African Journal of Business Management Vol. 6(46), pp. 11375-11383, 21 November, 2012
Available online at http://www.academicjournals.org/AJBM
DOI: 10.5897/AJBM10.1654
ISSN 1993-8233 ©2012 Academic Journals

Review

Information function for reducing uncertainty in feedback: Economics choices

Wang Jian

College of Economics and Trade, Agricultural University of Hebei, Baoding, P. R. China.
E-mail: wangjian@hebau.edu.cn. Tel/Fax: 86-0312-7528631.

Accepted 28 August, 2012

This study has proved the system control theory and economic analysis and concludes on the consistency between them. In order to achieve a stable system implementation and output for a socio-economic system, the feedback control is necessary. This result must be achieved through a negative feedback mechanism. However, feedback control must reduce uncertainty, without which information is impossible. Similarly, economic decisions also depend on information. As a result, this study did not ignore the discussion on the concept of information, uncertainty, risk and entropy. At the same time, supposing the study is done under a market-based economic system, according to the proof of microeconomics, the equilibrium production for achieving maximum profit has a requirement of insufficient production elasticity. For simplicity, by means of a short-run equilibrium analysis，this study established a general multiple input factors of model, for example, it introduced an imperfect competition market structure and carried out elastic analysis. Therefore, the study must consider the market demand changes and the impact of price variations. The related elastic analysis produced the important information, which gives some conditions for market price convergence. In socio-economic system，using information and its mechanisms can make the entropy in the system reduce, that is useful for economic analysis, decision and the system design.

Key words: Socio-economic system, feedback, uncertainty, elasticity.

INTRODUCTION

There are many definitions of the concept of information. Signal, message, data, etc are concrete types of information, and news and knowledge make up information. Among them, the most popular and useful concept on information is to reduce uncertainty; however, this concept is a functionality definition.

The founder of Information theory, Shannon (1948) pointed that “Quantities of the form $H=-k\Sigma p_i \log p_i$ (the constant K merely amounts to a choice of a unit of measurement) play a central role in information theory as measures of information, choice and uncertainty (Shannon 1948). In statistical significance, H in the formula is used to represent information entropy, where p_i refers to the probability of an event i in the system occurrence, and stochastic space may be i=1, 2, ..., n.

That means information function is to reduce uncertainty. The entropy concept originally came from physics, which was above the second law of thermodynamics for measuring a natural system disorder. Initial cosmos, produced by a huge energy--"big bang", then emerged elements and formed current world through 13-15 billion years (Lain, 1992). Evidentially, original matter transformed from energy, that is energy makes the world to prosper materially. However, natural world is an entropy increasing process. Positive entropy increasing means a relative bigger disorder, which is relative to a much more uncertainty variation. In an opposite direction or inversed significance information possibly reduces uncertainty, which leads to orderly structure and a production of negative entropy. Therefore, information is another rudimentary cosmogenic or elements of the universe in existence. In natural evolution process, information function has to be a negentropy result. Compared with the others, such as energy, matter, space and time, they are not its byproducts. But they have their own independent laws, as well as interactive laws with

them, which ultimately allow information per se to operate, or transmit, perhaps instantaneously, outside of the constraints of the other rudimentary cosmogenic or elements; and they are the byproducts of light speed. However, information is an indispensable cohort of surviving life whatever form it may take and wherever it may be in the universe, and that information technology is the best means for attempting to contact, probably, each other. That life emerged is important. Life matter has a basic demand to reduce uncertainty, by utilizing information. This makes information the life growing inner demand. Therefore, information should become an important component of life.

INFORMATION FUNCTIONS-REDUCE UNCERTAINTY

What is “uncertainty”? Dennis Lindley explains: “There are some statements that you know to be true, others that you know to be false, but with the majority of statements you do not know whether they are true or false. For you, these statements are uncertain” (Understanding Uncertainty; Dennis, 2006). He thinks that despite this extensive knowledge that you have, there remain many things whose truth or falsity is not known to you. So, uncertainty to a person may be individually different, which relates his own subjective judgment, beliefs or emotion; even if the probability does not exist, he tries to measure, calculate and remove the uncertainty.

Uncertainty is a term used in a subtle different ways in a number of fields, including philosophy, physics, statistics, economics, finance, insurance, psychology, sociology, engineering, and information science. It applies to predictions of future events, physical measurements already made, or to the unknown. Therefore, uncertainty may be divided into two sources: (1) Objective uncertainty based on epistemological or ontological uncertainty; (2) Subjective uncertainty based on moral or rule reasons.

