Old Keynesian Expectations-Driven Business Cycles

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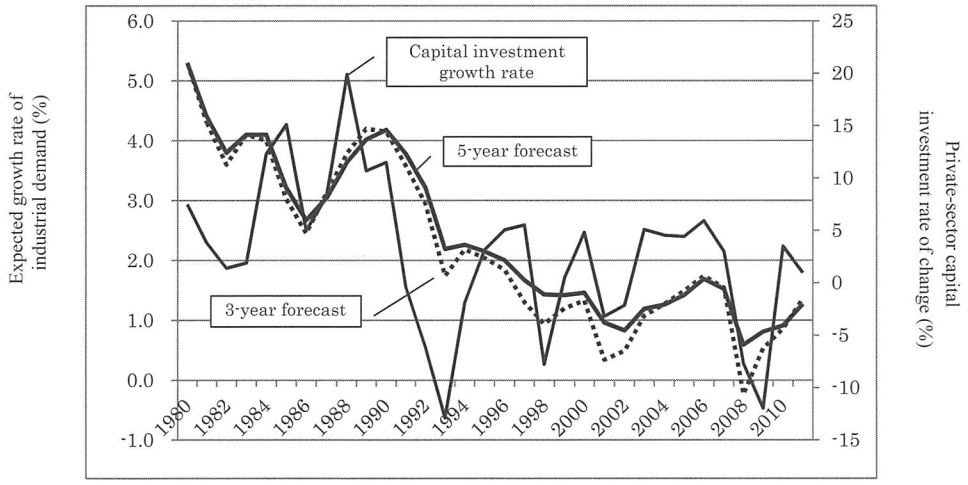
This study explores secular expectations-driven cycles following Keynes's (1936, 1937) vision that emphasized the significance of human beliefs. In an uncertain world, ones expectations result in self-fulfilling fluctuations. Sudden changes in society as a whole and in entrepreneurial expectations can predict the development and collapse of bubble phenomena. Expectations exhibit hysteresis when they pervasively adopt pessimism or optimism. Besides traditional economic policies, extrication from recession overlaid with persistently pessimistic expectations requires a social policy that responds effectively to the interactions woven from a state of expectations and actual economic movements. This study depends on intuitive diagrammatic expositions, rather than on a system of differential equations, to perform a qualitative analysis. (Key words: Self-fulfilling Expectations, Suddenness, Business Cycles, Qualitative Approach ; *JEL* classification E32, Z10)

Ⅰ. Introduction

Economic activity is ruled by expectations of future events. The survey data of *Consumer Confidence Index* (Cabinet Office) in Japan as well as University of Michigan *Consumer Sentiment Index* and the Conference Board *Consumer Confidence Index* in the US suggest that a correlation exists between household future prospects and actual consumer spending. The *Survey of Corporate Behavior* published by Japan's Cabinet Office suggests that changes in future demand expectations produce changes in investment (Fig. 1.1), and reveals statistical correlations between expected and actual growth rates of real GDP, which are not displayed in the figure, revealing that actual rates are likely to fulfill expectations.

We question the formation of such expectations. Traditional neoclassical economics has invoked the principle of maximizing choice behavior for expectation formation (Muth, 1961; Lucas, 1972; Sargent and Wallace, 1975; Barro, 1976). Clever, rational economic agents do not mistakenly fail to predict the future intelligently by using available information for their economic decisions except in the case of an unpredictable disturbance or random deviance (noise). If rational expectation is a positive hypothesis



Note 1: Questionnaire surveys were distributed by mail in January in each survey year to all companies listed in the first and second sections of the Tokyo, Osaka, and Nagoya stock exchanges (approximately 2,500 companies).
Note 2: The capital investment growth rate from 1985 to 2011 is at 2005 levels (chained prices), 93SNA, while the growth rate prior to that is at 2000 levels (chained prices), 93SNA.
Source: Cabinet Office, *National Accounts of Japan and Annual Survey of Corporate Behavior*.

Fig. 1.1 Forecasts of the industrial demand growth rate and the private-sector capital investment growth rate (real fiscal year)

in the sense argued by Friedman (1953), economists' important tasks involve solving intertemporal optimization problems through dynamic programming models (Hall, 2010). The general effectiveness of discretionary financial and fiscal policies is theoretically denied when economic agents form rational expectations.

