75% of the predictions were more accurate than HP's official predictions.

In 2003, the U.S. Department of Defense publicized a "Policy Analysis Market" (later dubbed as a "terrorism futures market"), which mainly predicted the political and military turmoil in eight Middle Eastern countries as well as the response from the U.S., aimed at improving America's intelligence gathering capability around the world. U.S. Senators later rejected and canceled this prediction market.

In 2005, Google announced its use of a prediction market within the company to predict product release dates, new office openings and other strategic events.

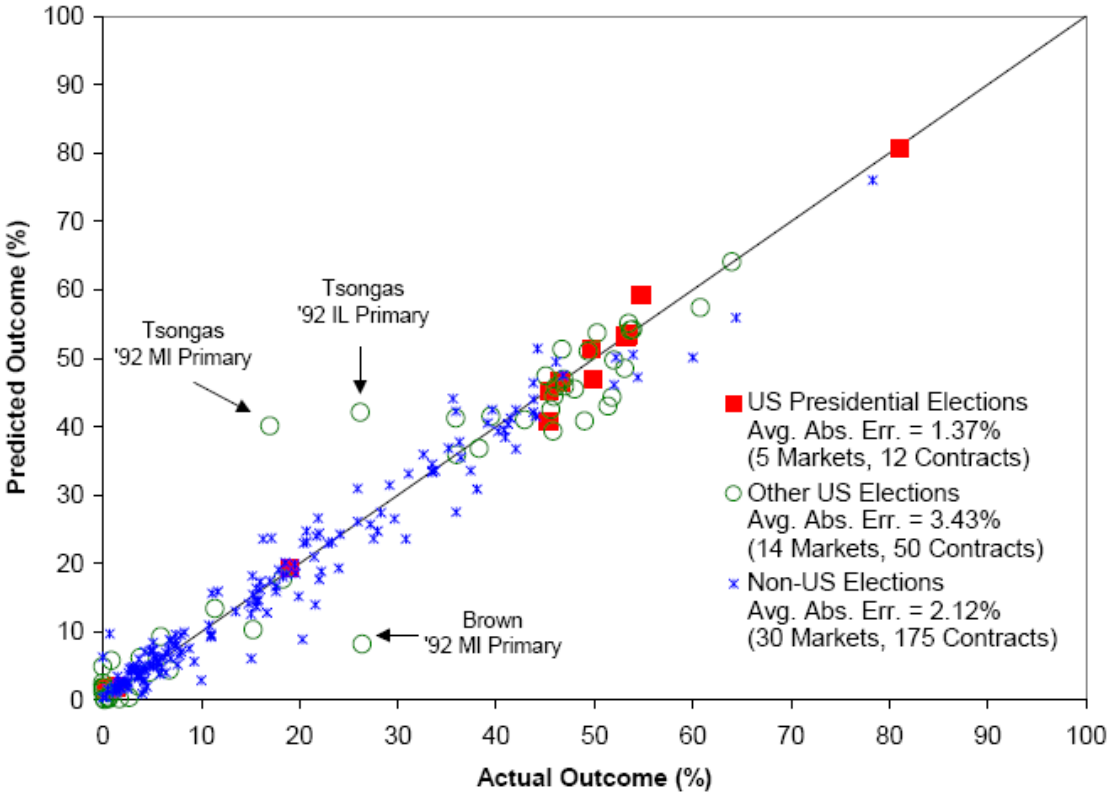
Intrade.com is a famous political prediction market where the participants can trade presidential election results from different countries. The accuracy of the predictions is incredible. For example, in the 2004 U.S. presidential election, Intrade.com predicted which states Bush and Kerry would win, and the predictions were surprisingly similar to the election results.



2.2 Accuracy

Prediction markets trades on the probable outcome of future events. The future price of contracts reflects the dynamic expectation of the probability of those events. Due to the incentives from winning, the market is able to amalgamate the collective wisdom of all the participants. Experiments show that the prediction market is often more accurate than traditional predicting tools. It also has many other advantages, like continuous real-time information gathering, active participation, information disclosure, high efficiency, and measurability.

Consensus Point, a website whose chief scientist is Dr. Robin Hanson, once announced that the accuracy rate of its prediction markets was 92%. In 2008, a survey found that Iowa Electronic Markets (IEM) of the University of Iowa predicted five presidential elections more accurately than ordinary polls in 74% of all cases. The election data in the figure below clearly shows that the market predictions are quite accurate.



The long-term prediction market has a great advantage in accuracy over individual predictions. The more participants, the more accurate the market will be. The following three reasons might help explain why:

1) Due to the complexity of events, no individual can possess a complete set of information.

   The knowledge is distributed amongst a group of people.

2) Prediction markets provide a mechanism for those with insightful ideas to put forth their information.
   When different ideas occur, people will vote by altering their trading practices, rather than simply succumbing to the current consensus from peer pressure.

3) Trading using real money makes people think differently and behave more cautiously.

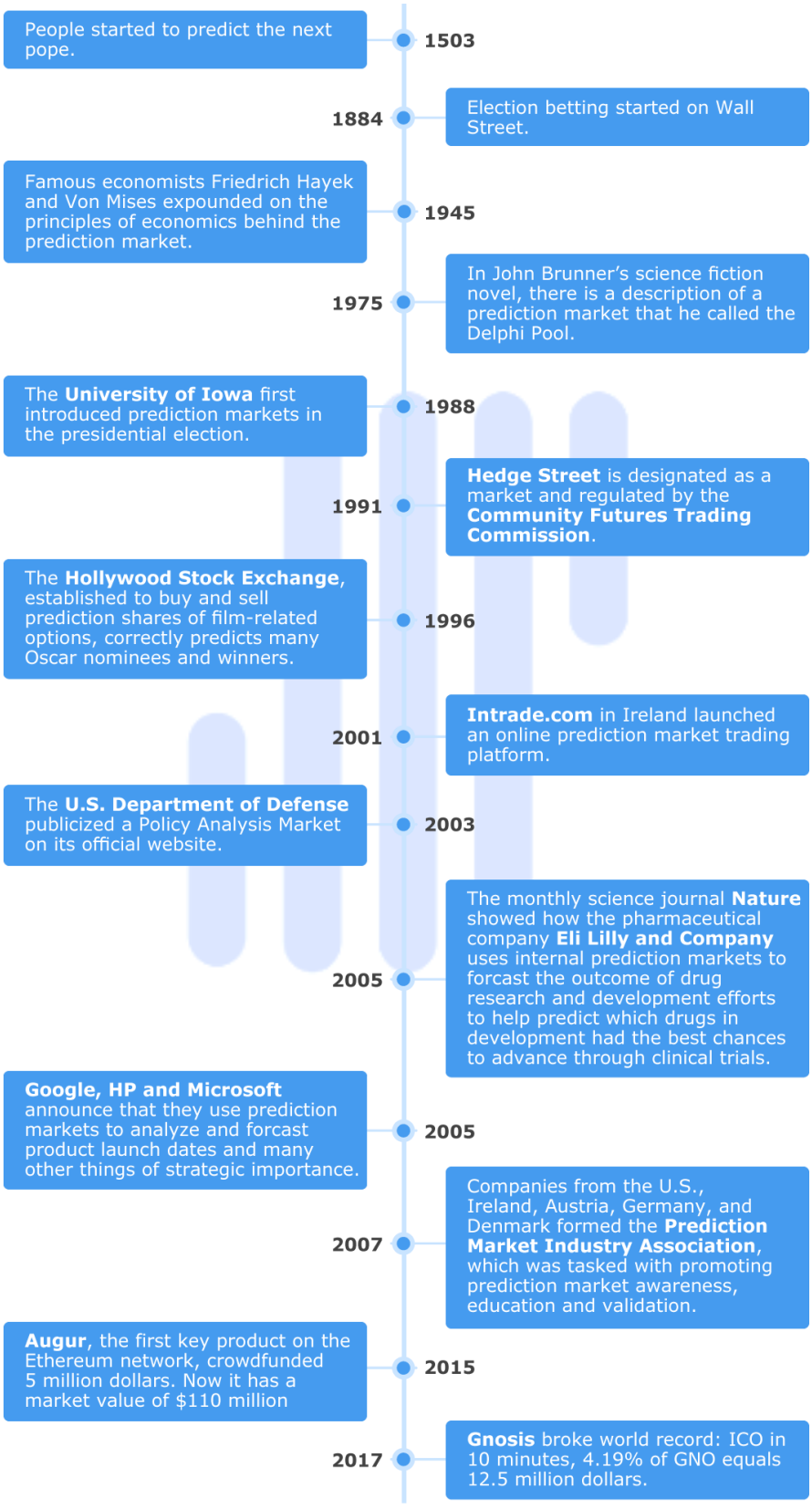
The prediction market, as accurate as it is, also faces some challenges. It represents public opinion, which can be influenced by many factors.

Segmented prediction markets also lack liquidity. People are only concerned about big things or those things related to their own interests; therefore, it is difficult to collect enough samples to generate general predictions. Many people participated when the prediction was about the U.S. presidential election between Clinton and Trump, but it would be another story if it were a presidential election in a small developing country in Africa.

The prediction market has also made some big mistakes, the Brexit vote, for example. On June 23, 2016, the day of the Brexit vote, prediction markets forecast that the probability rate of staying in the European Union (EU) was 85%, whereas the reality was that exiting the EU won by a small margin.

2.3 History

The following timeline shows important historical events related to prediction markets.



2.4 Differences from Betting

Throughout history, financial products have met and overcome the disparaging beliefs that they are just a form of gambling. At their inception, people considered life insurance immoral and regarded stocks as a means of betting. Today, however, people have accepted insurance and stocks as an important part of modern finance. Insurance can help people mitigate their risks, while stocks are important for companies to raise funds.

There are significant differences between prediction markets and betting. First, gambling has no practical social benefit, while the prediction market has community implications as it solicits people's views concerning future events. For instance, prediction markets for a U.S. presidential election can help financial markets make risk assessments, public expectations of housing prices becomes a reference for macroeconomics and governmental regulation, and weather prediction markets can help farmers prepare for extreme weather to lessen damaging financial outcomes.

Second, gambling is just a simple activity with its own rules and no externality. However, many factors influence the prediction market, such as economic data, spontaneous international events and other human or natural factors.

Third, while gambling involves large-scale funds, the capital involved in prediction markets is limited, with little or no financial impact.

2.5 Comparison with Traditional Methods

The following table compares prediction markets with other common methods of gathering information and opinions.