If there were no correct observation, analysis and forecasting, uncertainty would closely be linked to risk. That means uncertainty and risk both have impact on economic activities, but they are different. Economists Hirshleifer and Riley had written a book: “The Analytics of Uncertainty and Information” (1979-1992) (Hirshleifer and Riley, 1992). According to Hirshleifer (1972), “Uncertainty of a type is at least partially dispelled by unfolding of events over time. American Economist Frank Knight (1921) established the earlier distinction between risk and uncertainty: “Uncertainty must be taken in a sense radically distinct from the familiar notion of risk, from which it has never been properly separated....” The essential fact is that ‘risk’ means in some cases a quantity susceptible to measurement, while at other times it is something distinctly not of this character. Moreover, there are far-reaching and crucial differences in the bearings of the phenomena depending on which of the two is present and operating. It will appear that a measurable uncertainty, or ‘risk’ proper, as we shall use the term, is so far different from an immeasurable one that it is not in effect an uncertainty at all” (Frank, 1964). However, Hirshleifer criticized while we have not been able to accept Knight’s attempt to distinguish between risk and uncertainty. He was getting at — through imperfect express— an important and valid point. In his discussion Knight suggested that a person’s actions may well depend upon his ‘estimate of the chance that his estimates are correct’. Therefore, he pointed out that a person’s informational actions, though not his terminal actions do depend “upon his confidence in his beliefs” (July, 1979) (Hirshleifer and Riley, 1992).

In economics, expected value and utility can express risk. Currently, economists use Neumann—Morgenstern Expected –utility to study risk. They believe this rule is absolutely crucial when applying decision theory under uncertainty. Therefore, if economic actors face random performance with specific numerical probability, that situation involves risk; however, if economic actors in different possible events cannot give specific probability, then this situation involves uncertainty.

Generally, with scarcity of resources on earth life needs to subsist. Therefore, advanced humans learn to develop techniques to supply themselves with sustainable, equilibrium development of the society. Life needs to absorb, fix, transform and utilize energy. Entropy in physics is a classical measurement of system disorder. In natural process, entropy is always in increasing order, according to Rudolph Clausius (1822 to 1888).

This is nearly an accurate statement of the second law; although, entropy is actually a measure of unusable energy, meaning not useful energy. However, statistics defined entropy as the randomness of measurement. In a system, more randomness means more disorderliness. The formula of statistical entropy is:

$$S = k \ln \Omega$$

S is entropy; k is the Boltzmann Constant $=1.38066 \cdot 10^{-23} JK^{-1}$. Ω is the number of equivalent probable configurations. That means S∼H, the uncertainty and the disorder of the entropy have obtained a relatively coherent interpretation. Such as, entropy is a measurement of uncertainty or disorder, and also a consequence of energy loss. Therefore, variations of matter and energy produce life information. Life can obtain information to reduce uncertainty, and to do that, it has to consume energy.

However, life is an opening system with dissipative structure, and life system should have negative entropy exchange with the environment. The functions of life information have the basic abilities to receive and treat signals in a certain condition and range. This gives consistency of interpretation for economics, because natural selection has to utilize information. "The survival of the fittest" hinges on environmental competition. Long

term evolution has made humans to have advanced form of information ability to remember, do automatic study, exchange and create knowledge, etc. Therefore, life evolution is "to develop the superiors and to weed out the inferiors". That means it is a feasible selection process through information. Mankind and society have their aims which are generally different from others; however, those aims should be harmonious with natural environment. But they do pursue optimal choice. A series of tests or examinations as part of echoes from the natural process have given man and its society information, experience, knowledge to do proper judgment. The judgment is usually based on people's feasible aim, possible effect or idea. Obtaining information to reduce uncertainty is essential for evolution process, which satisfies several basic demands such as clear objective and behavior, prevention of risks, formation of social organizations, reduction of asymmetry and ultimately increasing competitiveness. The following analysis will give a further rational explanation by means of system methodology.

NO FEEDBACK CONTROL WITHOUT INFORMATION

Simultaneously, feedback, a word of cybernetics, without information cannot exist. In fact, information is conditional for feedback control, a kind of information function. If the natural world is defined as a natural process, this means the world system is without artificial influence. Suppose, in the pure natural world there is no information on humanity, or assume that people are blindfolded. In this natural process, ecosystem makes matter transforming and energy dissipative and fixed, but there is no significance of mankind participation. Therefore, the study names it as a natural ecosystem (Figure 1).

Now, time brings us to the current world, but then artificial influence impacted the natural process of the ecosystem. Traditionally, we think those influences are enforced by accomplished human labor, creation and socio-economic behaviors. So that, we usually think this artificial interrupted system is a socio-economic ecosystem. Actually, in system view it is a feedback to the natural system process, because people have strong destination and care about their influence on natural process. Currently, system opening is people's want and demand, and it aims to create sustainable world development.

