

No No No Commission Lower
Route Slippage Impermanent loss Allocation by Role Gas

TTSWAP

Detailed Design Whitepaper based on Market
Value Transaction Conservation Principle

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1 Summary

TTSWAP (token-token swap) is a decentralized automated market-making protocol built on the Ethereum blockchain. Its underlying principle is based on the transfer of market value triggered by user behavior, and it constructs a platform using value conservation trading strategies.

The whitepaper explains the design logic of the ttswap project, covering principles and implementations of good trading, investment, and withdrawal of value goods, as well as ordinary good investment and withdrawal, and the generation and distribution of good transaction fees.

2 Features

Value Conservation Trading Strategy

The value conservation trading strategy accurately reflects the true market value of currencies and facilitates fast good transactions.

1. Direct Trading without Intermediaries

On this platform, any two types of items can be directly traded without the need for intermediate conversions.

2. No Slippage within Trading Threshold

Transactions below the good trading threshold incur no slippage.

3. No Impermanent Loss for Liquidity Providers or good Investors

Constant market value inherently prevents impermanent loss. When users withdraw their investment, they receive the original invested good plus profits generated from providing liquidity.

4. Low Gas Fees with Simple Computational Logic

The logic behind the constant value trading model is simple, resulting in low computational load and gas consumption.

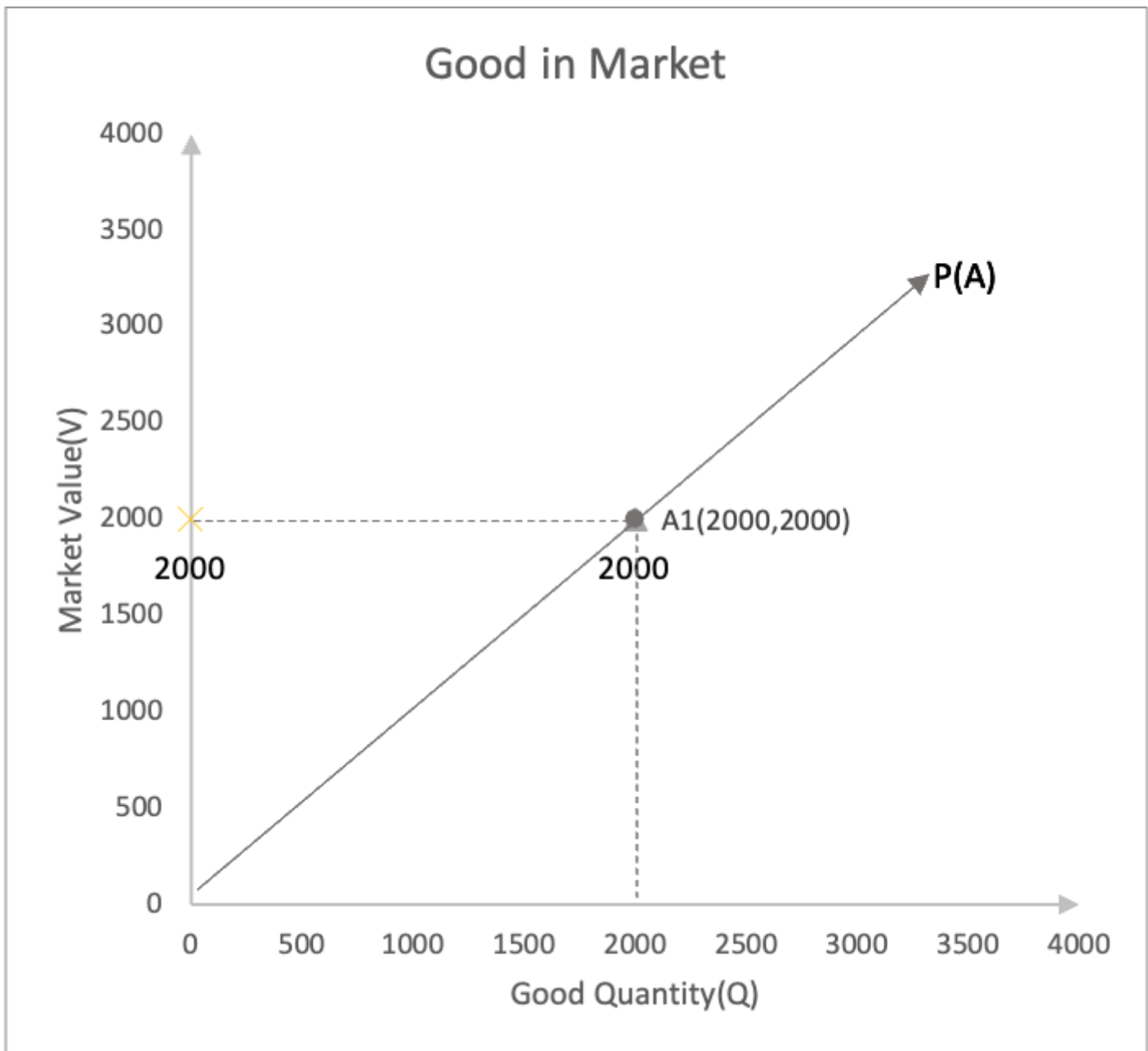
5. Fee Distribution Based on Roles for Everyone

Fees are distributed based on roles, allowing anyone to become a good investor (liquidity provider), merchant, portal, referrer, user, or platform role, sharing in the platform's growth earnings.

3 Principle of Value Conservation Trading Mode

3.1 Goods

Example: There are 2000 units of good A1 in the market, with a market value of 2000.



Definition:

Market value $V(A1)$: Used to measure the degree of demand for goods in the market. The market value of good A is 2000.

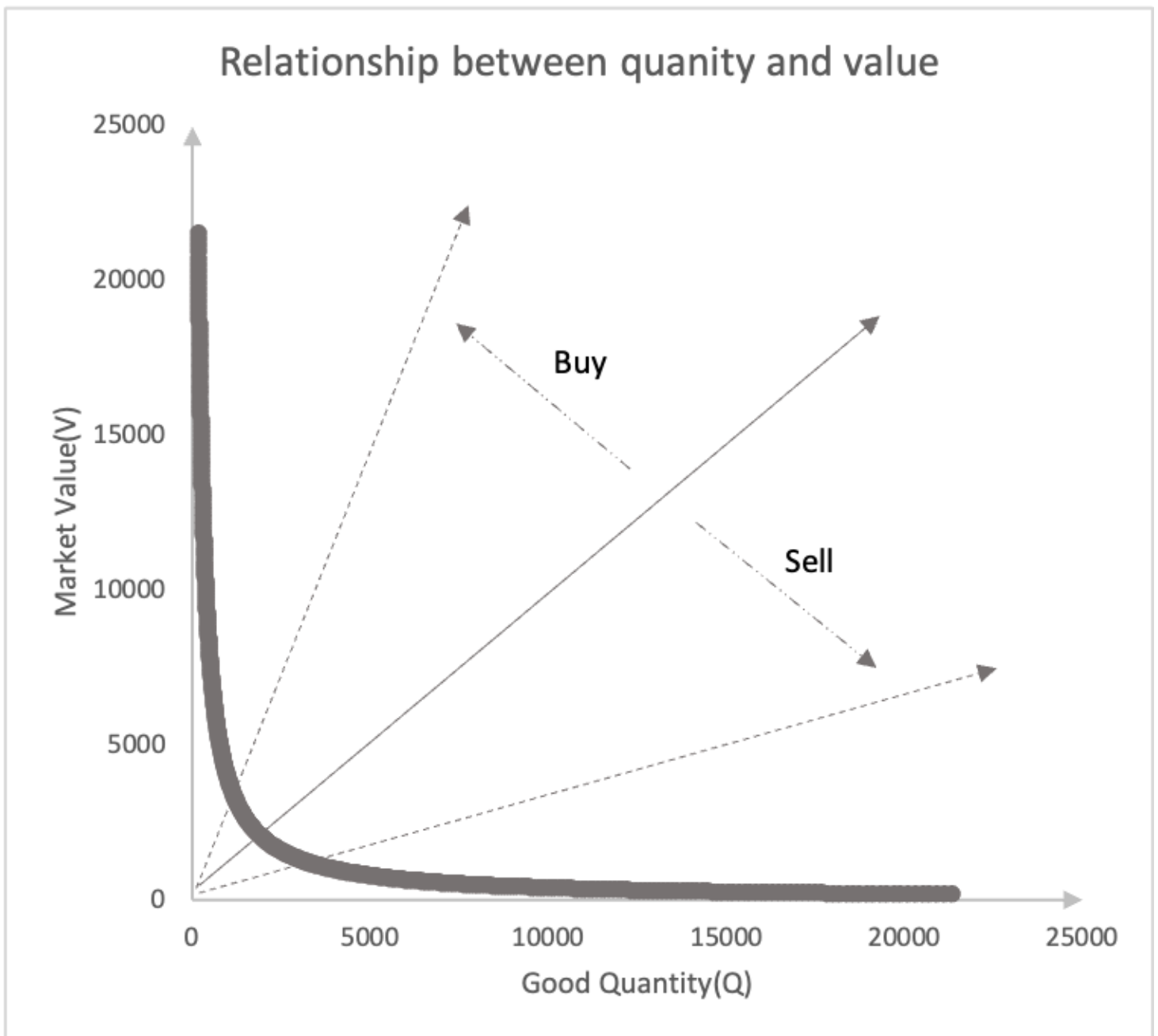
Quantity $Q(A1)$: Records the quantity of goods. The quantity of good A is 2000.