	Prediction Market	Poll	Experts' Opinions/Panel
Sampling	People participate actively	Random sampling	Recommendations screening
Scale	Big	General	Small
Frequency	Continuous; until the event ends	Once	Once; periodic
Method	Interactive	Solitary	Solitary; interactive
Content	Predicting the probability of events	Expressing personal preference	Personal preference + probability of events
Weight	Depended shares purchased	Equal	Uncertain
Participation Motivation	Equal proportion of economic returns	None	Reputation; one-time economic returns
Truth-telling Motivation	Economic returns	None	Popularity
Opinions Update	Reflects participants view changes via price movement; continuous	One-time analysis; discontinuous	One-time analysis
Accuracy	High	Average	Very high
Execution	Set up trading market	Large-scale interviews questionnaires	Selecting experts

2.6 Redefined by Blockchain

Although prediction markets work well, their current centralized implementation has plenty of shortcomings.

First, centralized markets cannot prove their own innocence. Many markets are suspected of having been manipulated, subjecting users to financial loss. Second, market finances are usually highly supervised, which results in a lack of user participation and limited transaction volume, thus keeping it out of the mainstream. For example, in the United States, the CFTC forced the famous prediction market ***intrade.com*** to close because it failed to comply with U.S. laws. Third, there is a certain conflict of interest between the prediction markets and current experts, social opinion leaders, and public opinion polling organizations.

Today, with the rise of peer-to-peer blockchain technology, prediction markets can take advantage of decentralization and popularize their applications. First, blockchain data is replicated across the network, and its tamper-proof implementation enables prediction platforms to prove their own innocence. Second, decentralization also allows prediction markets to gain global liquidity and the ability to maintain a massive amount of users. Third, blockchain-based prediction markets can attract more insiders and professionals to participate by using token incentives.

2.7 Delphy: The Decentralized Prediction Market Platform

Delphy is a decentralized social mobile prediction market platform built on Ethereum. The intrinsic decentralization of Ethereum ensures that predictive results are hard to manipulate which promotes information diversity, independent decision-making and a decentralized organization.

Delphy is a mobile application platform for the prediction market and an ecosystem for Prediction as a Service (PaaS). Users can participate in prediction market transactions anytime and anywhere, as well as use the Delphy API and SDK to custom-tailor all kinds of vertical field prediction markets.

The following chart summarizes the similarities and differences between Delphy and existing decentralized prediction markets:

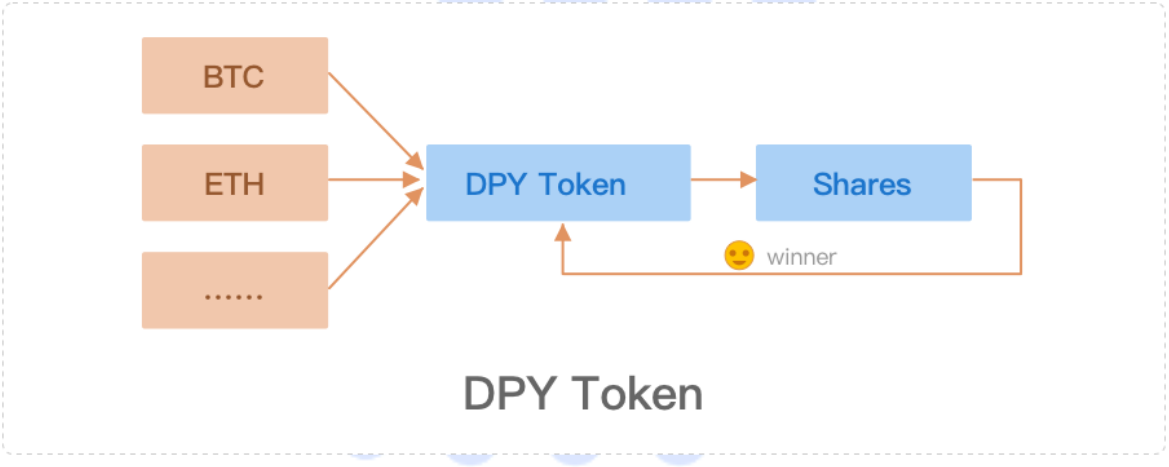
Delphy vs. Existing Decentralized Prediction Markets			
Features	**Delphy**	**Gnosis**	**Augur**
Distributed Oracle	√	√	√
Contract Fund Ownership	√	√	√
Quick Clearing	√	√	×
Token Holder Responsibilities	×	×	√
Scalability	√	√	×
Application Environment	√	√	×
Research Market-Based Governance Protocol	×	√	×
Multi-platform Compatibility Standards	√	√	×
Mobile App Light Ethereum Client	√	×	×
Customizable	√	×	×
Event Filter	√	×	×
Social	√	×	×

3~ Delphy Market Mechanism

3.1 Market Making

3.1.1 DPY Token

Delphy will issue its DPY token, which is based on the Ethereum smart contract and complies with ERC20 standards. ERC20 based tokens enable Ethereum wallets, exchanges and other smart contracts to interact with a variety of tokens in a common way. The DPY token, generated by Delphy smart contracts, will be released during the Delphy ICO and can be purchased with digital tokens like Bitcoin and Ethereum. In Delphy prediction markets, DPY tokens are the only ones used to buy shares and award winners.



3.1.2 Create Event

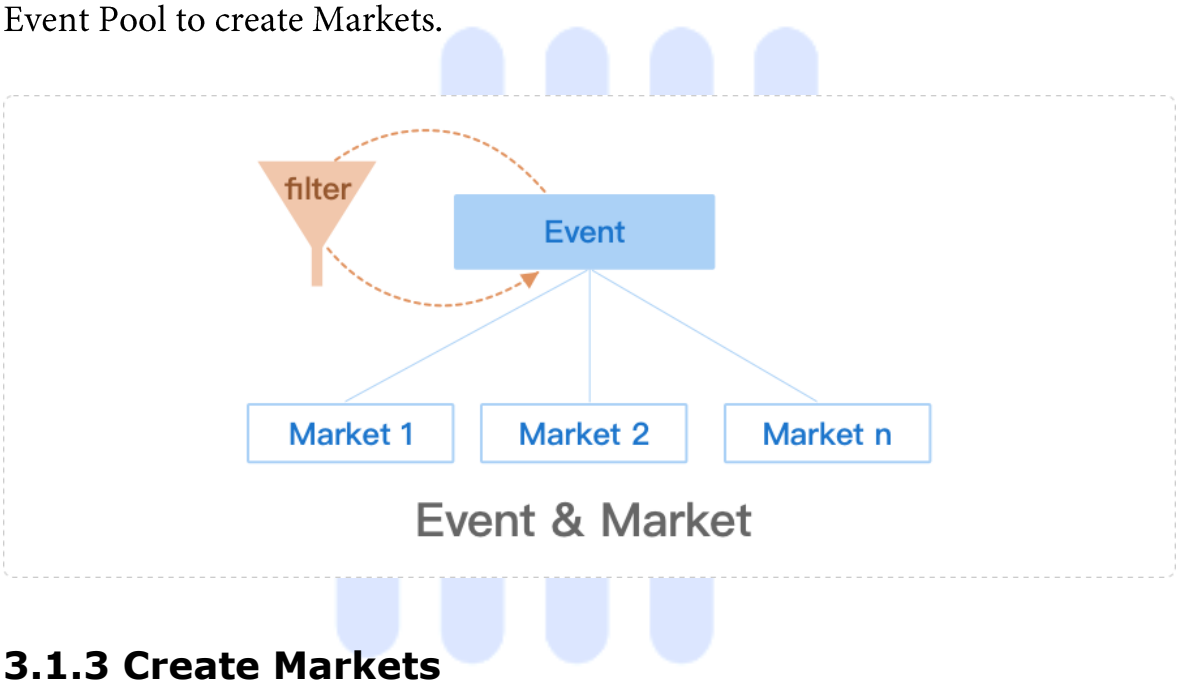
An “Event” refers to a future event of interest to be predicted in Delphy in the form of question and answers. For example, “Will Germany defend its crown in the 2018 FIFA World Cup?”

In Delphy, users can create Events based on future events in the real world by using the Event Editor and Event Template. When creating an Event, clients submit a detailed description, all possible outcomes, the Oracle that determines the outcome, and other information as needed.

The outcomes of an Event can be of three types: binary, list and range. Binary Events have two or more outcomes but only one correct answer. List Events have more than one correct answer. Range Events allow for a range of winning outcomes from one value to another, in form of [x..y], e.g., [5..9].

Events can be open or invitation only. All Delphy users can participate in an open Event, while an invitation-only Event is only visible and available to invited users.

The created Event enters a temporary Event Pool in Delphy. The system also has an Event Filter, which filters out illegal or unethical events, such as predictions on the assassination of a country's leader or the overthrow of a government. After filtering, the remaining Events enter the system's Live Event Pool to create Markets.



3.1.3 Create Markets

After users create an Event, they build a corresponding prediction market to provide a trading platform for participants. Users can search the system's Live Event Pool, select the Event they are interested in, and create a Market.

First, the user sets the loss limit, designated as an integer. The loss limit is an important parameter for the Market creators' deposit. The higher the loss limit, the greater loss the creator might suffer, however the possible reward is higher. A higher loss limit also provides for more liquidity in the Market and helps lessen the impact of price fluctuations.

Second, the user must have a high enough balance in his wallet. The deposit amount is calculated by the loss limit and the number of event outcomes. It

signals the largest loss the Market creator could pay, and is directly related to the result of the entire Market (please refer to section 3.2 for more details). The system will lock the number of tokens equivalent to the deposit in the Market creator's wallet. The creator cannot use the deposit until the Market is closed and liquidated.

The same Event can be used to create Markets with different preferences. Each Market may have different loss limits, deposits, market liquidities, delivery dates, Oracles and dispute resolutions. Users with different preferences can choose to trade in Markets that suit their own needs.

3.1.4 Pricing & Trading

Delphy uses the Logarithmic Market Scoring Rule (LMSR) to calculate the price of every outcome in the market in real-time as traders start to buy and sell shares. LMSR provides virtually unlimited market liquidity. This is different from traditional non-LMSR prediction markets and the stock market (please refer section 3.2 for more details).

In general, the more shares of a particular outcome that are purchased, the higher its price will be, while the more it is sold, the lower the price. In Delphy, users can find out real-time prices and trends for each outcome.