First of all, people have influence on nature that depends on their observation, acquaintance and incentive of different historic level. Thus, the variations of inputs-outputs, causes and effects in the socio-economic ecosystem have to reflect people's idea, their experience and rationality. In contemporary view, the feedback process indicates that information set has to do with human being understanding. In Figure 2, feedback is the only one process that is related with information, which

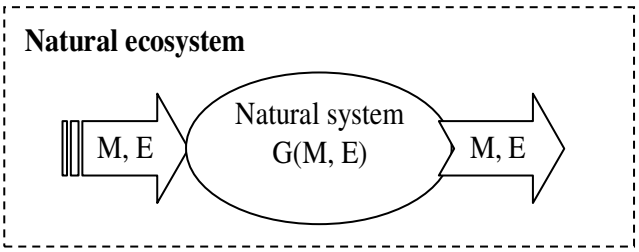

Figure 1. Natural system process.

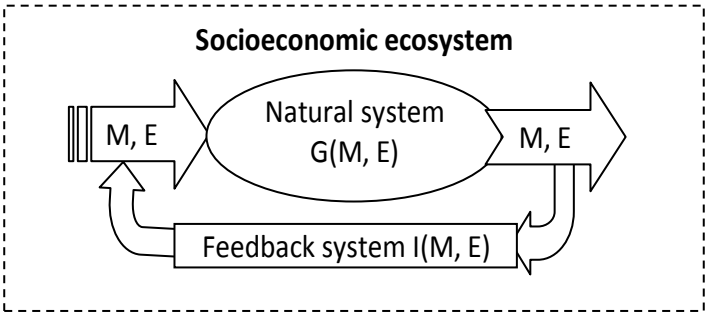

Figure 2. Artificial interrupted system process.

forms people's knowledge or scientific frame in order to interact with the natural process.

The study explains these in a system model. If people do care about the causes (X) and effects (Y) in the process of natural system, the relationship between causes and effects may depend on its system kernel, such as G(M, E) [7] (Sandquist, 1985). A generally supposition on a pure natural process is in one-dimension of non-inverse time and multiple dimension variations of space. Therefore, people usually think that natural process is aimless, with entropy ever increasing. However, people, for their own development goals, will not give up the opportunity to influence the natural processes. If nature becomes an open process through artificial influences, that is, to make the socio-economic system interact with natural ecosystem, negative entropy flow will be possibly formed.

Definition

If this effect causes the following relationship to exist, $\Delta X(M, E) \propto \Delta Y(M, E)$, then feedback process is realized through artificial interaction which relies on people's obtained information. If in a socio-economic ecosystem, the system kernel is indicated by G[X(M, E), Y(M, E)] and there exists a feedback system kernel as I[X(M, E), Y(M, E)], then we can find the following relationship:

$\Delta Y(M, E) / \Delta X(M, E) = G[X(M, E), Y(M, E)]/\{1- I[X(M, E), Y(M, E)]\square G[X(M, E), Y(M, E)]\}$

Simplifying: $\Delta Y / \Delta X = G /(1- I\square G)$

Certainly, without information the system feedback cannot work. Therefore, system realizing regulation or recomposing should be based on the system information feedback function. In system operation, the feedback design has some conditions or mechanisms.

Let us assume that G is a function of system causes and effects transforming process. Let $|F(I)|=|G /(1- I\square G)|=|G |/|1- I\square G|$. There are at least five cases:

(1) Positive feedback $|F (I)|>|G |$, that means $|1- I\square G|<1$; so the study can find the distribution on feedback I.

$$I \in \begin{cases} (0,\frac{1}{G}), \quad (\frac{1}{G},\frac{2}{G}), & if\ G>0 \\ (-\frac{2}{G},-\frac{1}{G}), \quad (-\frac{1}{G},0), & if\ G<0 \end{cases} .$$

(2) Negative feedback $|F (I)|<|G |$: that means $|1- I\square G|>1$; if G>0, the study has I<0; if G<0, then, I>0.

(3) Neutral feedback $|F (I) =|G |$: that means $|1- I\square G|=1$; if G≠0, the study has I=0; that means there is no feedback.

(4) Extreme cases $|F (I)|\rightarrow\infty$ or $|1- I\square G|=0$: that means feedback makes the system instability strong, at these two points:

$$I=\begin{cases} 1/G, & if \quad G>0, \\ -1/G, & if \quad G<0 \end{cases}.$$

(5) Generally, the study supposes G≠0; unless the case G is equal to zero or $I\rightarrow\infty$.

For a real system, taking the socio-economic ecosystem as an example, it is usually an active developing and opening system. The aforementioned analysis shows that G>0, I<0 or G<0, I>0 are negative feedback controls, which are the most popularly used for development of system stability. Thus, a feedback control applying in an opposite direction with the system movement is a normal choice. However, in a positive feedback process, the feedback action and the system operation are always in the same direction, but this study finds that the operated condition and range are limited and narrow. Otherwise, feedback control has to consider some extreme cases or points.

