Chinese Theory of Sticky Expectations

1. Introduction

The theory of rational expectations makes a set of assumptions that are much stronger than the real economy. In particular, the theory of rational expectations assumes:

(1) All agents use rational expectations.

(2) All agents make efficient use of all available information.

(3) All agents have instantaneous access to all the latest economic information.

This set of assumptions has simplified structures of economic models, but has problems explaining the real world. In recent 10 years, economists try to relax these three assumptions and form three new economic theories. They are the theories of rational inattention, sticky information and sticky expectations.

In 1991, for explaining many problems (especial inflation problems) in Chinese economic system, Laya Li tried also to relax these three assumptions and formed Chinese theory of sticky expectations. In this paper we will explain that Chinese theory of sticky expectations is similar to the theories of rational inattention, sticky information and sticky expectations on their basic concepts and basic thoughts.

2. Basic thought of rational inattention, sticky information and sticky expectations

2.1 Rational inattention

The thought of rational inattention can trace to Knight (1921, p67): "It is evident that the rational thing to do is to be irrational where deliberation and estimation cost more than they are worth."

Before Sims (2003) formally brought forward the theory of rational inattention, Sims (1998) had presented a classic definition of rational inattention: "Because individuals have many things to think about and limited time, they can devote only limited intellectual resources to the tasks of data-gathering and analysis. We know from personal experience that many data that we could look up daily, and that are in principle relevant to our optimal economic decision-making, do not in fact influence our behavior, except when they change dramatically, or perhaps when we occasionally set aside some time to re-assess our portfolio."

When they studied price adjustment, Levy, Chen, Ray and Bergen (2005) pointed out: "The essence of the idea of rational inattention is that processing price change information is not a costless activity." "If the costs of processing price change information exceed the benefits, consumers may rationally choose to be inattentive to such

price change information and therefore, not react to the price changes."

2.2 Sticky information

Mankiw and Reis (2002) pointed out: "The essence of the model is that information about macroeconomic conditions diffuses slowly through the population. This slow diffusion could arise because of either costs of acquiring information or costs to reoptimization. In either case, although prices are always changing, pricing decisions are not always based on current information." "To formalize these ideas, we assume that each period a fraction of the population updates itself on the current state of the economy and computes optimal prices based on that information. The rest of the population continues to set prices based on old plans and outdated information."

2.3 Sticky expectations

Roberts (1998) used the phrase "less-than-rational expectations". This is the same concept as Carroll's sticky expectations. In this paper, Roberts used two hypotheses. "One is that a fraction of the population has inflation expectations based on simple extrapolations of past inflation. The other is that inflation expectations adjust only gradually to the fully rational value."

Jonas Dovern, Joerg Doepke, Ulrich Fristsche, Jirka Slacalek (2006) pointed out: "Microeconomic foundations for the sticky information paradigm were elaborated in Carroll's (2003) work on the 'epidemiological model of expectations.' Carroll argues that US survey data on inflation expectations are consistent with a model in which, for each period, only a fraction of households adopts inflation forecasts of rational experts. The remaining households find it costly to update their information and continue using their past expectations rather than form fully rational predictions."

3. Chinese theory of sticky expectations

Laya Li (1991, p224-p228) established four hypotheses of Chinese theory of sticky expectations. Based on his theory, in 1993, he was awarded the most important economics prize in China – the prize of Sun Yefang economics. Laya Li (1995, p52) added a new hypothesis called information lag. Now we introduce these five hypotheses and basic features of Chinese theory of sticky expectations.

3.1 The first hypothesis

"Hypothesis of black box and gray box: For most economic men, they collect information to forecast based on black box model. In other words, they only think of the relationship between the input and output of the model, and they do not know the real structure of the model. The model is a black box to them. They get the relationship between input and output of the model by their experience in the past. They also update this relationship by their judging the future. Hypothesis of black box is consistent with the hypothesis of adaptive expectations comparatively. Some economic men have knowledge of economic theory, and they know relationship of variables of economic problems and structures

of the models in a certain extent, but they do not still know all knowledge of them. So their models are gray models”(Laya Li, 1995, p50).