If they are eligible to participate in a Market, Delphy users are able to use their DPY tokens to purchase shares of an outcome at the real-time market price. Similarly, users can also sell their shares in the Market for DPY tokens.

3.1.5 Liquidation & Delivery

When a Market matures, meaning the market Event transpires in the real world, Delphy determines the winning outcome based on the Oracle of the Event.

Users who own shares of the correct outcome are winners. Delphy automatically converts their shares into DPY tokens. After deducting certain fees, Delphy automatically delivers the DPY tokens into the winners' wallets. The non-winners are not liable for any other expenses. If the total amount of shares purchased by the non-winners is insufficient to cover the profits of the winners, the deposit from the Market creator is used to help liquidate the Market.

Certain transaction fees (e.g., the gas required by Ethereum) occur when a Market is created and shares are traded. For the risks and expenses the Market creator takes, there should be a reward to help incentivize Market creation.

Delphy will charge a small percentage of the winners' profit, which will be used for the following purposes:

1) Cover all necessary transaction costs associated with the Market.
2) Reward the Market creator.
3) Reward all DPY token holders.
4) Possible other uses.

When the Market is liquidated, the Event & Market is officially closed and no more transactions are allowed. If the Oracle associated with the Market cannot decide the outcome, or users dispute the correct outcome, Delphy will provide a variety of ways to resolve the dispute.

3.1.6 Messages & Comments

Every Market in Delphy usually comes with a list of all necessary outcomes and a comment area where traders can leave messages showing why they choose what they did and the rationale for their choice. Such event-based social activities provide more trading signals than the prediction price alone. Delphy also provides functions like peer-to-peer messaging, peer-to-peer payment, OTC trading, etc.

3.2 Pricing Principle

The Logarithmic Market Scoring Rule (LMSR), proposed by Hanson, is an automated market creating mechanism that always maintains a consistent probability distribution to reflect the market's evaluation of each event outcome. LMSR is becoming the de facto standard for prediction markets, as it has many excellent features, such as limiting losses resulting from the logarithmic growth of a predicted outcome, infinite liquidity, and the modularity of independent relationships. Many internal prediction markets and projects, such as Inkling Markets, Microsoft, YooNew, Augur and Gnosis, are using LMSR as a pricing mechanism.

In a prediction market, when the market is created from Event Φ, Φ's outcome can be one of the following types:

- **Binary**

  "Will the German national football team win the 2018 FIFA World Cup?"
  The outcome can only be "Yes" or "No".

- **List**

  "Which teams will be in the finals of the 2018 FIFA World Cup?"
  The outcome will be in a list of 32 items.

- **Range**

  "How much will Apple's stock price be on January 1st, 2018?"
  The outcome will have a wide range.

LMSR decides how market participants trade shares, how to determine the share price of each event outcome, and the probability of each outcome at any point of time.

3.2.1 Variable and Function Definitions

The number of outcomes for Event Φ is n. q_i refers to the number of current shares for the i-th outcome.

Loss Limit ℓ: An integer determined by the creator himself, which can be used to calculate the creator's potential loss. The higher ℓ is, the greater the loss the creator may suffer, yet the more liquidity the market has, and the less impact participants have on the price when they buy more shares.

Deposit $\mathcal{F}$: The maximum loss limit. The Deposit amount must be provided when the market is created. $\mathcal{F}$ is decided by ℓ and n.

$$\mathcal{F} = \ell \cdot \ln(n)$$

Market Status: A vector of the number of shares of all outcomes $(\mathbf{q_1}, \mathbf{q_2}, \cdots, \mathbf{q_n})$. One trade will only change $\mathbf{q_i}$ and then change the market status.

Cost Function C: The cost function of market status is:

$$C(q_1, q_2, \cdots, q_n) = \ell \cdot \ln(e^{\frac{q_1}{\ell}} + e^{\frac{q_2}{\ell}} + \cdots + e^{\frac{q_n}{\ell}})$$

ℓ is the loss limit , ln is the natural logarithm. The cost function C is the core function of LMSR. The specific payment amount for the purchase and sale of the shares is represented by the status difference of the cost function.

If you buy Δ (number of shares) of outcome i in current market, you need to pay:

$$C(q_1, q_2, \cdots, q_i + \Delta, \cdots, q_n) - C(q_1, q_2, \cdots, q_i, \cdots, q_n)$$

If you sell Δ (number of shares) of outcome i in current market, you need to pay:

$$C(q_1, q_2, \cdots, q_i - \Delta, \cdots, q_n) - C(q_1, q_2, \cdots, q_i, \cdots, q_n)$$

When the selling price is negative, you make profits from the trade.

Therefore, the trading of shares is a series of atomic operations. The next transaction begins only after the previous one is completed.

Instant Price Function $p(q_i)$: The price of shares of the i-th outcome and the partial derivative of the cost function:

$$p(q_i) = \frac{dC}{dq_i} = \frac{e^{\frac{q_i}{\ell}}}{e^{\frac{q_1}{\ell}} + e^{\frac{q_2}{\ell}} + \cdots + e^{\frac{q_n}{\ell}}}$$

If the i-th outcome wins as the predicted event happens, then $p(q_i) = 1$ and $p(q_{j\neq i}) = 0$.

Probability Function $P(q_i)$: The winning probability of the i-th outcome of current predicted event.

Creator's Profit Amount $\mathcal{R}$: If the i-th outcome wins when the predicted event ends, then:

$$\mathcal{R} = C(q_1, q_2, \cdots, q_n) - q_i - \mathcal{F}$$

When $\mathcal{R} < 0$, the creator suffers a loss.

Based on the LMSR above, we present the following propositions:

3.2.2 Propositions

Proposition 1: Deposit $\mathcal{F}$ equals the cost function of the initial market status.

Because no trades of shares are conducted in the initial status, $q_1 = q_2 = \cdots = q_n = 0$, then:

$$\mathcal{F} = \ell \cdot \ln(n) = C(0,0,\cdots,0)$$

Proposition 2: The cost function of the current market status equals the total capital of the current market.

The total amount of market funds equals the deposit, plus the capital used to purchase shares, minus the capital used to sell shares, minus the transaction fees involved.

Proof: It is known that the amount paid for purchasing shares or received from the sale of shares is the difference between the consecutive cost function of market status. Suppose there are m transactions between initial status $\alpha_0 = (0, 0, \cdots, 0)$ and status $\alpha_m = (q_1, q_2, \cdots, q_n)$. Every transaction can only change the number of shares for a single outcome, and x_j is the capital put into the market for the m-th transaction:

$$x_1 = C(\alpha_1) - C(\alpha_0)$$
$$x_2 = C(\alpha_2) - C(\alpha_1)$$
$$x_m = C(\alpha_m) - C(\alpha_{m-1})$$

Add up the above m equations, $\sum_{j=1}^{m} x_j = C(\alpha_m) - C(\alpha_0) = C(\alpha_m) - \mathcal{F}$, then:

$$C(\alpha_m) = \mathcal{F} + \sum_{j=1}^{m} x_j$$

QED

Proposition 3: $p(q_i) = P(q_i)$.

This proposition demonstrates that in LMSR, the instant price at which a participant buys the shares of one outcome is equal to the winning probability of that outcome.

Proof:

The standard entropy of the market is:

$$S(q_1, q_2, \cdots, q_n) = -\sum_i P(q_i) \cdot \ln(P(q_i)) \quad (1)$$

The Lagrange interpolation of the market is:

$$\Lambda(q_1, q_2, \cdots, q_n) = S - \sum_i q_i P(q_i) - 1$$

The biggest constraint on entropy is obtained by taking the derivative of Λ:

$$d\Lambda = \sum_i dP(q_i)[\ln P(q_i) + 1 + \alpha + \beta q_i] = 0 \quad (2)$$

Equation (2) must work for all i:

$$\ln P(q_i) + 1 + \alpha + \beta q_i = 0 \quad (3)$$

The sum of all probabilities is 1:

$$\sum_i P(q_i) = 1 \quad (4)$$

Combine equations (3) and (4), and eliminate α:

$$P(q_i) = \frac{e^{-\beta q_i}}{e^{-\beta q_1} + e^{-\beta q_2} + \cdots + e^{-\beta q_n}} \quad (5)$$

In the LMSR market, $\beta = -1/\ell$:

$$p(q_i) = P(q_i)$$

QED

Proposition 4 When the Event happens, if the profit for market creator $\mathcal{R} < 0$, i.e., the creator suffers a loss, then $|\mathcal{R}| \leq \mathcal{F}$.

This proposition demonstrates that if there is a loss for the Market creator, then the loss exists, and the largest possible loss equals the deposit.

3.2.3 Buying and Selling Share Process

We will describe the processes of buying and selling shares in the prediction market according to LMSR, based on the definition and propositions listed above.

Assumption: The creator creates a Market based on an Event with n outcomes, defines the loss limit ℓ, and provides the deposit:

$$\mathcal{F} = \ell \cdot \ln(n)$$

At Market creation, no one is trading the shares and:

$$q_1 = q_2 = \cdots = q_n = 0$$

Suppose the probability of each outcome is $1/n$, and the instant price of each share is:

$$p(q_i) = 1/n$$

The first participant, Alice, supposes outcome 1 will win, and buys a shares, then $q_1 = a$. The amount to be paid by Alice is decided by the difference of the cost functions:

$$C(a, 0, \cdots, 0) - C(0,0, \cdots, 0)$$

Please note that before Alice makes the purchase, the instant price of outcome 1 is $p(q_1) = 1/n$, but the amount Alice pays for buying a shares is not $ap(q_1)$, because the instant price $p(q_1)$ reflects only the current purchase price for a small number of (infinitesimal) shares. The bigger a is, the more Alice will have to pay. The instant price $p(q_1)$ will rise immediately after Alice buys and its instant price of $j \neq 1$ will decline. This means that the more shares of outcome i purchased, the higher its price will become and the higher its probability of winning.

At some point, the market cost is $C(q_1, q_2, \cdots, q_i, \cdots, q_n)$,

If Bob buys b shares of outcome i, he will pay:

$$C(q_1, q_2, \cdots, q_i + b, \cdots, q_n) - C(q_1, q_2, \cdots, q_i, \cdots, q_n)$$

When Alice sells a shares of outcome 1, she will pay:

$$C(q_1 - a, q_2, \cdots, q_i + b, \cdots, q_n) - C(q_1, q_2, \cdots, q_i + b, \cdots, q_n)$$

Selling shares leads to a negative cost difference, which means that Alice will make profits based on the amount of the cost difference. If the current instant price is higher than the purchase price, then Alice can make a profit by selling her shares.