USING INFORMATION TO ANALYZE CONDITIONS OR TO FIND CAUSES

Suppose that the study discussed system as partially measurable and controllable. Most causes and effects in nature are exogenous variables, but feedbacks are used as endogenous variables. Therefore, causes can be divided into subjective (internal) and objective (external). What is the relationship between causes and effects? In fact, some causes do not necessarily imply any effects, but under certain "conditions" they can lead to the occurrence of effects. Conditions should be the real causes. Otherwise, sometimes, to distinguish between causes and conditions often requires little practical significance. For effective scientific study, there are some principles of philosophy: "there must be same effect with same cause" and "there must be different causes for different effects". This is because the so-called "multi-cause" is actually only one cause, but other factors are conditions. Thus, conditions are necessary implication of conclusions. For obtaining the real cause we have to analyze the condition, which is the duty of informatics study and a key of feedback control.

Through principle of information, we know that for any of the two tests, the conditional entropy is smaller than the unconditional entropy. According to Shannon, the definition of information entropy is a function of probabilities of events. To take conditions and effects as examples, the study has given inequality (Guiasu, 1977):

$$H(X \mid Y) \le H(X) \ \text{Or}\ H(Y \mid X) \le H(Y)$$

Demonstration

If the study defines e as the effect of events, or a cause of multiple conditions, then c is the cause of the effect. Let P_i be the probability of effect i, (i=1, 2, ……, n), and P_{ij} be the probability of effect i under conditionally cause j (j=1, 2, ……, m). Suppose $H(X)=H_n(p_1, p_2, ……, p_n)$, $H(Y)=H_m(q_1, q_2, ……, q_m)$, thus, the conditional entropy will be,

$$\begin{aligned} H(Y \mid X) &= \sum_{i=1}^{n} p_i H_m(p_{1i}, p_{2i}, \cdots, p_{mi}) \\ &= -\sum_{i=1}^{n}\sum_{j=1}^{m} p_i p_{ji} \log p_{ji} \\ &= \sum_{i=1}^{n} p_i (-\sum_{j=1}^{m} p_{ji} \log p_{ji}) \\ &= \sum_{i=1}^{n} p_i L(p_{ji}) \end{aligned}$$

Here, for demonstration, the study introduced a convex function L (x),

$$L(x)=\begin{cases} -x\log x & x\in(0,1), \\ 0 & x=1. \end{cases}$$

Then, it is easy to find

$$L(xy) = -xy\log xy = -xy\log x - xy\log y = yL(x) + xL(y) .$$

According to Jensen's inequality $\sum_{i=1}^{m} \lambda_i f(p_i) \le f(\sum_{i=1}^{m} \lambda_i p_i)$

it proved that,

$$H(Y \mid X) = \sum_{i=1}^{n} p_i L(p_{ji}) \le L(\sum_{i=1}^{n} p_i p_{ji}),$$
$$= -\sum_{j=1}^{m} \sum_{i=1}^{n} p_i p_{ji} \log(\sum_{i=1}^{n} p_i p_{ji})$$
$$= -\sum_{j=1}^{m} q_j \log q_j \quad \forall \quad \sum_{i=n}^{n} p_i p_{ji} = q_j$$
$$= H(Y).$$

Also, $H(X \mid Y) \le H(X)$.

To improve information and to pursue condition, the study has to define the boundary of the system at first. In this process, it usually needs to give the names of the observations as constants or variables. Conditions emerging usually contain uncertainty in time and space; which means lack of certainty. People know something but they are not sure, so uncertainty is different from the unknown or ignorance. Uncertainty usually refers to a case of having limited knowledge when it is impossible to describe existing state, future exact outcome, or existence of more than one possibility. Therefore, there is need to pursue conditions in order to find causes in some cases.

ECONOMIC CHOICES

By means of conditional analysis, be it a very complex and difficult process, the aim of this study is to find causes. In general, effect depends on inevitability of causes, such as EU(Y) = $\sum p_i \bullet u[g(x)]$. The formula of EU (expected utility) refers to a revenue of Y, which relies on each asset (x) to obtain a possible return g(x). To reduce uncertainty by obtaining possibility p_i, i=1,2,.....,n, there is need to utilize information and to manifest risk- averse. “It has played a key role in economists’ adoption of expected utility as a descriptive theory of choice under uncertainty” (Machina, 1987).

Under the condition of scarcity of resources, people are bound to make economic choices, and their goals are designed to maximize utility, minimize risks and try to realize sustainable prosperity development of the world. Methodology of choice includes a process of integration and coordination, the first is following the principle of natural selection and the second is in accordance to voluntary and market regulation for satisfying social choices. The complexity is to bring the market mechanism to play an incentive role, and at same time to realize a feedback control by the society.

