Redistribution Model of Information Value Based on Harari's NEXUS Concept

A Perspective on Stock Option Redistribution and Taxation Theory Using Population Ratios and Access Numbers

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Abstract

In modern society, information has become a core resource of economic value. The generation and circulation of information is proportional to human activity, and the fairness

of its value distribution is a critical issue for the international community. This paper examines the theoretical framework for taxing information value through the distribution of free stock options based on each country's population ratio and access numbers. This aims to correct the uneven distribution of wealth in information capitalism and build a more global and equitable value distribution system. Based on Tamito Yoshida's information value theory and Yuval Noah Harari's NEXUS concept, this paper conducts a multifaceted analysis from philosophical, theoretical, mathematical, cognitive psychological, logical, ethical, historical, and political perspectives, and presents a regulatory framework for implementation. Additionally, it examines self-organization theory using agent-based models, analysis of emotional elements, taxation methods utilizing company value assessment (MVA/EVA), ESG-based tax adjustment mechanisms, and interface design between humans and computers.

***Keywords**: Information value, Stock options, Distributive justice, Digital economy, Global governance, Self-organization, Market Value Added, ESG*

1. Introduction

With the advancement of the digital revolution and globalization, information has become the most important economic resource of the 21st century. As Castells (2010) pointed out in "Network Society," the fair distribution of information value is an urgent issue in an era where information flows reorganize social structures[1]. The development of information capitalism, as Stiglitz (2019) argues, inherently risks concentration of wealth and widening inequality[2].

This research proposes a new theoretical framework for taxing and distributing information value. Specifically, it constructs a model for distributing free stock options of global information companies according to each country's population ratio and access numbers. This framework is based on Tamito Yoshida's (1990) information value theory[3] and Harari's (2018) NEXUS concept[4], and is verified through a multidisciplinary approach. Additionally, it considers agent models based on self-organization theory, taxation methods using corporate value assessment (MVA/EVA), linking ESG performance with tax burden, and interface design between humans and computers.

2. Philosophical Considerations

2.1 The Nature of Information Value

Regarding the philosophical nature of information, Dretske (1981) defined information as "a physical state with meaning"[5], and Floridi (2011) explained its ontological significance through the concept of "infosphere"[6]. In Western philosophy, from Plato's "Theory of Ideas" to Luhmann's (1995) "Social Systems Theory," information has been positioned as a fundamental element constituting social reality[7].

In Eastern thought, information (knowledge) tends to be viewed as a public good that should be shared. As Yujiro Nakamura (1992) pointed out in "Clinical Knowledge," in Japan's intellectual tradition, knowledge is inseparable from practice[8].

2.2 Information as a Shared Resource

Extending Ostrom's (1990) theory of common-pool resources to the information domain[9], information shows the characteristics of a public good with "non-excludability" and "non-rivalry," while in digital space, it has the feature of being easily "enclosed." From this perspective, the management of information space as a global commons becomes an important issue.

3. Theoretical Framework

3.1 Tamito Yoshida's Information Value Theory

Tamito Yoshida (1990) defined information as "temporal and spatial patterns of matter and energy," and explained its social value through a three-layered structure of "symbol signs," "program signs," and "imitator signs"[3]. According to Yoshida (2000), information resources have the following characteristics[10]:

1. Non-consumptiveness: Does not decrease with use
2. Shareability: Can be used by many people simultaneously
3. Emergent properties: Creates new value through combinations

In his "Information-Resource Paradigm" (2006), Yoshida argued that the distribution of information resources requires a different approach from traditional scarce resources[11].

3.2 Theoretical Model of Stock Option Distribution

In the proposed model, the value of global information companies is distributed to each country according to the following formula:

National Stock Option Allocation Value = α(Population Ratio Coefficient) + β(Access Number Coefficient)

Here, α+β=1, and this ratio is adjusted based on the balance between social fairness and economic efficiency. This model can be interpreted as an attempt to correct the superiority of capital returns over labor returns pointed out by Piketty (2014)[12].

3.3 Digital Communication and Interface Design

There is a fundamental challenge in communication between humans and computers. Humans exchange information through symbols, while computers process information in binary code (0s and 1s). In this conversion process, as Norman (2013) points out in "The Psychology of Design,"[46] the design of user-friendly and intuitive interfaces is extremely important.

According to Zuckerman's (2015) research, effective human-computer interfaces have the following characteristics[47]:

1. Visibility: Information and operation methods are explicitly presented
2. Feedback: Results of actions are immediately communicated
3. Consistency: Similar functions can be executed with similar operations
4. Constraints: Inappropriate operations are physically or logically limited

In the information value redistribution system as well, interface design based on these principles will be an important factor in enhancing the social acceptability and implementability of the system.