If outcome i wins when the Event happens, those who hold winning shares can redeem the shares at the price of one (1) per share, while people holding shares of other outcomes, $j \neq i$, will all suffer losses. When the total funds of $j \neq i$ can not cover the money paid to winners, the difference is deducted from the deposit $\mathcal{F}$. This means that the more accurate the Market forecast, the greater loss the creator suffers, while the less accurate the Market forecast, the more profit the creator makes. A good LMSR model makes the market creator lose, at most, deposit $\mathcal{F}$.

In an extreme Market, the creator will lose all of deposit $\mathcal{F}$. For example, when outcome i wins and all the participants buy its shares, which means q_i is big enough, $q_{j\neq i} = 0$. Therefore, the redemption the creator should pay is $\mathrm{q_i}$, and the net profit of the market (the buys put by all participants) is:

$$\mathrm{T} = \mathrm{C}(0,0,\cdots,\mathrm{q_i},\cdots,0) - \mathcal{F} = \ell \cdot \ln\left(\mathrm{n} - 1 + \mathrm{e}^{\frac{\mathrm{q_i}}{\ell}}\right) - \mathcal{F} \cong \mathrm{q_i} - \mathcal{F}$$

$\mathcal{R} = \mathrm{T} - \mathrm{q_i} \cong -\mathcal{F}$, so the creator's maximum loss is deposit $\mathcal{F}$.

Case Study

The creator created a binary Event:

"Will Ke Jie lose all the games to Alpha-Go on May 27th, 2017?"

This was a prediction event created in April 2017, and its outcome would be either "Yes" or "No".

If the creator defines $\ell = 100$, the amount of the reserves he will provide for the market is:

$$\mathcal{F} = 100\ln 2 = 69.31.$$

The total market capital before betting is:

$$C(0,0) = \mathcal{F} = 69.31.$$

The prediction market operates step-by-step as follows:

If you buy 100 shares of "Yes", then for the first transaction, the payment will be:

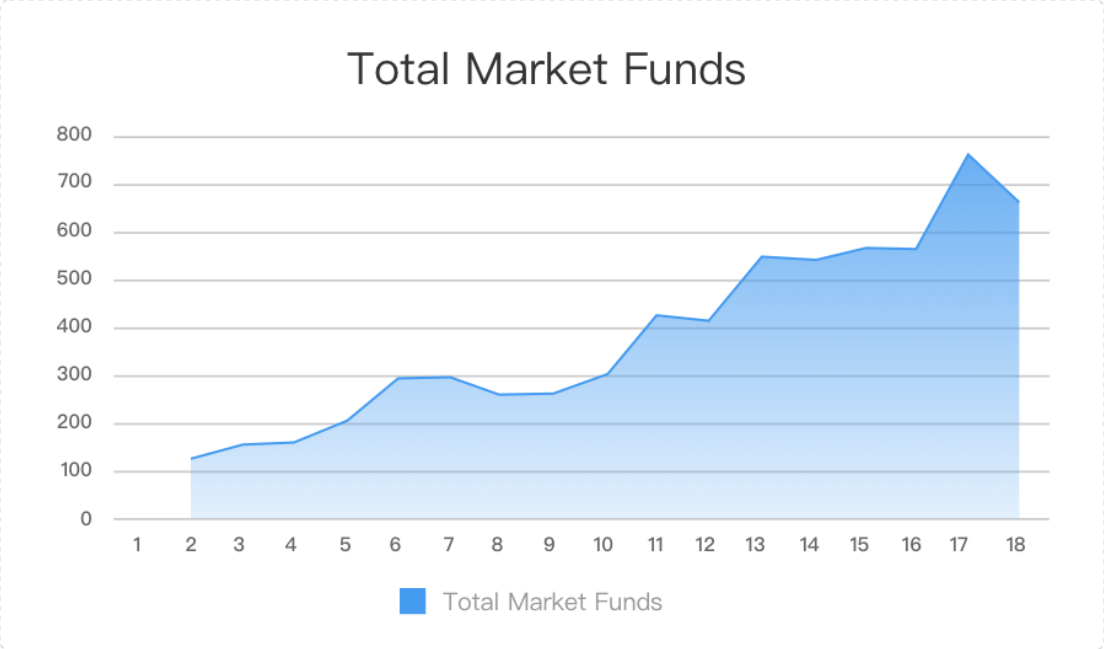
$$C(100,0) - C(0,0) = 62.01$$

The probability of "Yes" after the transaction is:

$$\frac{e^{\frac{100}{100}}}{e^{\frac{100}{100}} + 1} = 0.731$$

Subsequent transactions are calculated in the way described above as shown in the following table:

Step	Shares Purchased		Expense	Earning	Probability		Total Shares		Total Market Capital
	Yes	No			Yes	No	Yes	No	
0					50.00%	50.00%	0	0	$\mathcal{F} = 69.315$
1	100		62.01		73.11%	26.89%	100	0	131.326
2	40		30.72		80.22%	19.78%	140	0	162.042
3		20	4.29		76.85%	23.15%	140	20	166.328
4	50		40.45		84.55%	15.45%	190	20	206.779
5	100		89.73		93.70%	6.30%	290	20	296.504
6		50	4		90.03%	9.98%	290	70	300.508
7	-40			35.21	85.82%	14.19%	250	70	265.298
8		30	4.84		81.76%	18.24%	250	100	270.141
9	40		33.8		86.99%	13.01%	290	100	303.939
10		300	124.79		24.97%	75.03%	290	400	428.734
11		-10		7.41	26.89%	73.11%	290	390	421.326
12		150	126.56		7.59%	92.41%	290	540	547.889
13	-40			2.53	5.22%	94.79%	250	540	545.356
14		20	19.05		4.31%	95.69%	250	560	564.406
15	40		2.1		6.30%	93.70%	290	560	566.504
16		200	194.4		0.90%	99.10%	290	760	760.905
17		-100		98.46	2.41%	97.59%	290	660	662.442



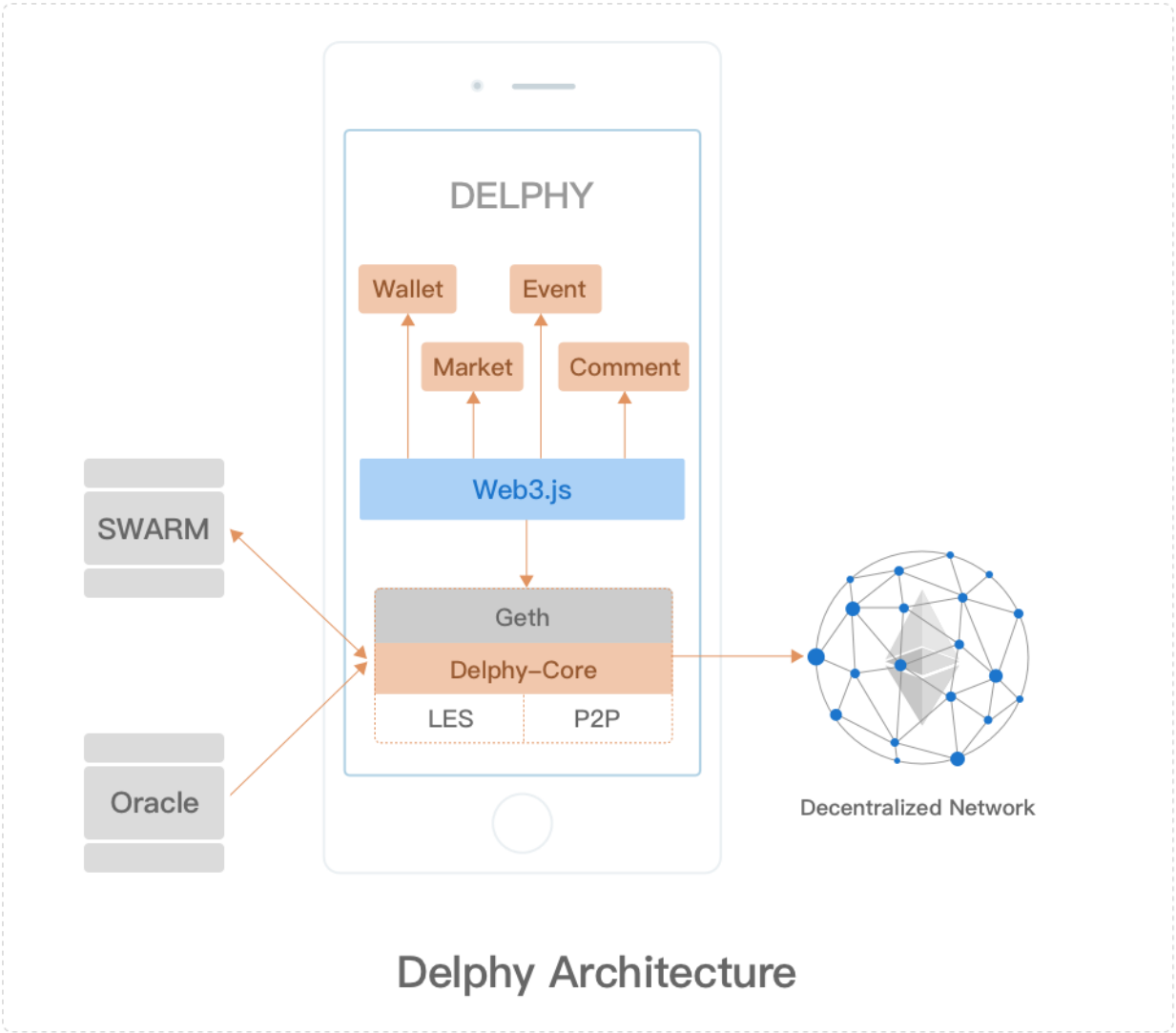
If the prediction market is closed, the probability of "No" is as high as 97.6%, which means that the market forecasts Ke Jie to win at least one (1) game. However, this prediction was opposite to the real result, which means the prediction failed and the creator made a profit. As the probability of "Yes" is 1 and "No" is 0, the market pays 290 shares of "Yes".

The total market is: $C(290, 660) = 662.44$,

and the creator's profit is: $662.44 - 290 - 69.31 = 303.13$

4~ Delphy Architecture

Delphy is a decentralized social prediction market platform built on Ethereum and the Delphy App is a light Ethereum client running on mobile devices. Delphy is an open source project with contributions from around the world.