Reasonable utilization of information

For sustainable development of the universe, people choose to use much information to substitute energy and materials consumption. The assumptions of material, energy and information are systematic input factors. In the model, they are observable, and controlled with non-negative variables (Wang, 2002, 2008). The relationship between variables and a function is as follows,

$[M(I),E(I),I] \in X \supset R^3$, if there is
f: $X \rightarrow R$.

Thus, $[Y,-M(I),-E(I),-I] \in R_k^4$

$Y \in R_k^4$ is a function of $Y \subset [Y,-M(I),-E(I),-I]$. Here, X is a space of all input elements; R is the feasible output of the system; f is the corresponding function between the input and output. This one-to-one relationship indicates that the system function orderly changes. Then, the study can use a function to indicate the system production process, such as,

$$Y(K)=\{[Y,-M(I),-E(I),-I] \in R_k^4, I \in K\}$$

In the formula, Y is the system supreme output result; M is a set of the material inputs, E is a set of the energy inputs; $I \in K$ is a system of guidance information, which reflects the system structure of state and organization is an important factor in performance. A system different from the others is due to its K difference. K shows the overall system parameters, and it represents full system reference to the structural parameters set. That means K involves money, market price, orderly information, etc in a socio-economic system. If only $I_i < I_j$, $\forall$ i, j exists M (I_i) ≥ M (I_j) and E (I_i) ≥ E (I_j), so Y (k_i) <Y (k_j), then the system is a high efficiency and high organization state.

Therefore, for socio-economic sustainable prosperity development people need to accumulate every kind of information, which includes natural, social, economic and cultural aspects, and learn to maintain, save, transform and process information. This work is not only for the benefit of contemporary socio-economic development, but also makes up the knowledge ladder for human evolution.

Reasonable production of single input

Considering the natural ecosystem as an open loop control, the study designs a feed forward control and a production system. Commonly, to describe a production process in economics, it usually needs some prerequisites. Suppose the system input and output are under certain technology; only one variable is single input and others are kept as constant. Therefore, the law of “diminishing return” is well known and can be presented as follows: when an input is added to each unit, the total output increase will be reduced, as seen in Figure 3, where MP curve shows the case.

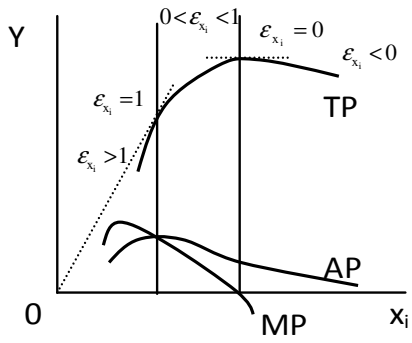

Figure 3. Relationships of input and output.

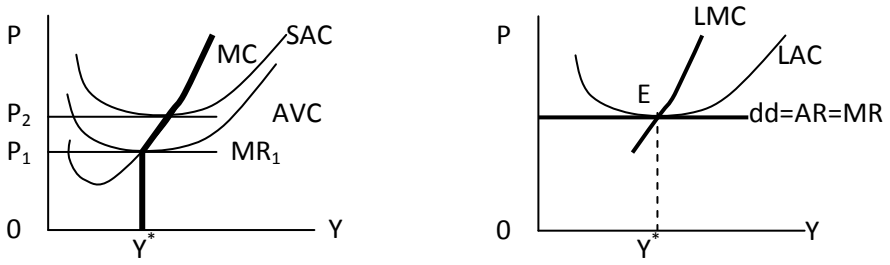

Figure 4. Firm equilibrium under perfect market.

For further economic analysis, we give some useful definitions: let total product TP=Y, average product AP=Y/x_i, and marginal product MP=ΔY/Δx_i. Based on the defined variables, the economic analysis on those relationships shows a reasonable range for the input and the output, being described by ($0<\varepsilon_{x_i}<1$) in Figure 3. Here, ε_{x_i} is defined as the production elasticity with single input.

$$\varepsilon_{x_i}=\frac{\Delta Y}{Y}\Big/\frac{\Delta x_i}{x_i}=\frac{\Delta Y}{\Delta x_i}\cdot\frac{x_i}{Y}=MP/AP$$

Microeconomics indicates: “a production plan is efficient if there is no way to produce more output with same input or to produce the same output with less input (Varian, 1997). The production efficient is the basis to decide the reasonable range, where the production shows the less elasticity and the total output is still going up until MP=0. If one only considers the physical production process, one can obtain maximum output under MP=0.