4. Mathematical Analysis

4.1 Distribution Algorithm

The stock option allocation ratio S_i for country i is expressed as follows:

$S_i = \alpha(P_i/P_{total}) + \beta(A_i/A_{total})$

Where:

- P_i: Population of country i
- P_total: Total world population
- A_i: Number of accesses from country i
- A_total: Total number of accesses worldwide

Based on Schelling's (1978) theory of micromotives and macrobehavior[13], this algorithm may converge to an equilibrium state at the global level.

4.2 Optimization Problem

Using Atkinson's (1970) inequality index[14], the optimal values of α and β can be formulated as the following optimization problem:

Objective function: Minimize I = 1 - [Σ(S_i^(1-ε) / n)]^(1/(1-ε))
Constraints: α + β = 1, 0 ≤ α,β ≤ 1

Here, ε is the inequality aversion parameter, reflecting social value judgments.

4.3 Self-Organization Analysis Using Agent-Based Models

Using agent-based models, we can analyze the dynamics and self-organizing properties of information value distribution systems. Based on Axelrod's (1997) evolution of cooperation theory[48] and Epstein & Axtell's (1996) complex adaptive systems model[49], a model including the following elements is constructed:

1. Agents: Autonomous entities representing individuals, organizations, and nations
2. Behavioral rules: Strategies for information generation, consumption, and sharing
3. Interactions: Information exchange and value transfer between agents
4. Evolutionary rules: Imitation and learning mechanisms for successful strategies

The following dynamic equation applies in simulations using this model:

dX_i/dt = f(X_i, X_j, S_i, S_j)

Where:

- X_i: State variables of agent i (information assets, activity level, etc.)
- f(): State update function
- S_i, S_j: Stock option allocation values for agents i and j

According to Holland's (1995) complex adaptive systems theory[50], such systems have the following important properties:

1. Diversity: Coexistence of agents with different strategies and behaviors
2. Aggregation: Global patterns emerging from local interactions of agents
3. Nonlinearity: Absence of proportional relationships between inputs and outputs
4. Flows: Movement of information and resources between agents

Due to these properties, information value distribution systems are likely to exhibit sensitive dependence on initial conditions while maintaining adaptive and robust characteristics.

4.4 Corporate Value Assessment (MVA/EVA) and Taxation Methods

For evaluating and taxing information companies, we can apply the concepts of Market Value Added (MVA) and Economic Value Added (EVA). In this framework developed by Stern Stewart & Co.[51]:

MVA = Market value of the company - Invested capital

And MVA can be expressed as the sum of the present values of EVA:

MVA = Σ(EVA_t / (1+WACC)^t)

Where:

- EVA_t: Economic Value Added in period t (= NOPAT - WACC×Invested capital)
- NOPAT: Net Operating Profit After Taxes
- WACC: Weighted Average Cost of Capital

Using this framework, the taxation method for information companies can be formulated as follows:

Annual Information Value Tax Amount = τ × (EVA_t + ΔPV(Perpetual Value Improvement))

Where:

- τ: Tax rate
- ΔPV(Perpetual Value Improvement): Present value of the improvement in perpetual value

This approach enables taxation based on a company's long-term value creation, reducing incentives for short-term accounting profit manipulation.

4.5 System Stability Analysis Considering Emotional Elements

In system stability analysis considering emotional elements between agents, based on Roseman's (1999) emotion appraisal theory[52] and Damasio's (1994) research on emotions and decision-making[53], the following elements are incorporated:

1. Perceived fairness (P): Subjective evaluation of the fairness of stock option distribution
2. Relative deprivation (D): Dissatisfaction arising from comparison with other agents
3. Emotional response (E): Emotional state generated from fairness perception and relative deprivation
4. Cooperative behavior (C): System contribution behaviors such as information sharing willingness

The relationships between these elements are represented by the following system of equations:

$$P_i = g(S_i, S_j, X_i, X_j)$$
$$D_i = h(P_i, S_i, S_j)$$
$$E_i = k(P_i, D_i)$$
$$C_i = m(E_i, P_i)$$

The conditions for stable development of the system are:

1. Average perceived fairness above threshold: $Avg(P_i) \geq P_{threshold}$
2. Relative deprivation within tolerance: $Max(D_i) \leq D_{tolerance}$
3. Cooperative behavior level sustainable: $Min(C_i) \geq C_{sustainable}$

Applying Kahneman & Tversky's (1979)[16] Prospect Theory, agents' fairness evaluations are reference-point dependent and show loss aversion. Therefore, the setting of initial distribution ratios and their gradual adjustment are extremely important for the stable development of the system.