Unit value $P(A1)$: The market value per unit quantity. The unit value of good A is 1.

3.2 The Relationship between Market goods and User Buying and Selling Behavior

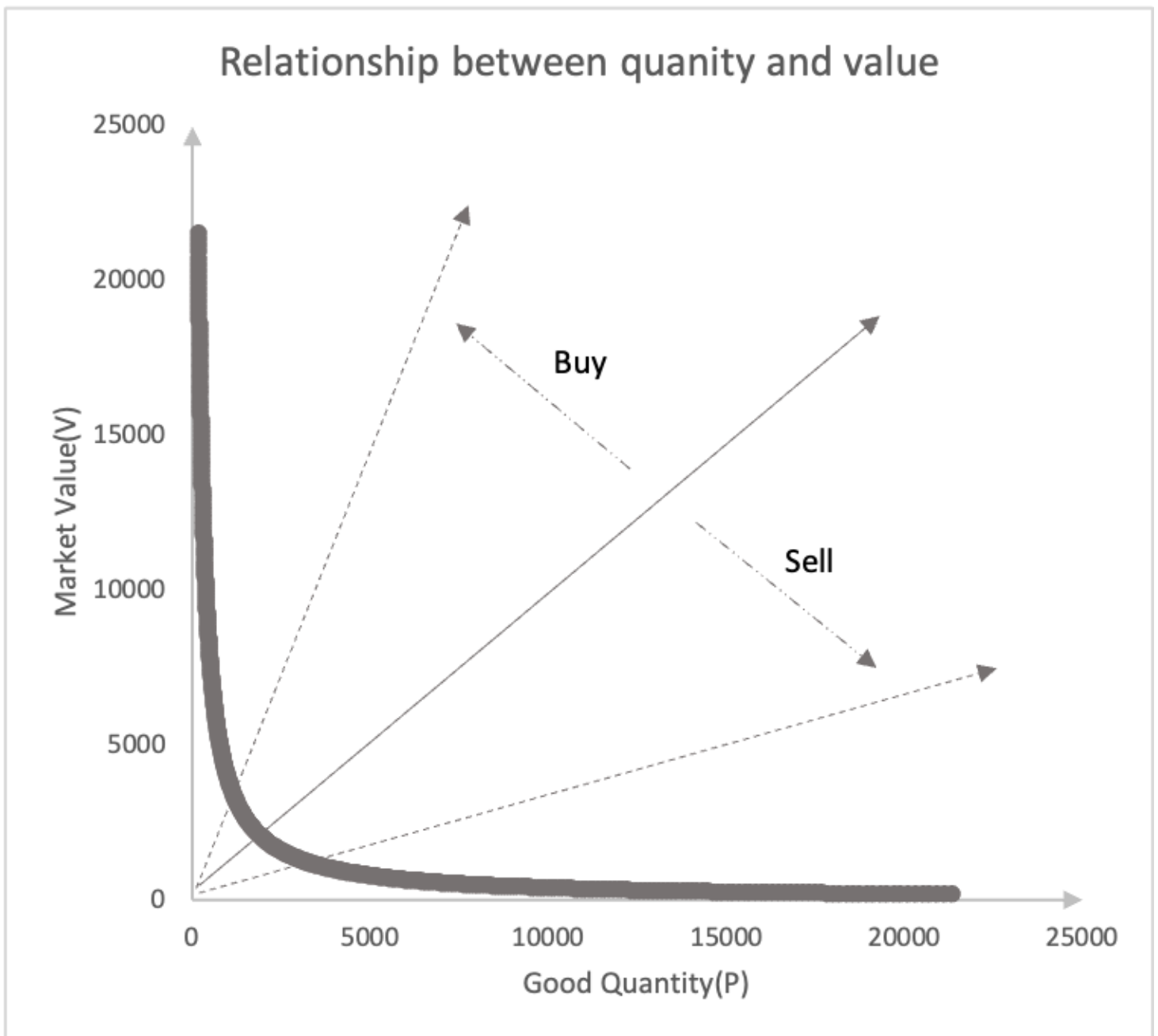
- Example 1: The user spends a value of 1000 to purchase good A.
The demand for good A in the market increases. $V(A1) = 2000 + 1000 = 3000$.
The quantity of good A in the market decreases. $Q(A1) = 2000 - 1000 = 1000$.
The unit value of good A in the market changes. $P(A1) = 3$.
- Example 2: The user sells good A for a value of 1000.
The demand for good A in the market decreases. $V(A2) = 2000 - 1000 = 1000$.
The quantity of good A in the market increases. $Q(A2) = 2000 + 1000 = 3000$.
The unit value of good A in the market changes. $P(A2) = 0.3333$.

Display as shown in the following diagram



3.3 The relationship between user behavior and good status in the market

Now, as users sell and purchase, the market value V and quantity Q of goods change, causing corresponding changes in the good prices. The changes in market value V and quantity Q of goods are depicted in the graph



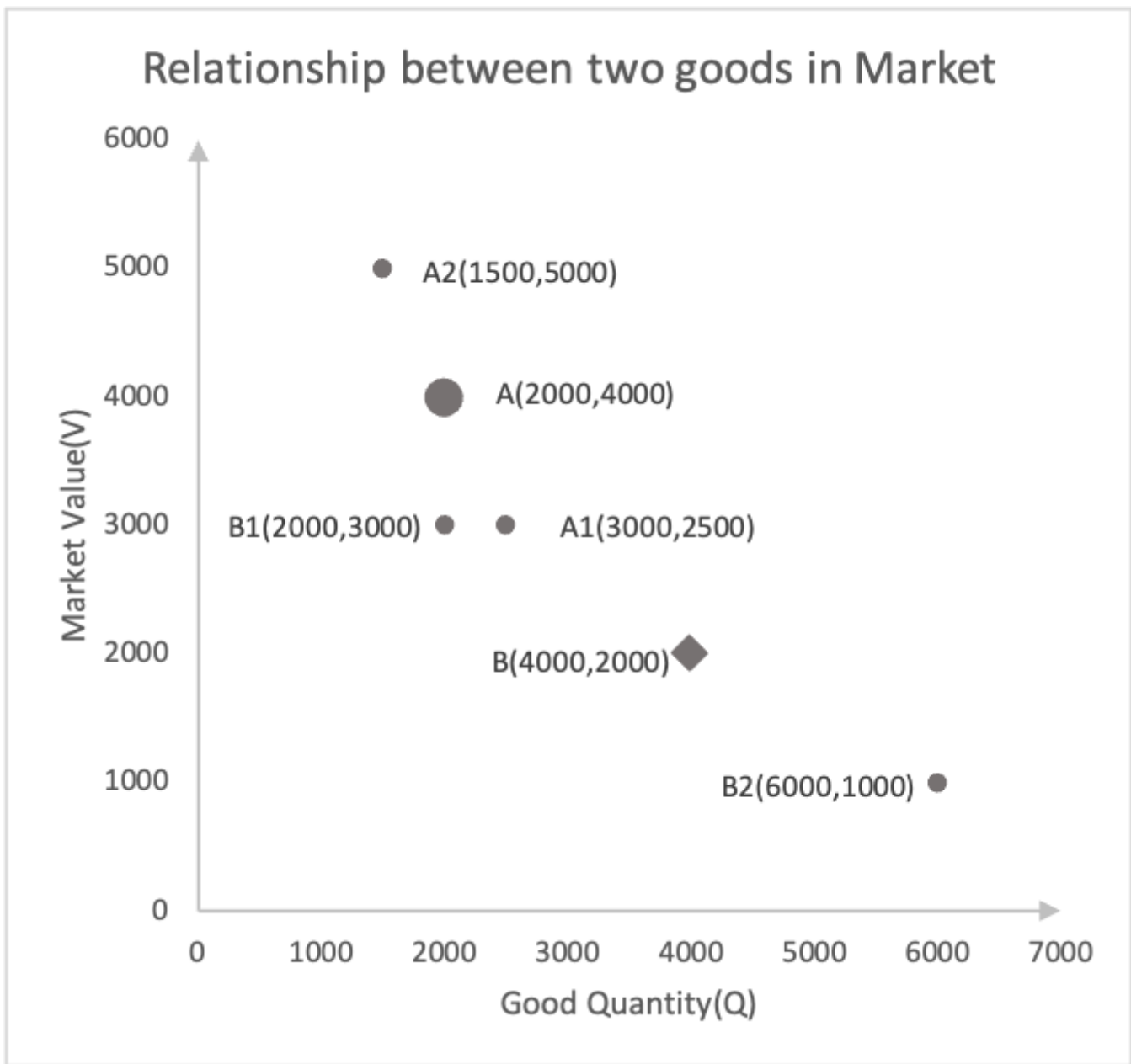
3.4 The relationship between two types of items in the market