The market mechanism

Perfect competition market

In free market economy, individual pursuit is to maximize utility, and enterprise aims to maximize profits and minimize cost. Community is encouraging competition in the market as its ideal choice. Market as an "invisible hand" automatically achieves efficient allocation of resources. Therefore, the system can be invisible for feedback control by market as an important part of the socio-economic system.

These are based on some competition hypothesis. From the view of microeconomics, a perfect competition market can be achieved based on several assumptions such as: a large number of sellers and buyers, production of homogeneous product, lack of enrance barriers to into the market, and complete market information at the same time. Therefore, in perfect competition market resources can be used to achieve optimum allocation, with lowest production quantity limitation, and contributing to maximum social welfare. By this hypothesis, products of firms have market demands, with infinite elasticity (Figure 4).

Imperfect competition market

However, a perfect competition market hardly trully exists; firms are often faced with markets imperfect competition, such as, monopolistic competition, oligopoly and the monopoly markets. In Figure 5, where the price $P^*>P_0$, yields Y <Ym, it illustrates that the required demand is elastic; however the product quantity of demand there is

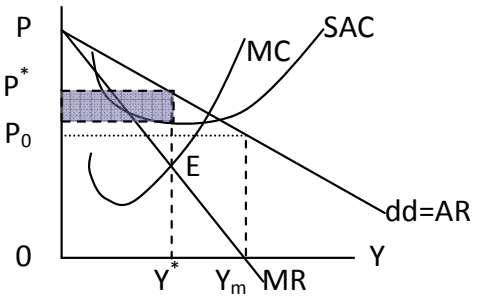

Figure 5. Firm equilibrium under imperfect market.

limited. So the allocation of resources there will be less efficient. According to microeconomic evidence, it is only when the elasticity of market demand is greater than the elasticity of market supply that the market equilibrium can become stable, and the price can converge.

Mathematical proof

Suppose P = P (Y) = P (f (X)), where X represents the input factors (or causes) of the production system; Y expresses the corresponding output (or effect); P is the price of the output product; ω is a set of prices for the input factors. Varian (1997) formulated a profit function as follows:

$$\pi = \mathrm{Y} \cdot P - \mathrm{X} \cdot \omega = Y \cdot \mathrm{P} - \sum_{1}^{n} x_i \cdot \omega_i, \quad (i = 1,2,\ldots,n).$$

In order to meet the extreme conditions,

$$\text{let} \quad \pi \to \mathrm{Max}, \quad \text{if} \quad \frac{\partial \pi}{\partial \mathrm{x}_i} = 0, \quad \frac{\mathrm{d}^2 \pi}{\mathrm{dx_i}^2} < 0.$$

Then, the study can derive the following formula;

$$\frac{\partial \pi}{\partial x_i} = \frac{\partial Y}{\partial x_i} \cdot P + \frac{\partial P}{\partial Y} \cdot \frac{\partial Y}{\partial x_i} Y - \omega_i = P \cdot \frac{\partial Y}{\partial x_i}(1 + \frac{\partial P}{\partial Y} \cdot \frac{Y}{P}) - \omega_i = P \frac{\partial Y}{\partial x_i}(1 + \frac{1}{\varepsilon_P}) - \omega_i = 0$$

.

In the formula, $\varepsilon_{\mathrm{P}} < 0$ is the product price elasticity of demand, so the conclusion of not perfectly competitive firms for profit-maximizing can be expressed as,

$$\frac{\partial Y}{\partial x_i}(1 + \frac{1}{\varepsilon_P}) = \frac{\omega_i}{\mathrm{P}}$$

.

If, the marginal product of factor inputs MP = əY / əx$_i$≥0, and $\varepsilon_{\mathrm{P}} < 0$, then the no loss of firm pricing condition is $|\varepsilon_{\mathrm{P}}| \geq 1$. That means, at the monopoly market, if the product price of demand is inelastic, the production would be a loss or failure. So that, we get an issue: $0 \leq (1 + 1/\varepsilon_{\mathrm{P}}) < 1$. Thus, production elasticity will be combined with single input factor, which requires $1 > \varepsilon_{x_i} > 0$ for efficient production. Under the conditions of monopoly factor existing market, for full input factors or scale production, the profit maximum function can be expressed as,

$$\pi = \mathrm{Y} \cdot \mathrm{P} - \sum_{1}^{n} x_i \cdot P \cdot \frac{\partial Y}{\partial x_i} \cdot \left(1 + \frac{1}{\varepsilon_P}\right) = Y \cdot P\left(1 - (1 + 1/\varepsilon_P) \sum_{1}^{n} \varepsilon_{x_i}\right) \geq 0.$$