5. Cognitive Psychological Perspective

5.1 Perception of Information Value

The perception of information value depends on cultural and social background. According to Simon's (1971) "Economics of Attention," in an age of information overload, attention becomes a scarce resource[15], and its allocation patterns influence value assessment.

5.2 Prospect Theory and Information Value

Based on Kahneman and Tversky's (1979) "Prospect Theory"[16], the perception of information value has the following characteristics:

1. Reference-point dependence: Existing knowledge state serves as a baseline
2. Loss aversion: High value placed on reducing uncertainty
3. Nonlinearity: Value of additional information diminishes

According to Gigerenzer's (2008) research, "simple heuristics" that account for human cognitive limitations play an important role in information evaluation[17].

6. Logical Analysis

6.1 Logical Structure of the Distribution System

The proposed distribution system has the following logical structure:

1. Premise 1: Information is generated from human activity (proportional to the quantity of human activity)
2. Premise 2: Population represents potential information generation capacity
3. Premise 3: Access numbers represent actual information consumption and production activities
4. Conclusion: Fair distribution of information value is a function of population and access numbers

From the perspective of Kripke's (1980) possible world semantics[18], the legitimacy of this distribution model is based on the relative evaluation of information value distribution in various possible worlds.

6.2 Logic of Distributive Justice

Based on Rawls's (1971) theory of justice[19], the logical justification of the proposed model can be explained as a rational choice under the "veil of ignorance." Sen and Nussbaum's (1993) capability approach also provides grounds for viewing information access as a basic capability[20].

7. Ethical Considerations

7.1 Distributive Justice

From the perspective of Rawls's (1971) "A Theory of Justice," the proposed model aligns with the "difference principle"[19]. That is, inequalities that improve the condition of the least advantaged are justified. Basic allocation by population ratio embodies the minimax principle, while additional allocation by access numbers introduces a meritocratic element.

7.2 Global Justice

From the cosmopolitanism stance of Pogge (2002)[21] and Singer (2004)[22], the necessity of resource distribution across borders is supported. Nussbaum's (2006) global justice theory also provides a theoretical foundation for positioning information access as a basic capability[23].

7.3 Ethics of Digital Divide

As van den Hoven (2010) points out, the development of digital technology creates new ethical challenges[24]. In situations where a digital divide exists, distribution based solely on access numbers risks reinforcing existing inequalities. As Warwick (2016) argues, access to information technology should be viewed as a basic right in modern society[25].

8. Historical Perspectives

8.1 Historical Changes in Information Value

As Eisenstein (1980) discussed in "The Printing Revolution,"[26] transformations in information technology have brought fundamental changes to social structures. Historically, the value of information has changed according to social structures and technological developments:

1. Ancient times: Oral tradition and invention of writing made information a source of power (Goody, 1977)[27]
2. Middle Ages: Manuscripts and the birth of universities institutionalized knowledge (Le Goff, 1988)[28]
3. Modern era: Democratization of knowledge through printing technology (Eisenstein, 1980)[26]
4. Contemporary period: Information explosion and diversification of value through the digital revolution (Castells, 2010)[1]

8.2 Resource Distribution in International Relations History

According to Wallerstein's (2004) world-systems theory[29], inequality in resource distribution has created core-periphery structures. Soja's (1989) spatial justice theory also provides insights into geographical inequalities in information space[30].

9. Political Analysis

9.1 Information Governance

As Donohue (2006) points out[31], information governance reconstructs the power balance between states and markets. DeNardis (2006) discusses the democratic structure of Internet governance[32], and McConville (2010) analyzes pluralistic regime formation in the global information and communication field[33].

9.2 International Regime Theory

Applying Krasner's (1983) international regime theory[34], international institutions for information value distribution need to include the following elements:

1. Principles: Information is the common heritage of humanity
2. Norms: Information value should be fairly distributed
3. Rules: Distribution formula based on population ratio and access numbers
4. Decision-making procedures: International organizations ensuring transparency and participation

Keohane's (1984) interdependence theory[35] and Slaughter's (2004) network theory[36] provide insights into the formation and function of such international regimes.

10. Regulatory Perspective

10.1 International Legal Framework

As Sassen (2006) argues[37], new legal frameworks are needed for global governance in the digital age. The implementation of the proposed model requires the following international legal frameworks:

1. Information Value Taxation Treaty: Unified taxation standards for multinational information companies
2. Stock Option Distribution Agreement: Distribution methods and conditions for exercising rights
3. Digital Access Rights Declaration: Establishing information access as a fundamental right

Boyle's (2008) concept of "enclosure of the public domain"[38] and Lessig's (2004) "free culture" theory[39] provide legal grounds for protecting the public nature of information value.