Now in the market, there are two types of goods, A and B. A(2000, 4000), B(4000, 2000).

When users use 500 units of good A, the corresponding market value is 1000. The market value of 1000 corresponds to 1000 units of good B.

When users use 500 units of good A, they can purchase 1000 units of good B. In the graph below, A will move to position A1, and B will move to position B1.

When users sell 500 units of good A, they will obtain 1000 units of good B. In the graph below, A will move to position A2, and B will move to position B2.

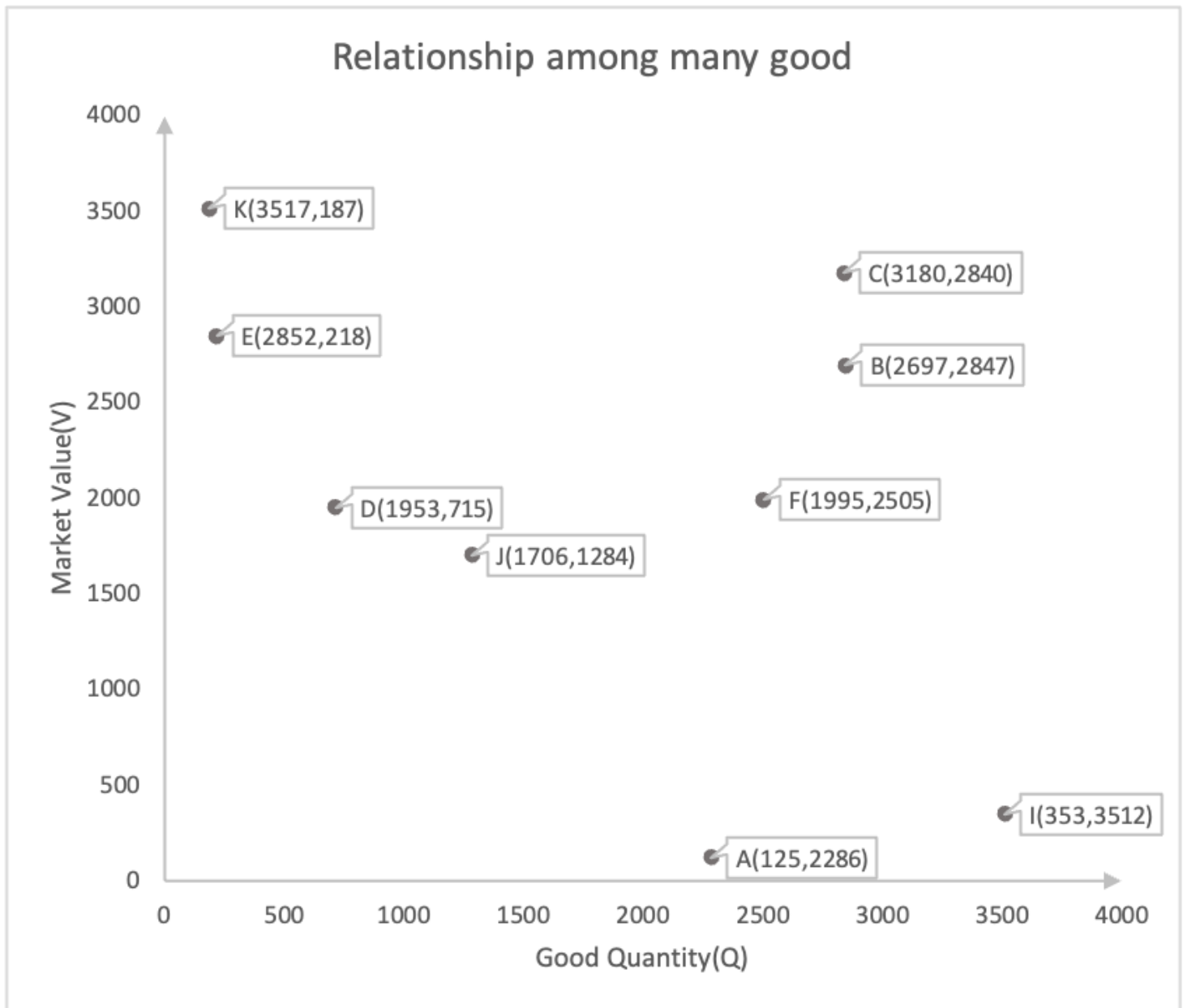


Due to the change in position, $P(A)$ and $P(B)$ also change. The relative price of good B to good A will also change. If there is a discrepancy with the external market price, other transactions will facilitate the convergence of market price with the external market price.

Note: If the proportion of purchase quantity in the market data is too large, it will cause significant fluctuations in the relative prices of the two goods. Therefore, each transaction will be split into multiple smaller orders for trading.

3.5 The relationship between multiple goods in the market

User transactions cause changes in the positions of any two goods, which in turn affect the positions of these two goods relative to other goods, resulting in synchronized price changes.



3.6 The relationship between transaction size and price of goods in the market

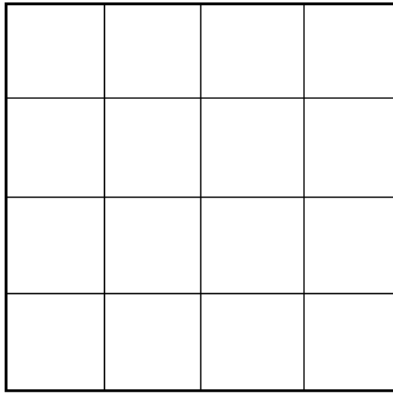
User transactions cause changes in the positions of any two goods, which in turn affect the positions of these two goods relative to other goods, resulting in synchronized price changes.

Transaction size	price change
10	0.000000200000
50	0.000001000000
100	0.000002000002
500	0.000010000050
1000	0.000020000200
5000	0.000100005000
10000	0.000200020002
50000	0.001000500250
100000	0.002002002002
500000	0.010050251256
1000000	0.020202020202
5000000	0.105263157895

3.7 No impermanent threshold

To prevent the platform's goods from being squeezed out by user transactions, each good is assigned a segmentation number during initialization. Each unit size corresponds to the non-slippage threshold of the good. Therefore, when users transact, if the transaction value is smaller than the non-slippage threshold of the good, there is no impermanent loss. If the transaction exceeds the non-slippage threshold of the good, the transaction will be split into units based on the threshold for execution.