Delphy Architecture

4.1 Delphy Core Elements

4.1.1 Ethereum

Ethereum is a public, open-source, distributed platform, based on blockchain technology that features smart contract (scripting) functionality and provides a decentralized, trustworthy and permissioned asset issuing and trading infrastructure for Delphy.

Ethereum is essentially a social computing platform. Delphy is a prediction market of social networks and a mobile Distributed Application (DApp). As a DApp on the public Ethereum blockchain, Delphy helps promote Ethereum to the mass market.

4.1.2 Smart Contract

Delphy takes advantage of Ethereum smart contracts to issue DPY tokens, create Events and Markets, connect Oracle and Event filters, as well as to complete pricing, trading, matching, liquidity, and so on.

4.1.3 Swarm

Swarm is a decentralized file management mechanism that helps Delphy store static files and metadata related to Events and Markets in prediction markets to provide distributed storage and retrieval services for Delphy mobile applications.

4.1.4 Light Ethereum Subprotocol (LES)

LES is a mechanism designed for mobile devices (such as smartphones, etc.) that only downloads the head of a block rather than the entire block during blockchain synchronization. It provides fully secure blockchain access, but does not participate in mining or consensus formation.

4.2 Delphy Mobile App

With the ubiquity of smartphones and the success of platforms such as Telegram and Wechat, Delphy adopts the "born mobile" strategy. Delphy takes advantage of the LES protocol of Ethereum to provide a decentralized prediction market as a mobile application. It is a light Ethereum client running independently on mobile devices rather than just browser-based or stand-alone desktop applications.

The Delphy mobile app uses LES to run the Geth and web3.js framework on smartphones, providing powerful and secure functions. Users can easily create Events, create a Market according to the Event they have interest in, set the Event & Market description and metadata, quickly query the Event & Market for share price and movement, buy or sell shares, make payments, and receive profits in different Markets.

4.3 Oracle

Oracle is the information release mechanism for the real outcome of Events in Delphy. Oracle determines the predicted outcome of an Event in Delphy by providing a series of APIs, which Delphy uses to determine the outcome of the prediction market to achieve the final settlement.

Oracle can be centralized (such as RealityKeys and Oraclize), as well as multi-centralized. A centralized Oracle is enough when a predictive application only needs a single data point to verify the results.

For example, in predicting an NBA game, the results on the NBA official website may be enough. For a multi-centralized Oracle, we will devise an incentive mechanism and implement the “m out of n” mode and Oracle's dispute resolution solution.

4.4 Delphy Features

4.4.1 Delphy App is a Light Ethereum Client

Delphy is a mobile platform running a light Ethereum client based on LES. The Delphy App supports all the functions of an Ethereum full node, except mining, and leverages the P2P protocol to communicate directly with the other nodes in the Ethereum network. This greatly improves efficiency and makes the Delphy App, SDK and API powerful and scalable.

4.4.2 Naturally Mobile

Smartphones are the preferred platform choice for Delphy to develop its application. The Delphy iOS and Android mobile apps will launch simultaneously with the Delphy platform, and will improve user friendliness, maximally meet users' needs, and boost the popularization of Ethereum and its development environment.

4.4.3 Customizable

Users can create Markets using the same Event with different preferences. Each Market may have a different loss limit, deposit, market liquidity, delivery date, Oracle, and dispute arbitration mechanism. Users with different preferences can choose their own Markets for transactions and really achieve personalized market creation and cooperation.

4.4.4 Event Filter

User-created Events enter a temporary Event Pool provided by Delphy. The system provides a default Event Filter that filters out illegal or unethical events, such as predictions on the assassination of a country's leader or the overthrow of a government. Delphy also provides Filter APIs for users to create their own Event filters to comply with the laws, regulations and customs in their own countries and jurisdictions.

4.4.5 Social

The Delphy App is a social prediction market interface. Predicting is a social event, and Delphy includes commenting, P2P payments, P2P messaging and OTC, to let users socialize with each other on a single platform.

5~ Delphy Applications

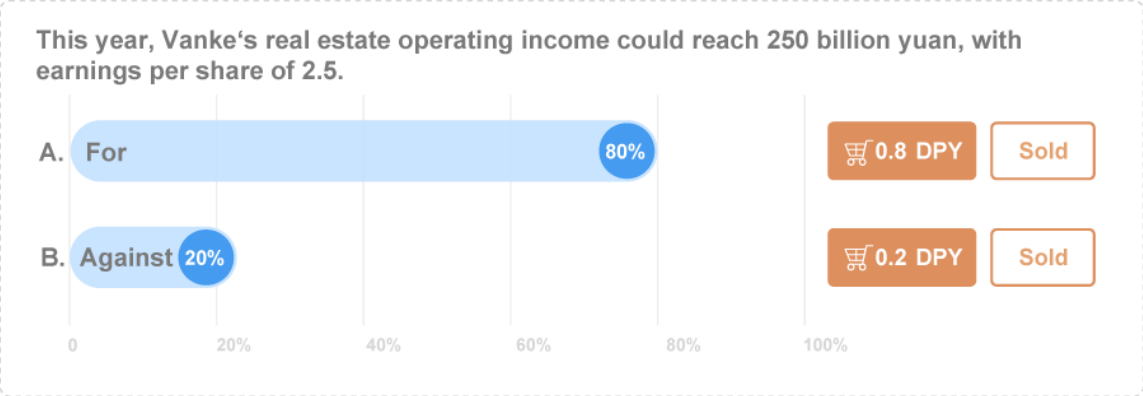
Delphy is a mobile platform for the prediction market and an ecosystem of the Predictions as a Service (PaaS) platform. Users can participate in transactions in any prediction market anytime and anywhere, as well as use the Delphy API and SDK to customize prediction markets based on different vertical field parameters. Delphy is applicable to prediction markets for finance, insurance, national defense, health care, public management, sports, entertainment, and even markets within organizations.

5.1 Finance

The prediction market has the potential to generate financial instruments that are more refined than existing derivatives, providing asset managers with more accurate tools to hedge against risks.

If we regard traditional financial instruments as representations of economic value, the present financial instrument "representations" could be considered limited to asset claims (such as currency and stock), announcements of financial relationships between economic entities (such as bonds), and statements of instrument-related values (such as derivatives). Prediction markets can bring more subtle and detailed representations of economic events and more clearly express value (and risk) at the macroeconomic and microeconomic levels.

For professional institutional investors who manage billions of dollars, forecasting the performance of companies in their portfolio is critical. Prediction markets provide opportunities for people who are intimately familiar with relevant situations to express themselves, as well as provide more market data to secondary market stock analysts.



5.2 Insurance

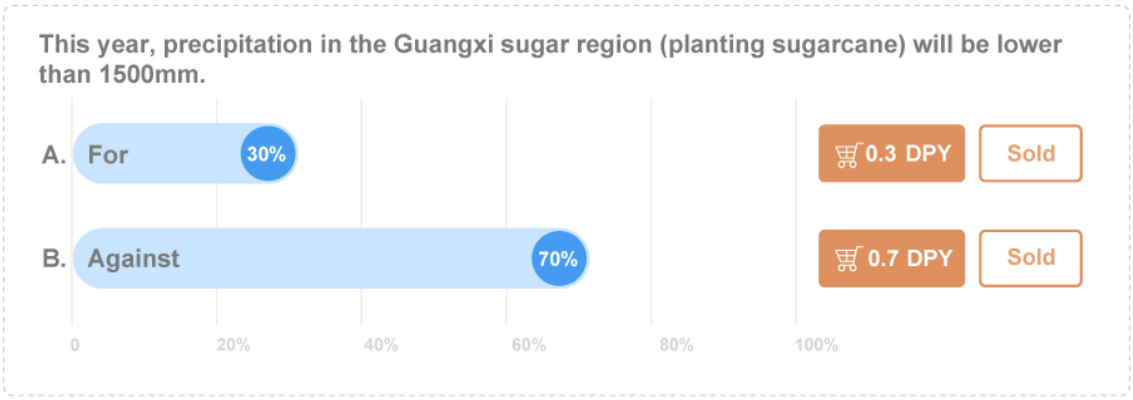
We use prediction markets to mitigate risks due to their high liquidity and accuracy. They essentially crowdsource risk assessment and create opportunities for participants to monetize their valuable private knowledge.

A typical example is the agricultural weather forecast. Agriculture is highly vulnerable to meteorological disasters, such as heavy rain, typhoons, low temperature and dust storms that cause significant agricultural production loss. According to statistics from the China Meteorological Administration, from 1949 to 1991, China experienced fourteen major droughts, several of which reduced grain production by more than 15 million tons.

As a result, farmers have a dire need to hedge against risks. According to statistics from the China Insurance Regulatory Commission, China's agricultural insurance premiums have increased sevenfold between 2007 and 2016. However, it is difficult to cater to each region and crop by just relying on agricultural insurance. The Delphy prediction platform enables farmers to create prediction markets that meet their individual needs and hedge against risks with more refined services.

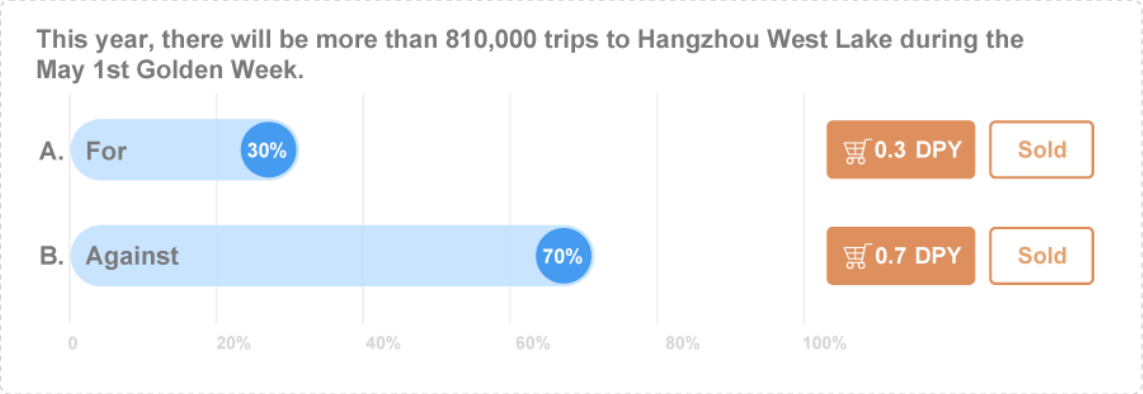
For example, sowing rice early in Northeast China hedges against a low temperature risk, as it is susceptible to a cold spring, while planting sugarcane hedges against the risk of too much or too little rainfall as it requires between 1500 to 2000 millimeters of rain per year.