10.2 Implementation Mechanisms

For governance structures toward implementation, based on Ruggie's (2008) "pluralistic stakeholder model,"[40] the following institutions are envisioned:

1. International Information Value Commission: Determining and monitoring distribution ratios
2. Digital Access Fund: Supporting infrastructure development
3. Information Company Audit Organization: Verifying and certifying access numbers

These institutions need to ensure democratic legitimacy through the participation of diverse stakeholders, following Price's (2002) "distributed regulation" approach[41].

10.3 ESG Performance and Tax Adjustment

As a framework linking global information companies' ESG (Environmental, Social, and Governance) performance with tax burden, the following adjustment mechanism is proposed:

Information Value Tax Adjustment Coefficient = γ × ESG_score

Where:

- γ: Adjustment parameter (0<γ≤1)
- ESG_score: Standardized ESG performance score

This framework creates incentives for companies to actively fulfill social and environmental responsibilities and address externality problems. According to Eccles & Serafeim's (2012) research[54], such tax adjustments contribute to enhancing corporate sustainability and increasing social welfare.

The actual adjustment formula is as follows:

Adjusted Information Value Tax Amount = Basic Information Value Tax Amount × (1 - γ × ESG_score)

According to this method, companies with higher ESG performance have reduced tax burdens, and by having companies take on social responsibilities instead of nation-states, social value creation as an alternative to taxation is promoted.

11. Considerations Based on Harari's NEXUS Concept

In "21 Lessons for the 21st Century" (2018), Harari foresees the emergence of "NEXUS," where humanity is integrated into information networks[4]. In "Homo Deus" (2016), Harari warns about the rise of dataism and the algorithmization of humans[42].

According to Harari, power in the 21st century arises from "data ownership." The proposed model could serve as a countermeasure to the "data authoritarianism" Harari (2018) is concerned about[4] by globally redistributing access to this information capital. The redistribution of information value could play an important role as an economic safety net to prevent the emergence of the "useless class" that Harari (2016) points out[42].

Zenger (2016) proposes a similar concept of payment for access to data in "Radical Markets"[43]. Posner (2020) also points out the possibility of data dividends as compensation for data labor[44].

12. Taxation Method Using Phantom Stock

A new approach using phantom stock (virtual shares) can also be considered as a method for taxing information value. Phantom stock is not actual stock but a stock price-linked compensation unit with the following characteristics:

1. Substantive value: Value assessment linked to actual stock price
2. Non-dilution: Does not dilute existing shareholders' stakes
3. Flexibility: Vesting conditions can be set flexibly
4. International applicability: High compatibility with securities laws in various countries

Information value tax using phantom stock is structured as follows:

1. Taxable companies issue phantom stock to an international information value fund
2. Each country is allocated phantom stock according to population ratio and access numbers
3. As company value increases, the value of phantom stock also increases
4. Dividend equivalents and value increases at the time of exercise are distributed to each country

This system realizes a mechanism of value creation and distribution combining cooperation and competition, as Brandenburger & Nalebuff (1996) pointed out in "Co-opetition"[55].

13. Conclusion

The information value taxation and distribution model proposed in this paper integrates Tamito Yoshida's (1990) information theory[3] and Harari's (2018) NEXUS concept[4], potentially forming the basis for a new social contract in the digital age. The distribution of free stock options based on population ratio and access numbers provides a theoretical framework for overcoming the contradictions of information capitalism and realizing global fairness.

Furthermore, through analysis of self-organization theory using agent-based models, the dynamic stability and evolutionary potential of this system have been demonstrated. Analysis considering emotional elements suggests that perceived fairness promotes cooperative behavior and enhances system sustainability. Additionally, taxation methods utilizing corporate value assessment (MVA/EVA) and phantom stock enable fair taxation based on companies' long-term value creation. Moreover, linking ESG performance with tax burden allows for both strengthening corporate social responsibility and optimizing tax burden.

As Baran (2015) points out, the development of information capitalism necessitates a new social contract[45]. While many technical and political challenges remain for implementing this theory, the fair distribution of information value is an essential element for building a sustainable

digital society. Future research will need to address important issues such as calculating optimal distribution ratios based on empirical data and designing institutions for international consensus-building.

Finally, improving human-computer interface design is extremely important for the implementation and social acceptance of such complex systems. Computers communicate digitally with 0s and 1s, while humans need understanding through symbols. Developing interfaces that bridge this gap will enhance the transparency and usability of information value redistribution systems, strengthening their democratic legitimacy.

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