Good A



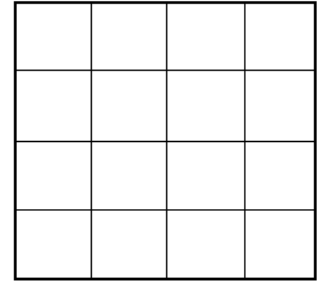
Good A1



Good B1



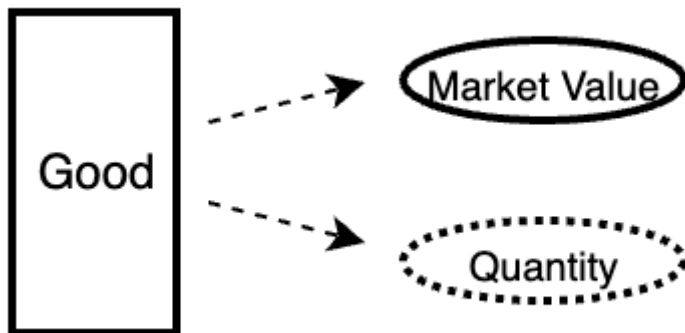
Good B



4 Good

4.1 Good introduce

Description of the good: The platform possesses 15 units of good A with a market value of 3000. Thus, the good has two attributes: market value and quantity. See the diagram below.

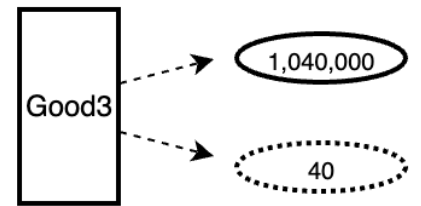
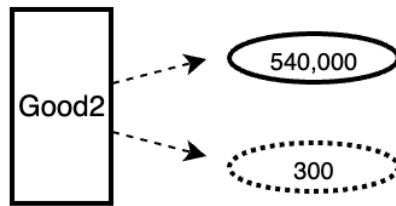
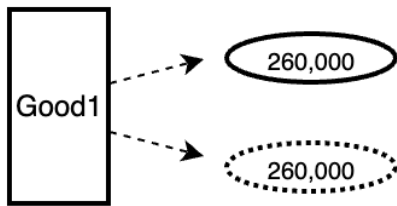


- Noun explanations:

Market value: Records the true market value of goods in the market. When users purchase goods, the market value of the good increases. When users sell goods, the market value of the good decreases.

Quantity: Records the current quantity of goods in the market.

- This can be described for any other good as shown in the diagram below.



4.2 Good type

type	introduce	Does the transaction incur any fees?	Can invest self alone	Can invest self alone with value good
metagood	first good in market	yes	yes	no
valuegood	The product is recognized by the market, with a good ecosystem and team.	yes	yes	no
normalgood	Adding new items, Market value to be confirmed	yes	No	yes

4.3 Good Config

- The item configuration occupies 255 positions.

4.3.1 Market set

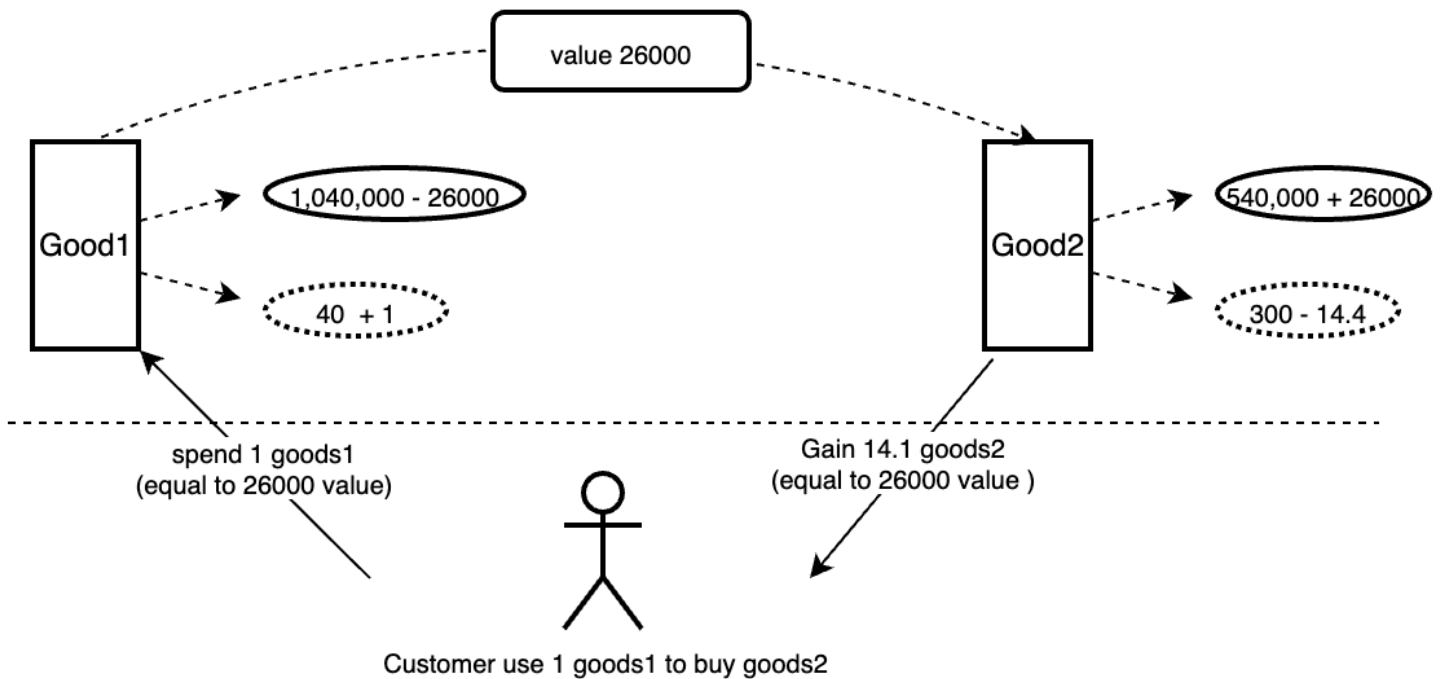
id	config	size	unit	max	min	start	end	note
1	valuegood	1	BOOLEAN	1	0	256	256	
...								

4.3.2 Good seller set

id	config	size	unit	max	min	start	end	note
1	invest fee rate	10	One ten-thousandth	1023	0	255	246	(1~1023)/10000
2	disinvest fee rate	10	One ten-thousandth	1023	0	245	236	(1~1023)/10000
3	buy fee rate	10	One ten-thousandth	1023	0	235	226	(1~1023)/10000
4	sell fee rate	10	One ten-thousandth	1023	0	225	216	(1~1023)/10000
5	trade chips	10	64	1023	0	215	206	(1~1023)X64
6	disinvest chips	10	1	1023	0	205	195	(1~1023)

5 Swap Good

The essence of good exchange is essentially when users exchange good A in the market for good B. By giving up good A, users demonstrate a decrease in the market value of good A. Users only abandon good A when its market value declines. Conversely, users purchase good B when its market value increases.



- As shown in the diagram, when users abandon good A, it leads to an increase in the quantity of good A in the platform and a decrease in its market value. Meanwhile, users acquire good B, resulting in a decrease in the quantity of good B in the platform and an increase in its market value. Consequently, the price relative to good A and good B decreases. In subsequent transactions, the same quantity of good A can only purchase a slightly smaller quantity of good B compared to the previous transaction.
-

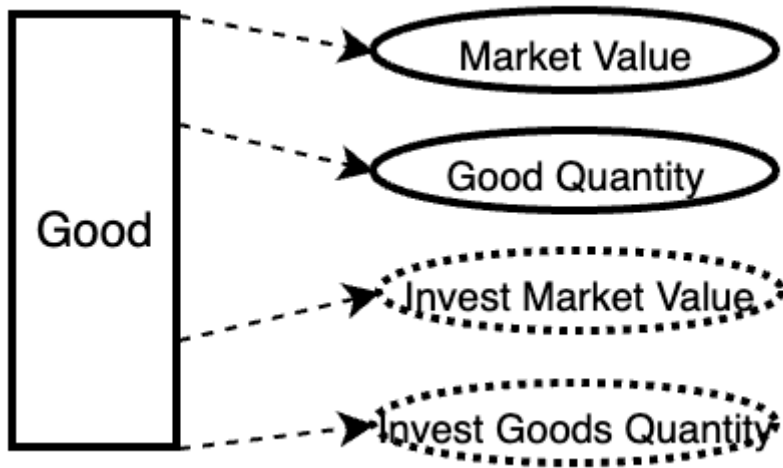
As shown in the diagram, we also adhere to the three fundamental principles of market value conservation in trading:

1. The market value of the goods used by users during purchase equals the market value of the goods they acquire.
2. The total market value of the goods held by users before purchase equals the total market value of all goods they hold after purchase.
3. User purchases and sales only result in the transfer of market value from one good to another; it does not disappear.