Delphy's prediction market is quite useful in agriculture. Farmers can participate in the prediction market to hedge against meteorological disasters to reduce economic loss. Meteorological experts can monetize their valuable experience and knowledge and help farmers at the same time.



5.3 Points of Interest (PoI)

With the improvement of people's living conditions, tourism has become an important leisure activity for Chinese people. However, because the tourism resources are centralized and limited, most scenic spots are extremely crowded for people travelling during holidays. Only a few famous spots can avoid such congestion. Predicting in advance which scenic spots have relatively fewer visitors is appealing to most people.



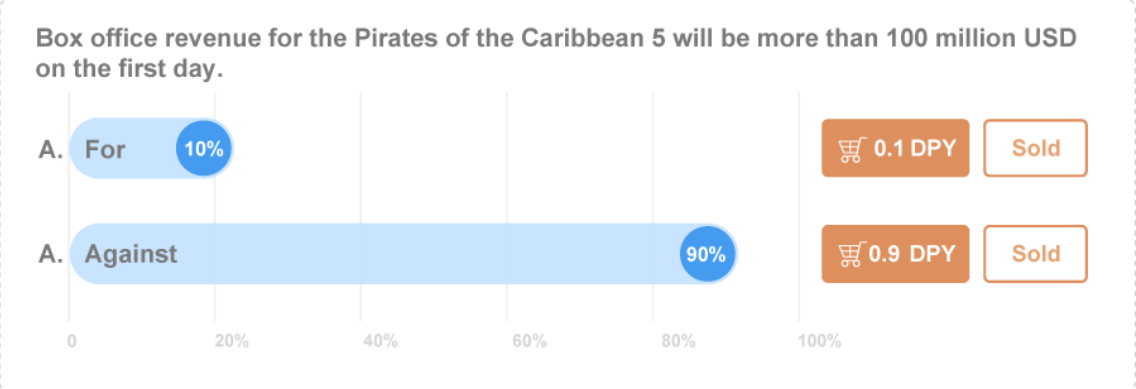
West Lake - a world-renowned scenic spot in the Zhejiang Province of China, took measures to limit the number of tourists it receives each year, because the number often vastly exceeds the maximum carrying capacity set by the country. In recent years, the area has also adopted technology to analyze large amounts of tourist data, providing a reference point and a basis for managing tourist numbers. The technology also sets appropriate tour routes, dynamically processes tourist information and helps develop business strategies.

5.4 Entertainment

The entertainment industry is one of the most prosperous industries in the world. According to China's "13th Five-Year Plan", the market cap of the culture and entertainment industry will reach ¥450 billion for 2015, and may be ¥1 trillion in 2020, with the television and film sector alone being valued at ¥500 billion.

Prediction markets can be widely used in the entertainment industry, for such things as forecasting auditions of variety shows, ratings, movie box office results and so on.

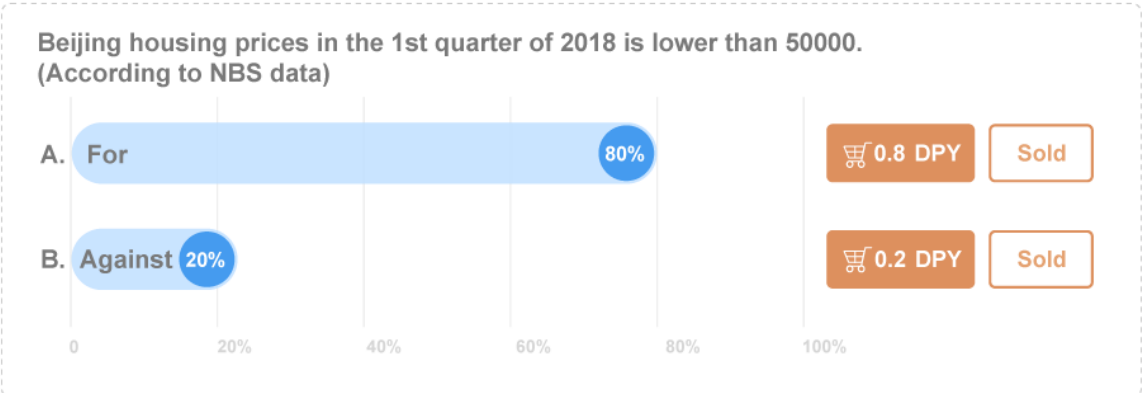
It is notable that Hollywood already has a box office prediction market. It demonstrated its amazing accuracy with its predictions for the 2007 Academy Awards Ceremony. The Hollywood Stock Exchange successfully predicted 32 out of the 39 nominations via ranking by transaction prices, and it correctly predicted seven out of the eight main awards before the ceremony officially began.



5.5 Housing Prices

Housing prices is a topic that concerns most people, as the house is usually the highest asset holding for most households, but key opinion leaders (KOL) and third-party transaction reports are currently the main data sources used to predict current housing prices.

Obviously, the prediction market, with the public participating to express their viewpoints, can intuitively reflect current housing price expectations. In addition to purchasers and sellers, this data also provides valuable reference points for governmental macro-control policies and real estate company investment plans.



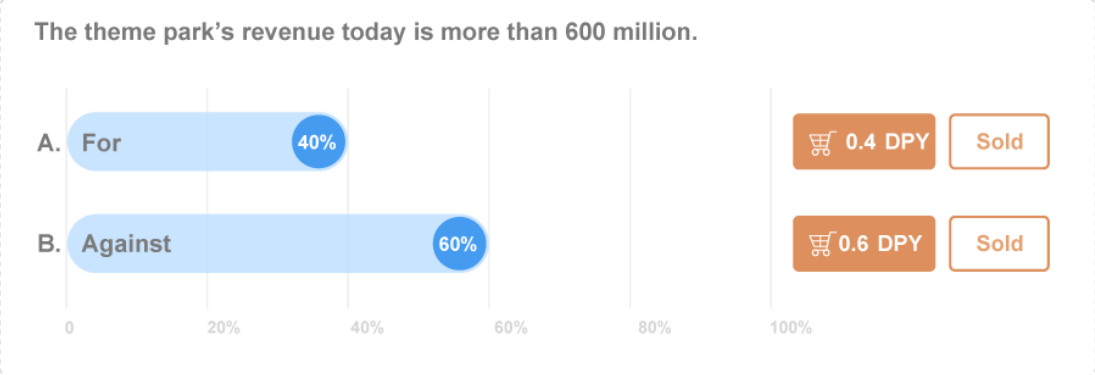
Although there are several channels to collect housing price data, the prediction market will use data released quarterly from official government sources such as the U.S. House Price Index or the National Bureau of Statistics of China to ensure data reliability.

5.6 Games

The online game market size is huge and continues to grow. According to the "2016 China Game Industry Report", the market cap of China's game industry exceeded ¥160 billion and shows no signs of slowing anytime soon. In the U.S., the market cap exceeded $17 billion.

For games in the prediction market, we call our APIs within the games to provide players with the game playing methods and mechanism instead of relying on game developers to include the methods and mechanism.

When it comes to games like theme parks, players can meticulously build and operate their own theme parks and even invite friends to join. For example, players can buy land, hire employees and set game facilities the way they want them.

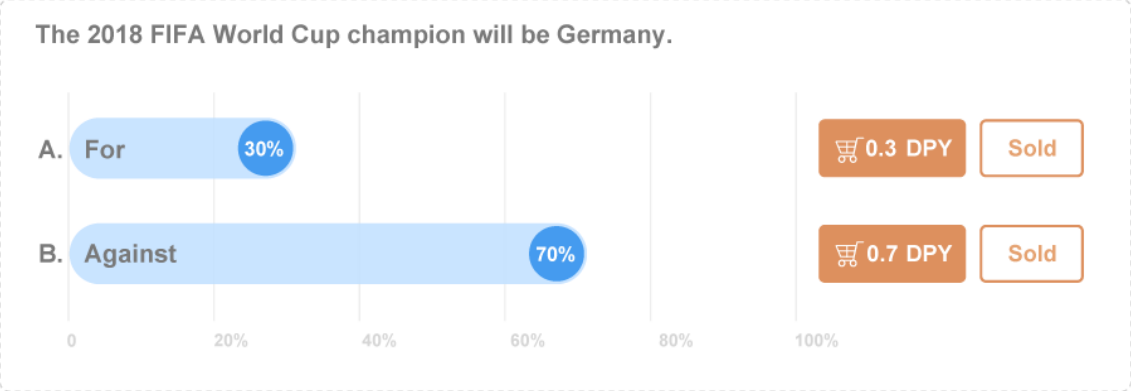


5.7 Sports

Sports betting has a long history. The famous story of “Tian Ji’s Horse Racing” strategy in China's Spring and Autumn period is one of the earliest records of ancient Chinese sports betting. Australia has had legitimate horse race betting for more than a hundred years. The U.K. legalized sports betting on May 1st, 1961. William Hill, a U.K. gaming company, is reportedly the first company to establish a legal online sports betting business back in 1998.

However, the adoption of a centralized prediction market in sports betting has been slow. This is because there are many requirements to establish such companies, and the platform cannot provide an open, fair, impartial and credible market environment since it is unable to prove its innocence. Besides, users run additional risks on centralized platforms, such as theft or payment processor accidents.

In contrast, a decentralized sports prediction market has the advantage of lowering the establishment and participation threshold, proving the platform's innocence, and avoiding the risk of a single point of failure. In the Delphy prediction market, fans can launch their own game predictions with preferences that meet their individual needs and increase the sense of participation.