3.2 The second hypothesis

“When an economic man collects information, he needs to pay expense, such as time, money etc. These are the cost for his getting information. The more information he collects, the more helpful for veracity of his expectations. But the cost of collecting information will increase along with the more information he collects. If the cost of collecting information is greater than the profit that corrective decision makes, then this is not worth doing. A rational economic man must give up effort to keep on collecting information when he collects condign amount of information. This is not difficult to get this marginal condition by microeconomics. It is that the marginal costs of getting information equals to the marginal benefits of making corrective decision”(Laya Li, 1995, p51). “According to hypothesis of rational economic man and information cost, an economic man does not try to get complete information. This produces a problem. If an economic man misses some important information, then it is possible that there are system errors in his expectations”(Laya Li, 1995, p51). “Because it is possible to produce system errors of expectations by missing information, this leads to that there is a relationship between expectations and uncertainty”(Laya Li, 1995, p51).

Compare to rational inattention, the second hypothesis can be called rational abandonment.

3.3 The third hypothesis

“Hypothesis of information lag: It is not synchronizing with its relative economic variables that the information is published and acquired. In the general equilibrium theory, information does not involve in the concept of time. Information is instantaneous, so it does not have time lag. In the real economy, when information is published, it delays in periods to its relative economic variables. Especially, this is obvious in China. At the same time, when an economic man collects available information, he needs to not only cost but also time. Because of information lag, expectations cannot be changed quickly in a short period of time. Due to information cost and information lag, an economic man takes a longer time to collect new information. It is difficult for him to response to the action of economic variable instantaneously, so his expectation is sticky. Of course, once an economic man has gotten the information that he needs, he will be response quickly and adjust his expectation as soon as he can”(Laya Li, 1995, p52).

In 1991, Laya Li used the concept of information lag. But at that time, he did not use it as a hypothesis of his theory. He just used it to explain that expectations are sticky. Laya Li (1991, p232) pointed out: “Expectations are sticky. In a short time, expectations will not be changed quickly. Because information cost is quite big in China, especially lag of publishing information, economic men take a longer time to get enough new information. Thus in a short time, information that they used to make expectations is not changed much. Therefore expectations cannot be changed much, either.”

3.4 The fourth hypothesis

"Hypothesis of learning behavior of expectation: This hypothesis can be divided into two parts. The first part, an economic man learns from the experiences of expectations in the past, and keeps on correcting his errors of expectations. The second part, an economic man learns from other people and simulates behave of expectations of other people. This can decrease the cost and lag of information by simulating expectations of other people"(Laya Li, 1995, p52).

"The learning function of expectations will push that expectations of gray box are accepted by public gradually and become the common expectations of public. Comparatively correct expectations of a small number of the population will become common expectations of most population by learning and spreading of expectations. But it needs time to learn and spread of expectations, too. It is impossible that correct expectations of a small number of the population will become common expectations of most population in a very short time. This leads also sticky expectations"(Laya Li, 1995, p52-p53). In other words, expectations diffuse slowly through the population. And expectations adjust only gradually to rational expectations in a long time. This means: In the beginning, a fraction of the population belongs to black box will uses expectations of population belong to gray box. Gradually, most population belong to black box will use expectations of the population belong to gray box. At this time, expectations of gray box become the common expectations of public.

3.5 The fifth hypothesis

"Hypothesis of that wrong expectation cannot exist in a long time. Because an economic man can learn from his practices and learn from other people, once he finds that his expectation is wrong, he will correct his mistakes immediately. Thus a wrong expectation cannot exist in a long time"(Laya Li, 1995, p53).

3.6 The features of sticky expectations

"According to definitions above, the sticky expectations is closed to rational expectations in a long period of time. If in a short period of time, there is big difference between sticky expectations and rational expectations. In a short period of time, the sticky expectations are closed to Keynes's uncertainty expectations. This is very similar to theory of sticky price. In a short period of time, price is sticky. In a long period of time, price is elastic. This is the reason that we use the phrase of sticky expectations"(Laya Li, 1995, p53).

There are two factors in Keynes's uncertainty expectations. One is stickiness, and another is sudden change. In Chinese theory of sticky expectations, there are also these two factors. Laya Li (1995, p54-p55) pointed out: "In the beginning of the inflation and uncertainty is smaller, an economic man's expectation is easy to be sticky to the lower inflation. When inflation is getting larger during the period and uncertainty is getting larger, the expectation will be sudden changed and be sticky to the higher inflation."