6 Invest or disinvest good

6.1 Record invest data

In market good trading, liquidity must be provided by someone. It is necessary to record the total market value of good investments and the total quantity of investments.

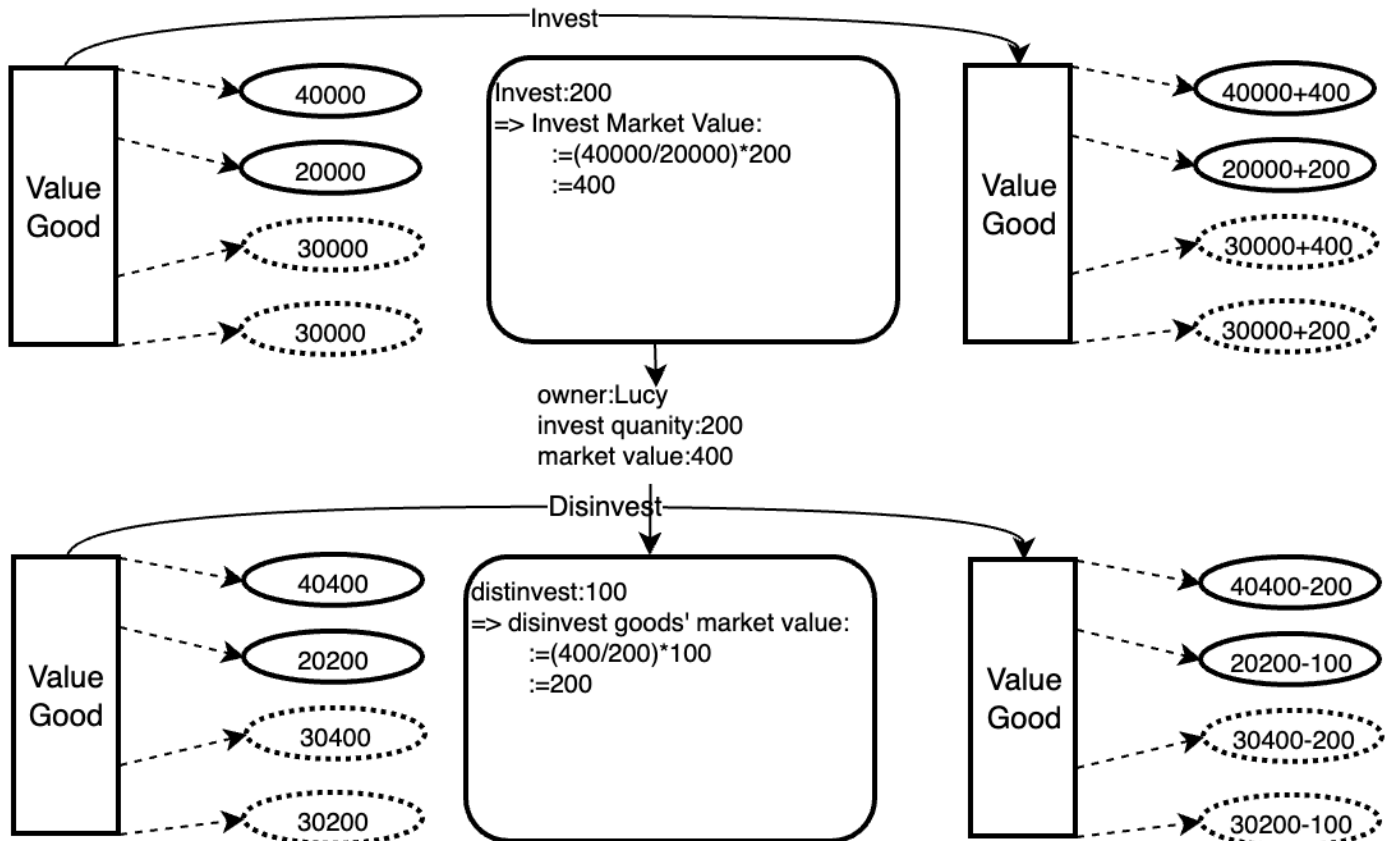


- Noun explanations:

Investment value: Records the total market value of goods when users invest.

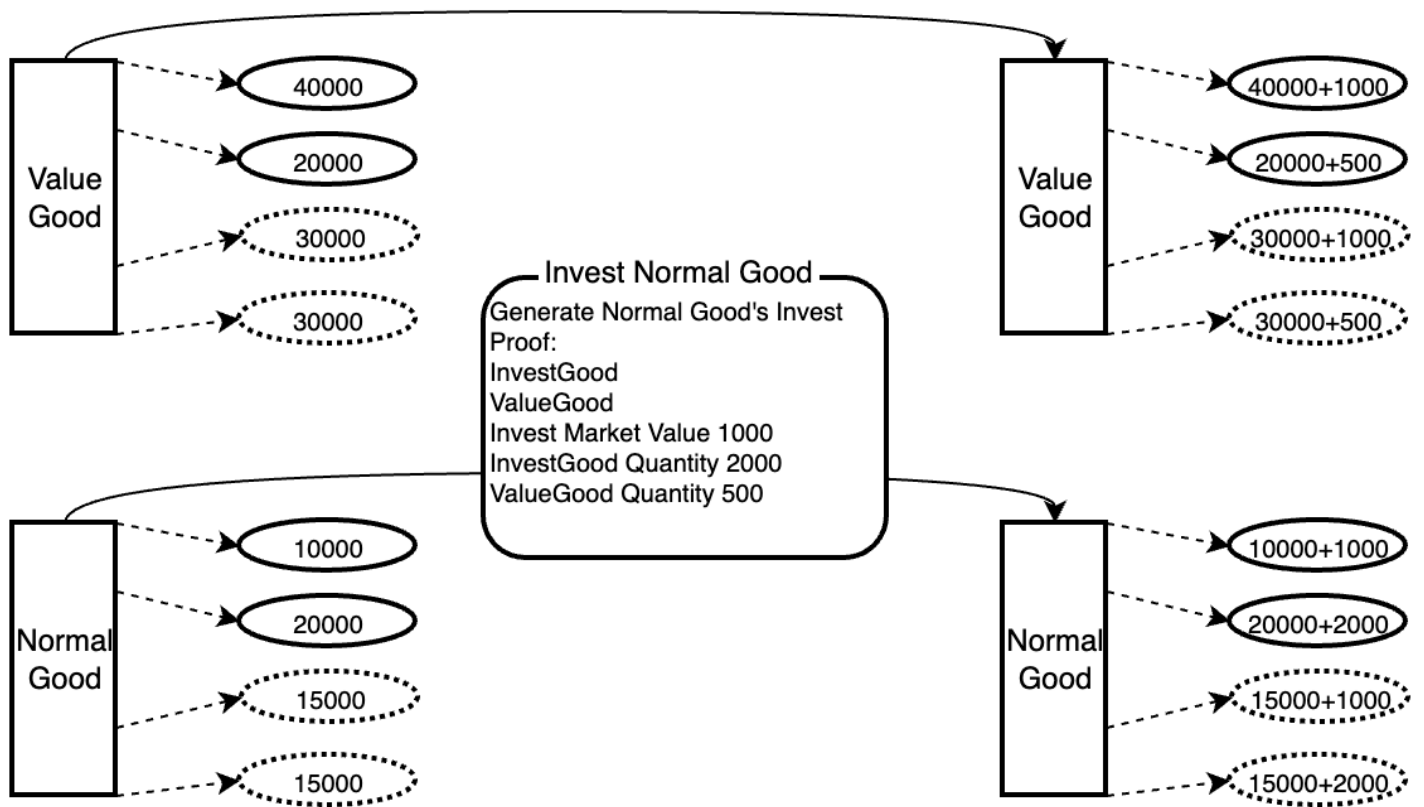
Investment quantity: Records the total quantity of goods invested by users.

6.2 Invest or disinvest value good



- User Invests in Valued goods:
Users calculate the market value corresponding to the investment quantity based on the current status of valued goods. This facilitates profit calculation when withdrawing investments.
- User Withdraws from Valued goods:
Users calculate the profits generated from investments based on investment records.
When withdrawing from goods, the canceled quantity or the canceled market value corresponding to the quantity needs to be less than the total current quantity or the total value divided by the maximum withdrawal ratio.