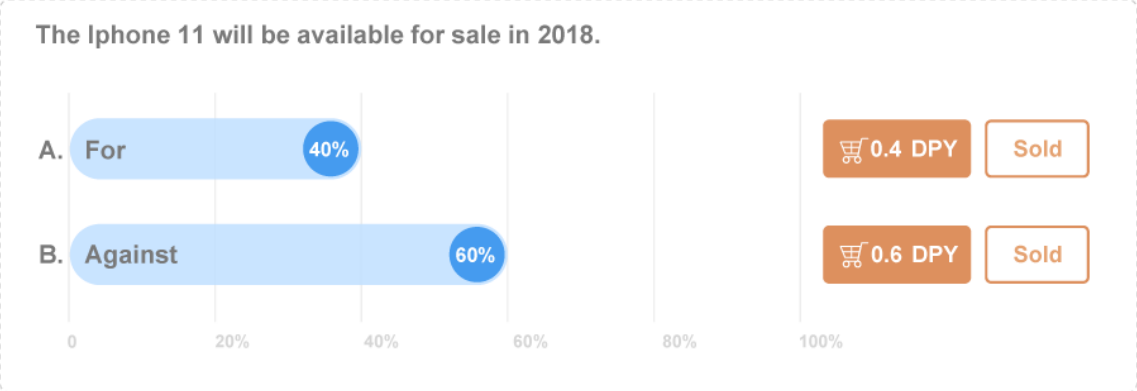
5.8 Governance Policies

The prediction market can help all organizations maximize the efficiency of its human resources. It helps pool the knowledge, wisdom and experience of all stakeholders, enhance the overall competitiveness of the organization, and provide a channel for all employees to express themselves and contribute to the development of the organization. More importantly, it improves the sense of participation, which means a lot to the Millennial Generation.

Therefore, a prediction market within the organization can help managers and administrators better understand employees' ideas and guide the organization's operation.

For example, Microsoft once used a prediction market to forecast whether a product would be delivered on time. Within the first three minutes of the transaction, the price of "on time" went down, meaning that participants

had no faith in the product being delivered on time. The project manager held a meeting to discuss how to solve the delay problem, and the price went back up. Ultimately, the product was not delivered on time because end users were not satisfied with some of its performance.



This example shows that a prediction market, by collecting all kinds of information, can help refine the governing policies inside an organization.

Microsoft is not the only company that has deployed a prediction market. For the past ten years, many Fortune 500 companies, including HP, Best Buy, General Electric, Google and IBM, have been doing the same thing.

Economist David Rothschild believes that using prediction markets in business decisions has two purposes. One is to inform participants what may happen in the future so that they can collect information and resources more efficiently, and the other is to make them know how the various factors affect prediction results.

In addition, prediction markets also help organizations more effectively manage economic and social risks, such as a decline in consumer demand, disease outbreaks and epidemics, and environmental disasters.

6~ Legal Matters and Risk Factors

6.1 Delphy Legal Structure

A non-profit foundation, Delphy Foundation Limited (**"Delphy Foundation"**), has been established in Singapore with respect to Delphy, which will act as an independent legal entity to organize a core team to develop such a decentralized prediction market platform and application. However, the operation and use of Delphy per se will be fully subject to and dependent on the community's autonomy and the Delphy Foundation will merely be a garden-variety member within the community who may put forward proposals or suggestions on Delphy's self-governance without supreme or distinguishable power of authority.

The Delphy Foundation will sell, in the form of private sales and crowdsale, DPY tokens that are designed to be used on the Delphy platform. DPY will serve as the payment method and unit of account for users to use Delphy's services. Nobody will be responsible to repurchase or redeem any sold DPY. DPY, as a kind of virtual commodity with practical uses, are not securities or speculative investment instruments. The Delphy Foundation does not guarantee any intrinsic value of or economic return from DPY. DPY does not represent any real-world assets or rights (such as shares, voting rights, etc.) of the Delphy Foundation. The typical target users of DPY are crypto-token and blockchain veterans.

No U.S. citizens, permanent residents, or green card holders are allowed to participate in the DPY crowdsale, thus the Delphy Foundation will not sell DPY to the foregoing persons.

The Delphy Foundation will use proceeds from the sale of DPY at its own discretion, which include expenses for technical development, marketing, compliance, financial audit, business development, etc.

Delphy contains a completely decentralized prediction market on top of Ethereum. Anyone around the world can access, free of geographical restrictions, the inherent functions of Delphy by, and only by, consuming DPY. The Delphy platform has neither a physical presence nor association with the territory or fiat currency of any country or region. Nevertheless, regulatory authorities in various countries around the world may confront

Delphy with interrogatories and supervision. To satisfy and comply with the local laws and regulations, the Delphy platform may be out of service in certain jurisdictions. The Delphy Foundation and its team will endeavor to seek a "sandbox policy" or safe harbor treatment to allow Delphy to better serve the users.

6.2 Disclaimers

The Delphy Foundation does not make, and hereby disclaims, any representation or warranty with respect to Delphy or DPY (such as merchantability or fitness for particular purposes), except those expressly specified herein. Each purchaser's decision to participate in the DPY crowdsale and purchase any DPY shall be made based on his/her own knowledge of Delphy and DPY and the information disclosed in this Whitepaper. Without prejudice to the generality of the foregoing, each purchaser will, upon the launch of Delphy, accept DPY on an "as is" basis, irrespective of the technical specifications, parameters, performance or function thereof.

The Delphy Foundation hereby expressly disclaims its liability, and shall in no case be liable to any person, for:

(1) any person's purchase of DPY in violation of any anti-money laundering, counter-terrorism financing or other regulatory requirements that are imposed in any jurisdiction;

(2) any person's purchase of DPY in violation of any representation, warranty, obligation, covenant or other provision under this Whitepaper, and the resulting failure or inability to make his/her payment or to claim relevant purchased DPY;

(3) early termination of the DPY crowdsale for any reason;

(4) failure or abortion of Delphy development and resulting failure to deliver DPY;

(5) delay or rescheduling of Delphy development and resulting failure to meet any anticipated milestone;

(6) any error, bug, flaw, defect or otherwise of the source code of Delphy;

(7) any malfunction, breakdown, collapse, rollback or hard fork of Delphy or the blockchain of Ethereum;

(8) failure of Delphy or DPY to meet any specific purpose, or unfitness for any specific use;

(9) utilization of the proceeds raised through the DPY crowdsale;

(10) failure to timely and completely disclose any information relating to the development of Delphy;

(11) any purchaser's divulgence, loss or destruction of the private key of his/her crypto-currency or crypto-token wallet (inter alia, the private key of the Delphy wallet used by that purchaser);

(12) any default, breach, infringement, breakdown, collapse, service suspension or interruption, fraud, mishandling, misconduct, malpractice, negligence, bankruptcy, insolvency, dissolution or winding-up of any third party crowdfunding portal of DPY;

(13) any difference, conflict or contradiction between this Whitepaper and an agreement between any purchaser and any third party crowdfunding portal;

(14) trading or speculation of DPY by any person;

(15) listing or delisting of DPY on or from any exchange;

(16) DPY being classified or treated by any government, quasi-government, authority or public body as a kind of currency, securities, commercial paper, negotiable instrument, investment or otherwise that may be banned, regulated or subject to certain legal restrictions;

(17) any risk factors disclosed in this Whitepaper and any damage, loss, claim, liability, punishment, cost or other adverse impact that is caused by, associated with, in connection with, incidental to or consequential to that risk factor.

6.3 Risk Factors

The Delphy Foundation believes that there are numerous risks involved in the development, maintenance and running of Delphy, many of which are beyond the control of the Delphy Foundation. Each DPY purchaser should peruse, comprehend and consider carefully the risks described below in addition to the other information stated herein before deciding to participate in the DPY crowdsale campaign.

Each DPY purchaser should pay particular attention to the fact that, while the Delphy Foundation is established in the Republic of Singapore, Delphy and DPY lie in cyberspace only without physical presence and hence do not fall within or pertain to any specific jurisdiction.

Participating in the DPY crowdsale campaign shall be an action based upon prudent decision and will be deemed as the relevant DPY purchaser having been fully aware of and agreed to take all the risks below.

(1) Termination of the Campaign

The DPY crowdsale campaign may be early terminated, in case of which a purchaser may only be refunded with part of his/her payment as a result of the Bitcoin / Ether price volatility and/or the expenses incurred by the Delphy Foundation.

(2) Insufficient Information Availability

Delphy is at the stage of development as of the date of this Whitepaper and its philosophy, consensus mechanism, algorithm, code and other technical specifications and parameters could be updated and changed frequently and constantly. While this Whitepaper has contained the then up-to-date key information of Delphy, it is not absolutely complete and is subject to adjustments and updates that the Delphy Foundation might make from time to time for certain purposes. The Delphy Foundation is not in a position, nor obliged, to keep the purchasers closely posted on every detail of Delphy development (including its progress and expected milestones no matter whether rescheduled or not) and therefore will not necessarily provide the purchasers with timely and full access to all the information relating to Delphy that may emerge from time to time. The insufficiency of information disclosure is inevitable and reasonable.

(3) Regulatory Measures

Crypto-tokens are being, or may be, overseen by the regulatory authorities of various jurisdictions. The Delphy Foundation may receive queries, notices, warnings, requests or rulings from one or more regulatory authorities from time to time, or may even be ordered to suspend or discontinue any action in connection with the Campaign, Delphy's development or DPY. The development, marketing, promotion or otherwise of Delphy or the DPY crowdsale campaign may be seriously affected, hindered or terminated as a result. And since regulatory policies could change from time to time, existing regulatory permission or tolerance on Delphy or the DPY crowdsale campaign in any jurisdiction could be just temporary. DPY could be defined from

time to time as virtual commodity, digital asset or even securities or currency in various jurisdictions and therefore could be prohibited from being traded or held in certain jurisdictions pursuant to local regulatory requirements.

(4) Cryptography

Cryptography is evolving and cannot guarantee absolute security at all times. Advances in cryptography, such as code cracking, or technical advances such as the development of quantum computers, could present risks to all cryptography-based systems including Delphy. This could result in the theft, loss, disappearance, destruction or devaluation of the DPY held by any person. To a reasonable extent, the Delphy Foundation will be prepared to take proactive or remedial steps to update the protocol underlying Delphy in response to any advances in cryptography and to incorporate additional reasonable security measures where appropriate The future of cryptography or security innovations is unpredictable while the Delphy Foundation will try its best to accommodate the continuing changes in the domains of cryptography and security.

(5) Development Failure or Abortion

Delphy is still in the process of development, rather than a finished product ready to launch. Due to the technological complexity of the Delphy system, the Delphy Foundation could be faced with unforeseeable and/or insurmountable difficulties from time to time. Accordingly, the development of Delphy could fail or abort at any time for any cause (including insufficiency of funds). The development failure or abortion would result in non-availability of the purchased DPY for Crowdsale to any purchaser.