Thus, if $|\varepsilon_{\mathrm{P}}| \to \infty$, we will face a competition market; for in $\sum_{i}^{n} \varepsilon_{x_i} \leq 0.$ π≥0 a firm has a choice Therefore, under the assumption of perfect competition some results had been approved and indicated that "the elasticity of supply with respect to output price will be inelastic only if $\frac{1}{2} > \sum_{i}^{n} \varepsilon_{x_i} > 0.$" (Michael (1994), Wang, 1997; Chinese Agriculture Yearbook, 1991-2011). Table 1

Now considering a monopoly market, the study want $\sum_{1}^{n} \varepsilon_{x_i} \Big/ (1 - \sum_{i}^{n} \varepsilon_{x_i}) \geq |\varepsilon_P|$ π≥0; then from the study finds a conclusion $1 > \sum_{1}^{n} \varepsilon_{x_i} \geq \frac{1}{2}$, which must respect $0 \leq (1 + 1/\varepsilon_{\mathrm{P}}) < 1$ or $\infty > |\varepsilon_{\mathrm{P}}| \geq 1$. Thus, the distribution range of the market price elasticity for a monopolist is from its maximized revenue (MR = 0, $|\varepsilon_{\mathrm{P}}|$=1) to the market price elasticity $|\varepsilon_{\mathrm{P}}| \to \infty$; its ultimate price will be 0 demand.

SUMMARY AND CONCLUSION

From the analysis, in an economy, where the market is not considered, one can achieve maximum output, but there is no maximum profit. From competition to monopoly, the profit of firm is increasing, but the efficient of resource use is receding. In particular, most of the market is non-perfect competition in reality. When monopolistic factors exist in a market, only demand has elastic, but supply lacks elastic, which allows the firm to obtain profit over normal profit. For the market economic mechanism, the product price elasticity of demand should be greater than the product supply elasticity, which is also a convergence condition of market cyclical operation.

The existence of imperfect competition markets might have many reasons, but here, the main considerations are the problems of information. In fact, information is

Table 1. Flood disasters covered areas and final affected area in China since 1990 (Unit: 10^6 hectares)[15].

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Areas covered	11.80	24.60	9.42	16.39	17.33	13.06	18.15	11.41	22.29	9.016	7.32	6.04	12.38	19.21	7.46	10.93	8.10	10.46	6.48	7.61	17.52
Areas affected	5.60	14.61	4.46	8.61	10.74	7.63	10.85	5.84	13.79	5.07	4.32	3.61	7.47	12.29	3.75	6.05	4.57	5.10	3.66	3.16	7.02
Rrd%	0.52	0.41	0.53	0.47	0.38	0.42	0.40	0.49	0.38	0.44	0.41	0.40	0.40	0.36	0.50	0.45	0.44	0.51	0.45	0.58	0.60

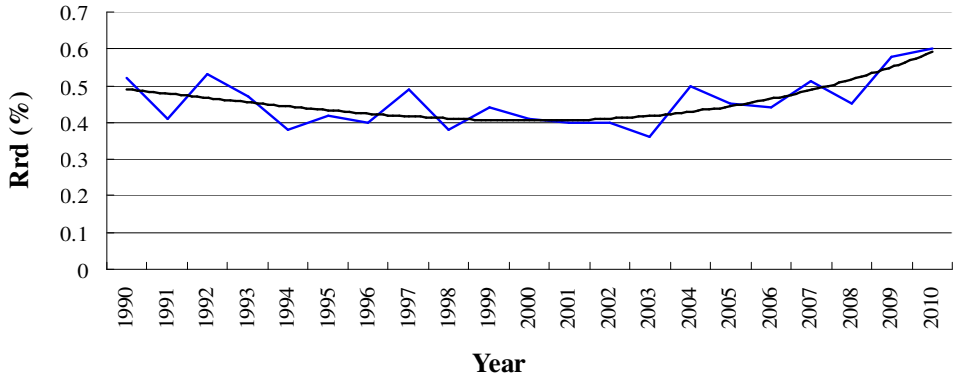

Figure 6. The rate of disaster reduction for flood in China over 20 years.

incomplete, often asymmetric, and individuals are irrational because subjective and objective probability is often inconsistent. Therefore, individual rationality and social developments are difficult to maintain and coordinate very well, resulting in some contradictions, which constitute the causes of loss of efficient economy.

Since the mid-1990s of the last century, the world has been moving toward a market economic system; global trade is becoming prosperous, showing a trend of world economic integration development. Market economy in promoting the world economic prosperity has many advantages, but it also has certain limitations. People respect free market, individual rationality and advocate for competition, but market economic crisis can be also foreshadowed.

Objectively, imperfect competition is wide-spread, and the market failure is taken for granted. Therefore, the operation of the market cannot be "laissez-faire". From a micro-perspective, productions of those products have insufficient price elasticity of demands, but they also meet the demands of people's livelihood. If the market is inefficient, what do those industries do about it? They often take price subsidies or monopoly pricing as the measures.