6.3 Invest normal good

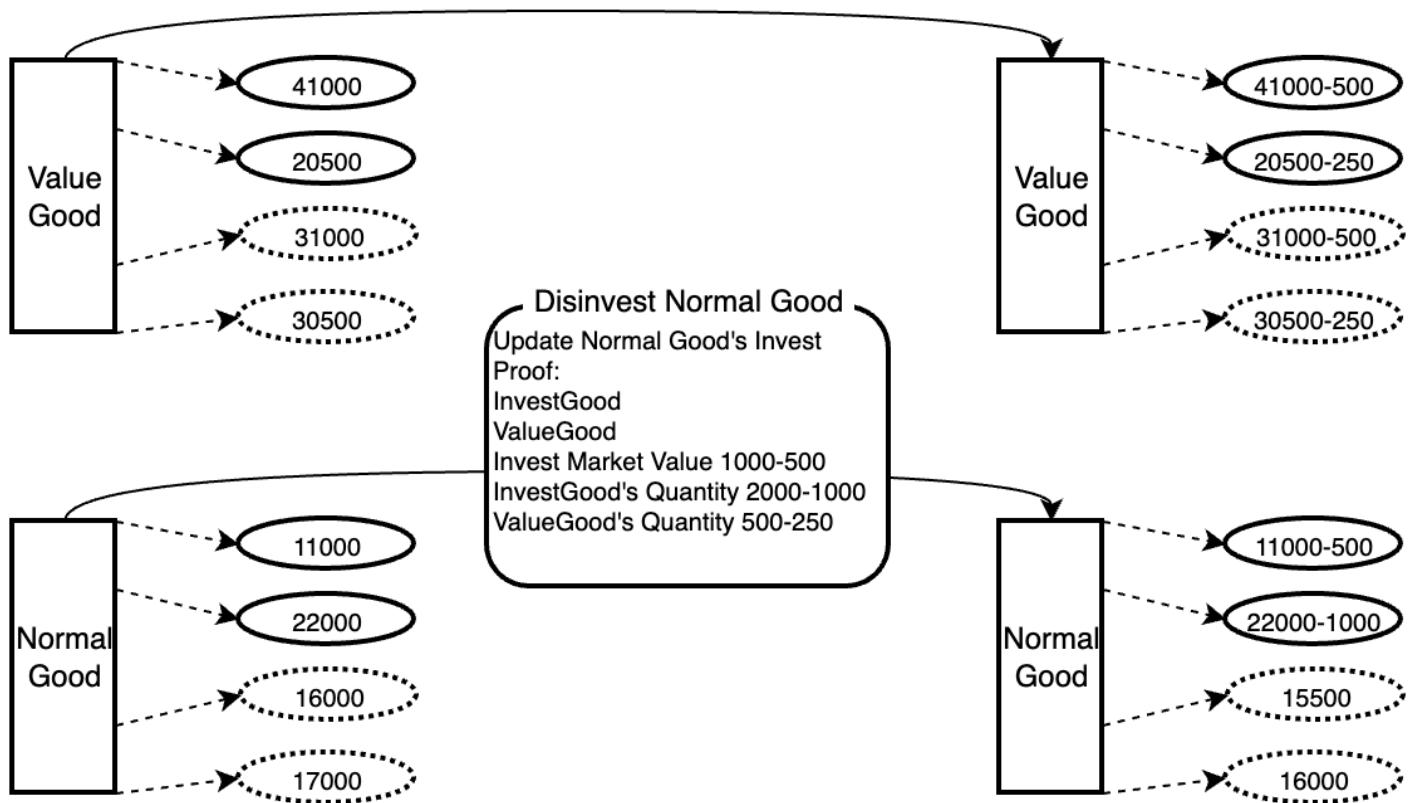


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- User Invests in Regular goods:

Due to the volatile market value of regular goods, it is easy to form arbitrage against other users' tokens on the platform. To avoid this situation, it is necessary to invest in valued goods with comparable market values. Both valued goods and regular goods generate investment returns, as detailed in the fee distribution.

6.4 Disinvest normal good

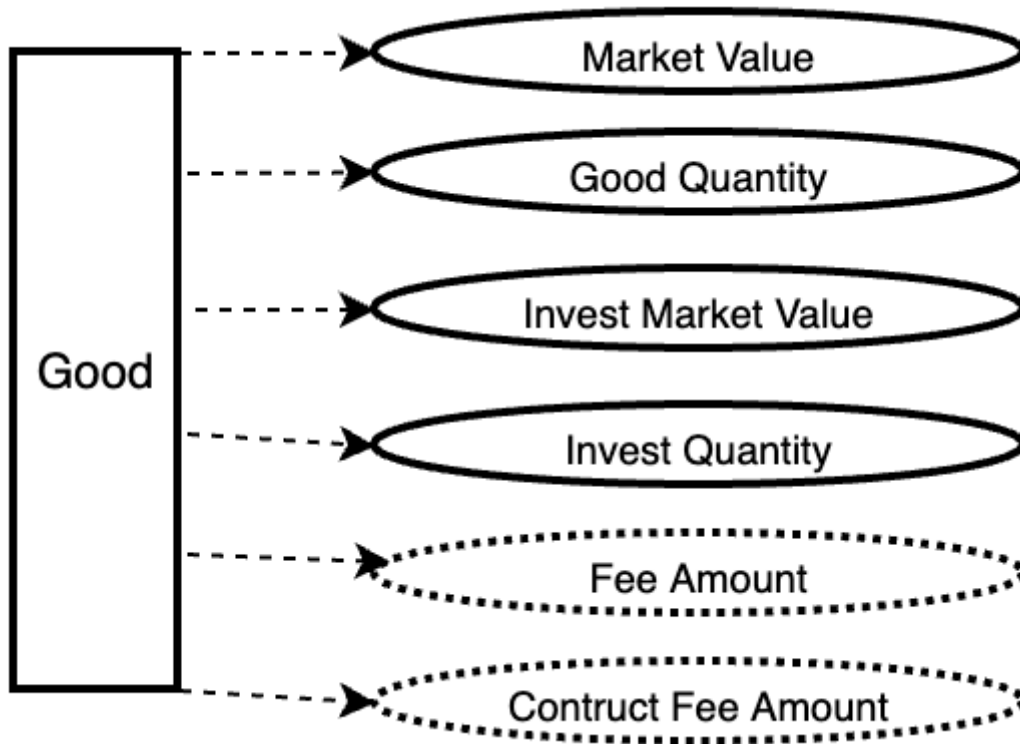


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7 Good's fee

7.1 Record good's fee

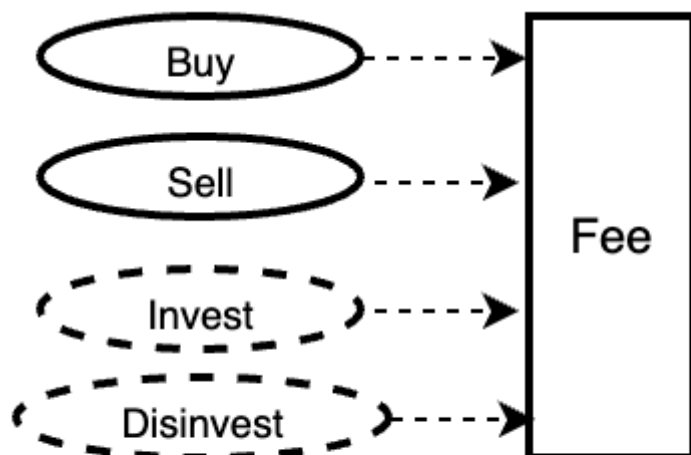


- Noun explanations:

Total fees refer to the sum of actual transaction fees generated and construction fees.

Construction fees are virtual fees introduced to calculate the profits generated from user investments, but they are not actual transaction fees. For more details, please refer to Sections 7.4 and 7.5.