(6) Theft of Crowdsale Proceeds

There may be attempts to steal the crowdsale proceeds received by the Delphy Foundation (including the fiat currency amount converted therefrom). Such a theft or attempted theft may affect the ability of the Delphy Foundation to fund the development of Delphy. While the Delphy Foundation will adopt cutting-edge technical solutions to keep the crowdsale proceeds safe, certain cyber thefts could be hardly unpreventable.

(7) Flaws in Source Code

Nobody can guarantee the source code of Delphy to be flaw-free. It may contain certain flaws, errors, defects and bugs, which may disable some functionality for users, expose users' information or otherwise. Such flaws, if any, would compromise the usability, stability, and/or security of Delphy and

consequently bring adverse impact on the value of DPY. Open source codes rely on transparency to promote community-sourced identification and solution of problems within the code. The Delphy Foundation will work closely together with the Delphy community to keep improving, optimizing and perfecting the source code of Delphy onwards.

(8) Unpermissioned, Decentralized and Autonomous Ledger

There are three prevailing categories of distributed ledger adopted among the contemporary blockchain projects, namely, unpermissioned ledger, consortium ledger and private ledger. Delphy's underlying distributed ledger is an unpermissioned one, which means it is publicly accessible and useable to everyone on a permission-free basis. While Delphy is initially developed by the Delphy Foundation, it is not owned, operated or otherwise controlled by the Delphy Foundation. The community of Delphy, which is spontaneously formed and is open, decentralized and admission-free to join, is composed of users, fans, developers, DPY holders and other participants worldwide who are mostly not connected with the Delphy Foundation in any manner. Such a community will be decentralized and autonomous as to the maintenance, governance and even evolution of Delphy while the Delphy Foundation will merely be an active player in the community peer to others without supreme or arbitrary authority, irrespective of its earlier efforts and contributions to the genesis of Delphy. As a result, it is not at the mercy of the Delphy Foundation how Delphy would be governed or evolve after the Launch.

(9) Update of Source Code

The source code of Delphy is open and could be updated, amended, altered or modified from time to time by any member of the community of Delphy. Nobody is able to foresee or guarantee the precise result of an update, amendment, alteration or modification. As a result, any update, amendment, alteration or modification could lead to an unexpected or unintended outcome that adversely affects Delphy's operation or DPY's value.

(10) Security Weakness

The blockchain of Delphy rests on open-source software and is an unpermissioned distributed ledger. Regardless of the Delphy Foundation's effort to keep the Delphy system secure, anyone may intentionally or unintentionally introduce weaknesses or bugs into the core infrastructural elements of Delphy which the security measures adopted by the Delphy Foundation is unable to prevent or remedy. This may consequently result in the loss of DPY or any other digital tokens held by a purchaser.

(11) "Distributed Denial of Service" Attack

The Ethereum is designed to be public and unpermissioned and therefore may suffer cyber-attacks of "distributed denial of service" from time to time. Such attacks will adversely affect, stagnate or paralyze the network of the Delphy system and accordingly render the transactions thereon delayed to be recorded or included in the blocks of the Ethereum blockchain or even temporarily unable to be performed.

(12) Insufficiency of Processing Power

The rapid growth of Delphy will be accompanied by a surge of transaction numbers and demand of processing power. If the demand of processing power outgrows how much the nodes of the Ethereum blockchain network can then provide, the network of Delphy could be destabilized and/or stagnated, and there could be fraudulent or false transactions such as "double-spending" to arise. In the worst-case scenario, the DPY held by the purchasers could be lost, and rollback or even hardforking of the blockchain of the Ethereum could be triggered. All these aftermaths would do harm to the usability, stability and security of Delphy and the value of DPY.

(13) Unauthorized Claim of DPY for Crowdsale

Any person who gains access to the DPY purchaser's registered email or registered account by deciphering or cracking the purchaser's password will be able to claim the purchased DPY for Crowdsale in bad faith. As such, the relevant purchased DPY for Crowdsale may be missent to the person whomever claims that the same through the purchaser's registered email or registered account, which sending is not revocable or reversible. Each DPY purchaser shall take care of the security of his/her registered email and registered account throughout by taking such actions as: (i) using a highly secure password; (ii) refraining from opening or responding to any scam emails; and (iii) keeping strictly confidential all the secret or personal information about himself/herself.

(14) Private Key of DPY Wallet

The loss or destruction of a private key required to access DPY may be irreversible. DPY are controllable only by possessing both the relevant unique public and private keys through the local or online DPY wallet. Each purchaser is required to safeguard the private keys contained in his/her own DPY wallet(s). Where such private key of a DPY purchaser is lost, missing, divulged, destroyed or otherwise compromised, neither the Delphy Foundation nor anyone else will be able to help the purchaser access or retrieve the related DPY.

(15) Inflation

Subject to the specific underlying protocol at the launch of Delphy, the total quantity of DPY may slightly increase over time, and could further increase because of the adoption of a patch or upgrade of Delphy source code. The resulting inflation of DPY supply could lead to the drop of market price, and consequently DPY holders (including the purchasers) could suffer economic losses. It is not guaranteed that a purchaser or DPY holder would be compensated or made good somehow for the DPY inflation.

(16) Popularity

The value of DPY hinges heavily on the popularity of the Delphy system. Delphy is not expected to be popular, prevalent or widely used soon after the Launch. The worst-case scenario is that Delphy may even remain marginalized in the long run, appealing to only a minimal portion of the users. By contrast, a significant portion of DPY demand could be of speculative nature. The lack of users may result in increasing volatility of DPY market price and consequently compromise Delphy's long-term development. The Delphy Foundation will not (nor has the responsibility to) stabilize or otherwise affect DPY's market price if there is any such price.

(17) Liquidity

DPY is not a currency issued by any individual, entity, central bank or national, supra-national or quasi-national organization, nor is it backed by any hard assets or other credit. The circulation and trading of DPY on the market are not what the Delphy Foundation is responsible for or pursues. Trading of DPY merely depends on the consensus on its value between the relevant market participants. Nobody is obliged to redeem or purchase any DPY from any DPY holder (including the purchasers). Nor does anyone guarantee the liquidity or market price of DPY to any extent at any time. To divest his/her DPY, a DPY holder would have to locate one or more willing buyers to purchase the same at a mutually agreed price, which attempt could be costly and time-consuming and does not necessarily bear fruit. And there could be no crypto-currency exchange or other marketplace having DPY listed thereon for trading.

(18) Price Volatility

Cryptographic tokens, if traded on public markets, usually have extremely volatile prices. Fluctuations in price over short periods of time frequently occur, which price may be denominated in Bitcoin, Ether, US Dollars or any other fiat currency. Such fluctuations could result from market forces (including

speculations), regulatory changes, technical innovations, availability of exchanges and other objective factors and represent changes in the balance of supply and demand. The Delphy Foundation is not responsible for any secondary market trading of DPY no matter whether or not there would be such markets for DPY. Therefore, the Delphy Foundation neither is obliged to tame the price volatility of DPY nor cares about that. The risks associated with DPY trading price have to be taken by the DPY traders themselves.

(19) Competition

Delphy's underlying protocol is based on an open-source computer software such that nobody claims copyright or any other type of intellectual property right of the source code. As a result, anyone can legally copy, replicate, reproduce, engineer, modify, upgrade, improve, recode, reprogram or otherwise utilize the source code and/or underlying protocol of Delphy in an attempt to develop a competing protocol, software, system or virtual platform or virtual machine, which is out of the Delphy Foundation's control and may consequently compete with or even overshadow or overtake Delphy. Besides, there have been and will be various competing blockchain-based platforms that compete with Delphy. The Delphy Foundation will in no case be capable of eliminating, preventing, restricting or minimizing such competing efforts that aim to contest with or overtake Delphy.

7~ Roadmap

2017 Q3

1) Develop Delphy-Core

2) Develop Delphy.go

3) Develop Centralized Oracle

2017 Q4

1) Develop Event & Market Editor

2) Develop SWARM-based Storage

3) Develop Mobile Wallet

4) Develop iOS & Android App

5) Continuously develop Delphy-Core, Delphy.go and Oracle

2018 Q1

1) Launch Alpha version

2) Integrate RealityKeys

3) Provide API & SDK

4) Security Auditing

5) Delphy Pilot Run

2018 Q2

1) Hackathon

2) Developing decentralized storage and index

3) Developing KYC

4) Developing Event Filter

5) Security Auditing

8~ Team

8.1 Core Team

Bo Wang

Bo obtained his B.S. in Information Management from Peking University and his M.S. in Information Economics from the University of Michigan. He is a serial entrepreneur in both China and the U.S. and is the co-founder and former VP of Engineering at Factom. He is an expert in blockchain consensus algorithms and P2P networking.

Tllik

Tllik gained his Ph.D. in Applied Mathematics at Peking University. He is a cryptography scientist and information security expert focusing on the study of Elliptic curve pairings and Elliptic curve discrete logarithm problems. He has more than 10 years of research and development experience in information security.

Bill

Shiwu graduated from Zhengzhou University with B.S. degree in Mathematics and is excellent at algorithm and performance optimization. He is an expert in 3D game engines and has been a key contributor or founding member for a few successful game companies in China. He is an all-around full-stack engineer currently focusing on smart contract programming with Solidity.

Jerry

Qinggang earned his Master's degree in Computer Science from the Chinese Academy of Sciences. He was a staff engineer for the Internet of Things (IoT) and Cloud Computing projects for Oracle China, and a principle contributor to the implementation of the National Standard of Cryptography. His main expertise includes JVM / EVM, Hyperledger / Fabric. and Ethereum. He is a main enabler of JavaCard and N3 systematic cryptographic algorithms.

Hua Fang (Frank)

Frank has a Master's degree in Communication Engineering from Aachen University of Technology in Germany and is a Certified Public Accountant. He used to work for the world's leading telecom equipment manufacturer and eCommerce company and has extensive experience in product development and project management. He is a full-stack engineer with focus on React.

Xiong Lu (Eda)

Eda obtained her B.S. degree in Information Systems at the Beijing Information Science & Technology University, and has rich experience in User Interface (UI) and User Experience (UX) design on mobile devices and 3D game console.

Mark

Mark has a B.S. in Computer Science, focusing on research and analysis of the blockchain market. He is deeply involved in researching chain market dynamics and overall market planning and implementation. He is responsible for Delphy's market planning and for early promoting in the Delphy community.

8.2 Council and Advisory Board

Bo Shen: Founder of Fenbushi Capital

James Gong: Founder of ChainB.com

Roland Sun: Partner of Broad & Bright

Gang Wu: Founder of Bixin.com

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