Socio-economic and ecological systems have easy answer to this question. Such a specific case is shown in Figure 6, where the changes in natural ecosystems, affecting the stability of human social life, and bring some disasters to the society. Taking resisting floods as a classical example, in past 20 years, China has invested a lot of manpower, material and financial resources, etc. to enforce disaster prevention, infrastructure construction, and establishment of social security system. As a result, using the disaster covered areas to compare the final disaster affected area scale, we can calculate a disaster reduction rate to be expressed by Rrd%. The variations of Rrd increase have shown a process in socio-economic system for increasing information, material and energy inputs and bringing entropy reduction in the system.

Suppose, let Afc expresses the areas of flood covered and Afa expresses areas of flood affected. Thus, Rrd=(Afc-Afa)/Afc, Figure 6 shows the variations and the achievements of the flood relief over 20 years in China.

In nature and society, more exogenous factors

influence people's decision. The market studies supply and demand, but demand is the most active factor. With the uncertainties in the external environment, economic analysis becomes more and more complex. During the possible world economic crisis at the beginning of the 21st century, the economic ideas of New Keynesianism and laissez-faire conflict occurred again. Despite the complex nature of socio-economic system, which is not fully controllable and also difficult to observe, the history of socio-economic system in progressive development has shown that humans must learn from the intervention of the socio-economic operation. In fact, insisting on the implementation of feedback control in socio-economic development process is scientific. Based on this study, the system theory and economic analysis conclusions confirm each other. A socio-economic system implements feedback control in order to give the system output a stable result; the system mechanism must be designed as negative feedback.

Currently, the designed social system and the socioeconomic goals are usually different in every nation. Throughout the time of China's reforming and opening up, and in their establishment and development of market economy not very long, their experience of information and knowledge is still far from the developed nations; people seem to have tasted the sweetness of the market economy. However, whether people have noted that, besides those historical gaps, on the strategic vision of socio-economic development there are still some differences. In modern history, there have been two attempts on socio-economic development strategies: one is to promote economic competition, privatization, expansion, seeking a dominated unified picture of world development; the other is to encourage economic cooperation and build an harmony to diversify world development. In the road of development and reform, nations need to exchange and learn from each other, and science is prescriptive in nature. Human socio-economic development is still too hard to get rid of such a choice of history.

ACKNOWLEDEMENTS

The paper is supported by Chinese Education Ministry of Social Science and Humanities Project (No. 12YJAZH138), Philosophy and Social Science Project (HB12YJ001) and Soft Science Project (12457204D-4) of Hebei Province.

REFERENCES

Chinese Agriculture Yearbook" [M]. Chinese Agricultural Publishing house, 1991-2011.
Dennis VL (2006). Understand Uncertainty [M]. by John Wiley and Sons pp.1-15.
Frank HK (I964). Risk, Uncertainty and Profit [M]. (Reprints of Economic Classics) Augustus M. Kelley, Bookseller. New York pp.19-20.
Guiasu S (1977). Information Theory with Applications [M]. McGraw-Hill, New York (Proposition 1.8):10-35.
Hirshleifer J (1972). "Liquidity, Uncertainty, and the Accumulation of Information" [PDF]. In: Carter and Ford, Uncertainty and Expectation Econ. p.138. http://time.dufe.edu.cn/spti/article/hirshleifer/hirshleifer185.
Hirshleifer J, Riley J (1992). The Analytics of Uncertainty and Information [M]. Cambridge University Press; pp.10-11. UCLA, Department of Economics, Working paper #159, July 1979.
Lain N (1992). "Absolute Beginners---The Big Bang" Astronomy 26-27.
Mark JM (1987). "Choice Under Uncertainty: Problems Solved and Unsolved". J. Econ. Perspect. 1(1):121-154.
Michael JP (1994). "Price elasticity implied by homogeneous production function" [J]. J. Agric. Econ. Res. 45:2.
Sandquist GM (1985). Introduction to System Science [M]. Prentice-Hall, Inc. pp.1-36.
Shannon CE (1948). "A Mathematical Theory of Communication". Bell Syst. Tech. J. 27:379-423, 623-656.
Varian HR (1997). Microeconomic Analysis [M]. W. W. Norton & Company, Inc. (3ed.) pp.4-6.
Wang J (1997). "(M, E, I) Model as a Multi-Input Production Function with Homogeneousness of Degree h" [J]. Analyse de Systemes 23(4):15-19.
Wang J (2002). Information Economy and Management [M]. Peoples Publishing House of Xinjiang (2ed.); p.197.
Wang J (2008). Information Economics [M]. Agricultural Publishing House of China pp.311-312.