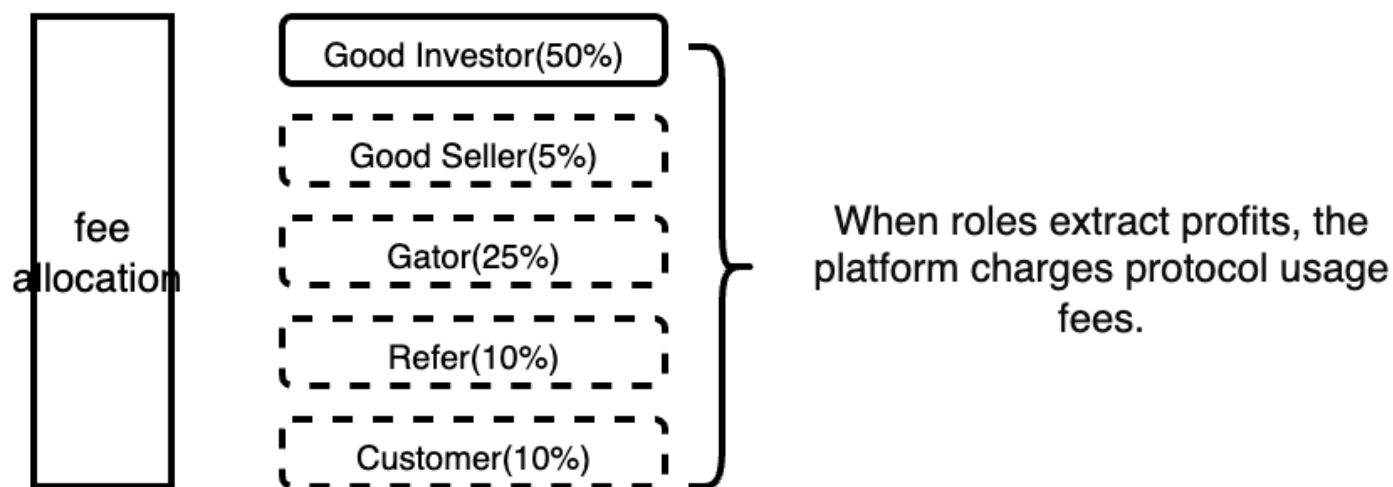
7.2 Fee source



The fee ratio will be adjusted by good owner based on the actual situation.

The source of transaction fees (actual transaction fees) is calculated based on the fee rate of goods when users perform operations.

7.3 Fee allocate



The allocation ratio will be continuously adjusted based on the actual situation.

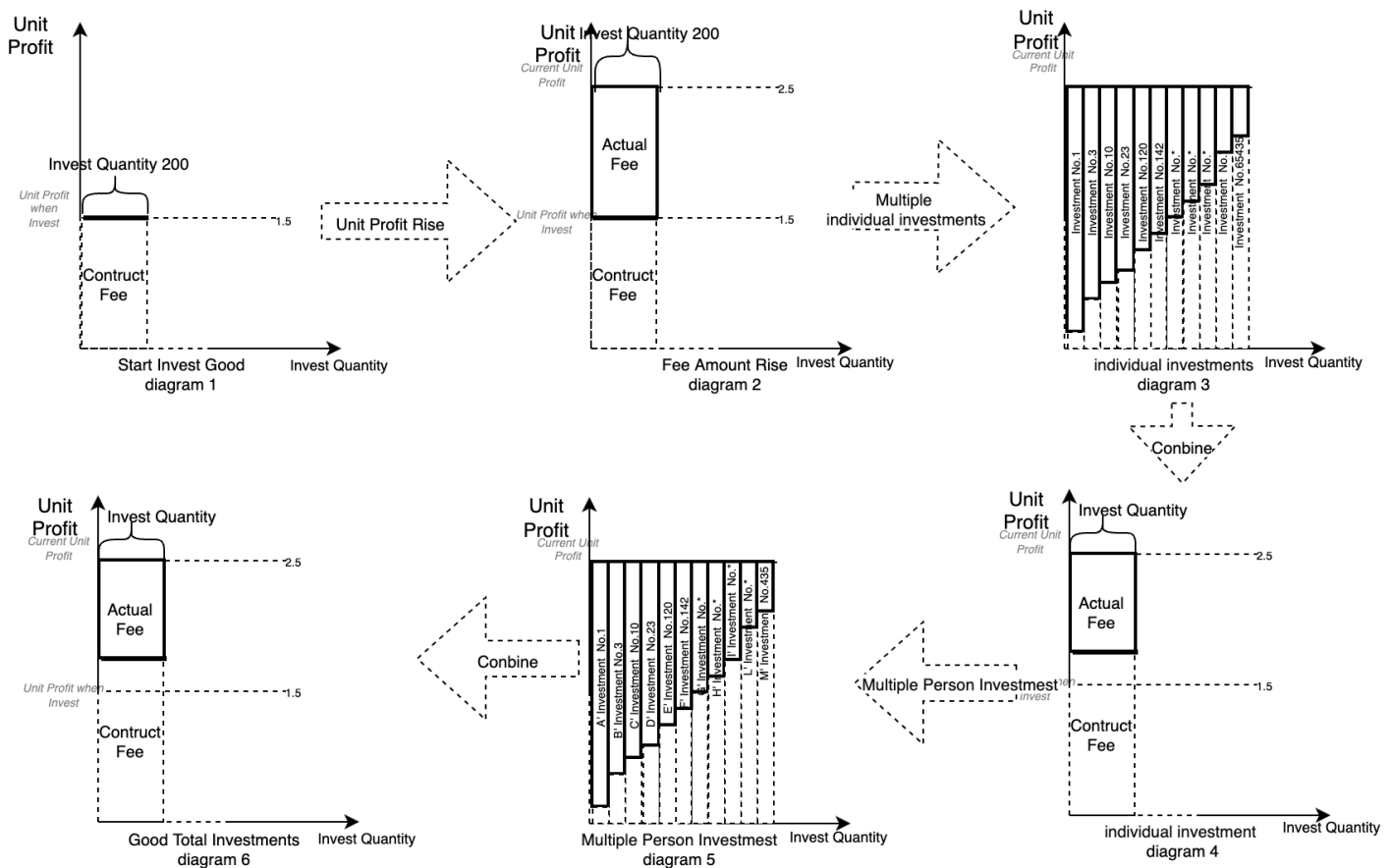
The platform involves platform technology, portal operation, referrers, users, and liquidity providers.

The platform will distribute profits reasonably.

The fee distribution for liquidity providers can be found in Section 7.4, Fee Process.

- If users fill in a referrer:
The allocation for each role is recorded in real-time.
- If users do not fill in a referrer:
The proportion held by users is allocated to merchants.
The proportion held by referrers is allocated to the portal.

7.4 Fee compute flow(invest)



- diagram 1
Unit fee refers to how much fee each unit of investment should receive, calculated as the total fee amount divided by the total investment quantity. As transactions progress, fees continuously generate, leading to an increase in the total fee amount, and consequently, an increase in the unit fee.
The construction fee is introduced at the beginning of user investment to record the total fee

amount that users should not enjoy. It is calculated as the investment quantity multiplied by the unit fee at the time of investment.

- diagram 2

When fees continue to generate within the platform, the unit fee will continuously increase.

The profit generated from user investments is calculated as follows: Profit = (Unit fee X Investment quantity) - Construction fee.

- diagram 3

When users make multiple investments in the same good, they can consolidate them into a single investment record.

The consolidated construction fee after merging equals the sum of the construction fees before merging.

The profit generated from user investments is calculated as follows: Profit = (Unit fee X Investment quantity) - Consolidated construction fee.

- diagram 4

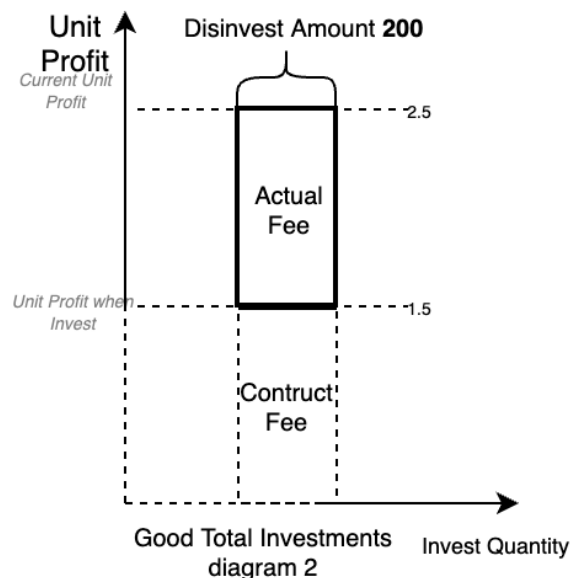
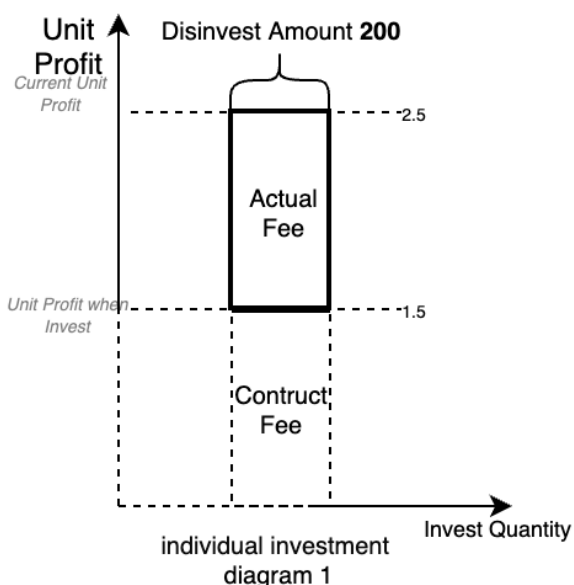
The diagram illustrates the consolidated investment situation.