3.7 The coarse information of chaos systems

An important thought of rational abandonment is to use coarse information. Though an economic man will lose much information of the economic variables by using coarse information, he can pay attention to the main characteristic of information by a limited time and cost. For example, Laya Li(1995, p146-p150) studied coarse information of chaos systems. He only studied rise and fall of a variable and ignored its values. He used 0 to indicate fall and used 1 to indicate rise. Thus the value of variable X(t) maps to V(t). The value of V(t) is 0 or 1. He found some new phenomena in chaos systems.

For example, we have a chaos system: $X(t+1) = \lambda X(t)(1-X(t))$ and let $3 <= \lambda <= 4$. $0<= X(t) <= 1$. Let X(0) is any point in [0, 1]. After limited iterative calculate, we can get a sequence of V(t). We can find the relationship between λ and V(t):

When $3.0 <= \lambda < 3.68$, V(t) is (1010101010……). This sequence only consists of (10). We know that when $3.569945 <= \lambda$, X(t) gets chaos values.

When $3.68 <= \lambda < 3.829$, V(t) consists of (10) and (110), such as (10101101011010……).

When $3.829 <= \lambda < 3.86$, V(t) is (110110110……). This sequence only consists of (110).

When $3.86 <= \lambda < 4$, V(t) consists of (10), (110), (1110), (11110), ……, (111……10),……, etc.

Thus V(t) only consists of the patterns as following:

(10), (110), (1110), (11110), ……, (111……10), …… .

For each pattern, its most right value is 0 and the rest values are 1.

From above results, it is easy to find: if V(t) of a chaos system has value 0, its next value must be value 1. But if its value is value 1, its next value is not necessary to be value 0. And along with λ gets larger, the chance that V(t) is value 1 gets larger, too.

According to these study results, the chaos system has different features from stochastic processes.

Laya Li studied three different chaos systems. He got similar results, too.

4. Compare

4.1 Rational abandonment versus rational inattention

The thought of rational abandonment that an economic man only collects part of all available information and gives up the rest information is the same as the thought of rational inattention that an economic man only pays attention to part of all available information

and neglects the rest information. Here both of them distinguish between all available information and the information that an economic man is actually used to make his decisions.

Both uncertainty and information filter are the important elements in Laya Li's theory and Sims's theory. But they use different methods to study uncertainty and information filter. Laya Li (1995, p83-p106) uses variance to measure uncertainty and uses Kalman filter and stochastic optimizing control to analyze problems. Sims uses entropy to measure uncertainty and uses a new optimizing control information model that he creates to analyze problems.

It needs to point out that Laya Li lists time as an independent element from information cost. This is directly corresponding to the limited attention of an economic man. When an economic man distributes his limited time to different information, he can only pay his limited attention to them.

4.2 Laya Li's Sticky expectations versus sticky information

The first essential thought of sticky information (Mankiw and Reis (2002)) is that information diffuses slowly through the population. This is similar to that expectations diffuse slowly through the population in Laya Li's forth hypothesis.

The second essential thought of sticky information (Mankiw and Reis (2002)) is that a fraction of the population use outdated information to make decisions. The outdated information is lagged information. In other words, information lag is also outdated information.

Mankiw and Reis (2002) used sticky information to instead of sticky price in their theory. Laya Li used both sticky expectations and sticky price in his theory. Laya Li called it dual stickiness. For example, Laya Li (1991, p192-p193) set up a rule that makes a new price based on an old price for the firms: "At this time, a firm will add a rising cost that comes from expecting inflation on its old price." It is similar to the rule of thumb of Gali & Gertler (1999): some firms just simply add a correction for inflation that has occurred recently on the old price to form a new price.

4.3 Black box and gray box versus householder and expert

Laya Li's first hypothesis divides economic men into two groups, black box group and gray box group. The expectation of the black box group is similar to Carroll's household expectations. The expectation of the gray box group is similar to Carroll's expert expectations.

There are two key thoughts in Laya Li's forth hypothesis. First, a fraction of the population belongs to black box will use expectations of the population belong to gray box. Gradually, most population belong to black box will use expectations of the population belong to gray box. Second, expectations adjust only gradually to rational expectations in a long time. These two thoughts are similar to Carroll's theory that a fraction of households uses expectations of experts for a period. And household expectations move towards expert

expectations. They are also similar to the two hypotheses of Roberts (1998).

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