- diagram 5

When multiple users invest, it can be aggregated into the total investment quantity, total investment market value, and total construction fee for this good.

The total actual investment profit for this good at present equals the current total fees minus the aggregated construction fees.

7.5 Fee compute flow(disinvest)



- diagram 1

When users withdraw their investments, the profit gained equals (Unit fee X withdrawal quantity) - (Construction fee X (withdrawal quantity / total investment quantity)).

- diagram 2

The profit and construction fee incurred when subtracting user withdrawals from the good.

8 Market config

id	config	size	unit	max	min	start	end	note
1	good investor	6	One percent	63	0	256	247	
2	good seller	6	One percent	63	0	246	237	
3	gater	6	One percent	63	0	236	227	
4	referer	6	One percent	63	0	226	217	
5	customer	6	One percent	63	0	216	207	
6	plat	6	One percent	63	0	206	197	
...								

9 Main code implementation (see code for details)

9.1 Deploy Contract gas

Deployment Cost	Deployment Size
5144500	25351

9.2 Function(main function)GAS

Function Name	min	avg	median	max	note
buyGood	51373	138059	60565	329943	
disinvestNormalGood	61544	128844	124744	204344	
disinvestNormalProof	60921	128221	124121	203721	
disinvestValueGood	38356	73889	91656	91656	
disinvestValueProof	40516	92016	97816	126116	
initNormalGood	332431	359376	356331	405431	
investNormalGood	60628	122094	113028	192628	
investValueGood	40648	116896	155177	279577	
setMarketConfig	1125	1125	1125	1125	
updateGoodConfig	3098	3098	3098	3098	

10 Platform Token

The platform adopts a 4C growth-oriented community token construction scheme. Through this scheme, the platform's growth is more flexible and promoted. The dual-token model will continue to be refined.

10.1 4C Growth-Oriented Community Token Governance Development Plan

4C Growth Community Token Roles are divided into four categories: Founders, Partners, Value Contributors, and Capital Contributors.

1. Founder Portion:

The founder portion is held solely by the project initiator, who provides a significant amount of human capital to develop products, establish brand identity, expand the market, recruit talent, and establish management systems, while also bearing significant risks. Founders enjoy control,

decision-making power, and profit-sharing rights. (Not subject to forced buyback upon resignation, 60-month quarterly unlocking after 12 months online. At the end of the unlocking period, controlled by the community account, and the owner also has voting and profit-sharing rights over this portion)

2. Partner Roles (Partner Portions A and Partner Portions B):

As initial project partners, they utilize their team's strong execution capabilities to overcome various challenges and believe in expanding and strengthening the community without resources. The original partners evenly distribute control, decision-making power, and profit-sharing rights. (Partner Portion A is not subject to forced buyback upon resignation, while Partner Portion B is subject to forced buyback upon resignation, with 36-month quarterly unlocking after 6 months online. At the end of the unlocking period, controlled by the community account, and the owner also has voting and profit-sharing rights over this portion)

3. Value Contribution:

Divides profit-sharing rights based on the value provided to the community. Voting rights for this portion are held by the founders. Adjustments to position portions, employee options portions, and other portions are made according to circumstances.

- Community Position Portions:

The portion of positions is determined by the importance of positions in the community. This portion is allocated to individuals responsible for important community positions, and the proportion corresponding to important positions is determined by the community at the beginning of each year. After being qualified and excellent, individuals responsible for important positions can convert a certain proportion into Partner Portions A and Partner Portions B through community decisions. The profit-sharing rights of position portions are enjoyed by the responsible individuals, control is controlled by the community account, and decision-making power is held by the founders. (When resigning, the community will buy back the Partner Portion B, and if the community does not repurchase it, the Partner Portion B will automatically convert to Partner Portion A. It is a position share and will be recovered by the community upon resignation, and is locked by the community)

- Community Member Option Portions:

Reserved for incentivizing employees to work together for the community. After being qualified and excellent, outstanding employees can convert a certain proportion into Partner Portion B through community decisions, control is controlled by the community account, decision-making power is held by the founders, and profit-sharing rights are enjoyed by employees. (When resigning, the community will recover this portion, and it is locked by the community)

- Other Portions:

Used for treasury, operations, events, advisory, etc.

4. Capital Contribution:

- Crowdfunding Portion (See Crowdfunding Plan):
Provides financial support for team building, product development, and liquidity development.
- Airdrop Portion:
To compensate for early user risks on the platform.
- Investment Portion:
Provides financial support for team advancement, product improvement, etc.

Throughout the process, as more capital enters, it is ensured through issuance. Additionally, the community will also ensure profit sharing through buybacks or dividends.

10.2 Design of 4C Growth-Oriented Community Token Allocation Guidelines

Allocation Dimension	Founder Portion	Partner Portion	Value Contribution			Capital Contribution		
			Position Portion	Member Option Portions	Other	Crowdfunding Portion	Airdrop Portion	Investment Portion
Rate	20%	12%	15%	10%	21%	10%	3%	9%
Founder	20%	3%						
Partner A		3%						
Partner B		3%						
Partner C		3%						
Crowdfund participant						10%		
Airdrop participant							3%	
Investor								9%

Note:

1. The unlocked portion of all roles is held by the community account.
2. At the end of each quarter, transfers are made based on actual circumstances.
3. The value contribution portion is only entitled to dividend rights for the corresponding individuals, with no control or ownership rights. Depending on the team's achievement of goals, a portion may be converted into Partner-A or Partner-B shares.
4. Voting rights for holdings in the community account are controlled by the project founders.

10.3 TTS Token Issuance Guidelines.

The equity tokens enjoy community dividend rights and asset ownership.

Total issuance: 1 billion tokens.

11 Legal License

11.1 Description

To uphold the proper rights of the project and facilitate understanding of the agreements by other users, different files are governed by different open-source licenses. Violations of these agreements may result in legal consequences.

11.2 Protocol Description

Documents using the MIT license are freely available for everyone to use.

Documents using the BUSL-1.1 license can only be used for learning purposes within the term of the agreement and cannot be used for commercial purposes. For specific terms of the agreement, please refer to the LICENSE file in the project or on GitHub: <https://github.com/ttswap/ttswap-core/LICENSE>. If the project inadvertently violates other open-source licenses, please contact us immediately, and we will make adjustments promptly.

11.3 Open Source License Information

- |—— GoodManage.sol(BUSL-1.1)
- |—— MarketManager.sol(BUSL-1.1)
- |—— ProofManage.sol(BUSL-1.1)
- |—— interfaces
 - | |—— I_Good.sol(MIT)
 - | |—— I_MarketManage.sol(MIT)
 - | |—— I_Proof.sol(MIT)
- |—— libraries
 - | |—— Address.sol(MIT)
 - | |—— FullMath.sol(MIT)
 - | |—— L_Good.sol(BUSL-1.1)
 - | |—— L_GoodConfig.sol(BUSL-1.1)
 - | |—— L_MarketConfig.sol(BUSL-1.1)
 - | |—— L_Proof.sol(BUSL-1.1)
 - | |—— L_Ralate.sol(MIT)
 - | |—— Multicall.sol(GPL-2.0-or-later)

- | | SafeCast.sol (MIT)
- | | Strings.sol (MIT)
- | types
- | S_GoodKey.sol(MIT)
- | S_ProofKey.sol(MIT)
- | T_BalanceUINT256.sol(MIT)
- | T_Currency.sol(MIT)
- | T_GoodId.sol(MIT)
- | T_ProofId.sol(MIT)