However, other researchers who examined expectations treated them differently from the neoclassicists (Knight, 1921; Keynes, 1936; Myrdal, 1931, 1939; and Shackle, 1938). In contrast to probabilistic risks of how only trial results are unknown within known probability distributions (mathematical probability), they emphasized inherent uncertainty under which probability distributions (and therefore their values of average and variance) are also unknown. Most human decisions to do something positive "can only be taken as a result of animal spirits—of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities" (Keynes, 1936, p. 161). On considering that psychological expectations in humans who could never accurately know current or future economic fundamentals are at the root of fluctuations in output and employment, Keynes noted that "the economic machine is occupied at any given time with a number of overlapping activities, the existence of which is due to various past states of expectation" (1936, p. 117). [(1)]

According to Jones (2008), the US is one such example wherein the optimism of

consumers and entrepreneurs during the long post-war period has acted positively on economic growth supporting factors. Although optimism stimulates the animal spirit, pessimism entails dangerous uncertainty, producing a negative effect on real variables. According to Cowen (2011), the US currently has overinflated expectations. Despite the fact that the "low-hanging fruit" has been consumed, in reality people hold on to inflated expectations, and become over-confident and ambitious, creating an untenable situation in which millions of people have become complicit in the financial crisis. Cowen concluded that groundlessly overinflated growth expectations have amplified chaos and instability in the economy.

Sociologist Robert Merton (1949) established the concept of a self-fulfilling prophecy. In the sense that the result of acting on belief (theory) becomes reality, rational expectations are self-fulfilling. However, the sociological notion of self-fulfilling expectations (predictions) characterizes the phenomenon by which the expectations are actually fulfilled because people act on the basis of a belief in those expectations even if they are mistaken. According to Merton, expectations are either self-fulfilling or self-destroying such that actions influenced by expectations produce a denial social result of them. Jones (2008) and Cowen (2011) consider sociological and psychological Keynesian formation of expectations.

In a stable environment, we commonly assume rational expectation formation, especially for repeated events. However, this assumption's universality is dubious in the general economy. A practical understanding is that an economy consists of persons who seek the rational formation of expectations while being exposed to many sources of market friction and imperfection. Emphasizing inherent uncertainty does not imply abandoning economic theorizing. Similar to Katona (1951), this study explores dynamic expectation formations that incorporate psychological and social dimensions.[(2)]

II. Social Expectation Distribution

Given the state of technology and preference, various micro- and macroeconomic expectation variables share a certain relationship with the general expectations of optimism and pessimism. For example, optimistic (or pessimistic) future expectations imply that the economic growth rate and business return rates are higher (or lower) in the future, implying a fall (or rise) in the unemployment rate.

2.1 Features of the Public Opinion of Expectations

It is known that members of society (the populace or citizens) make certain future forecasts subject to their own circumstances. This study describes future states of

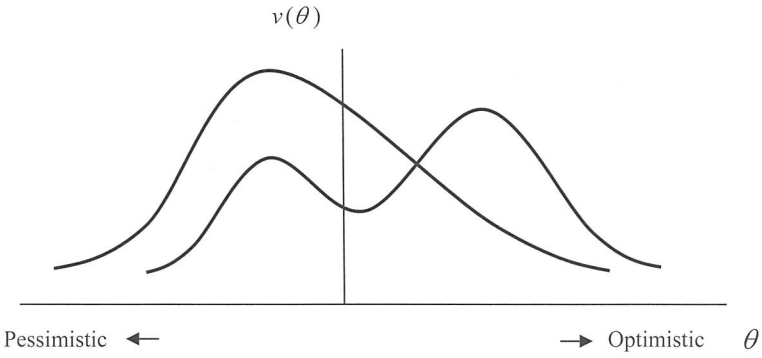


Fig. 2.1 Social expectation distribution

expectations using common terminology such as optimistic (bullish) and pessimistic (bearish) states. We present the following social axioms below.

Axiom 1: There is a social frequency distribution that indicates people's optimism and pessimism for the future.

Axiom 2: The state of social expectations changes dynamically according to social situations.

In addition to Axioms 1 and 2, Condition 1 establishes the characteristics of social frequency distribution of expectations.

Condition 1: The public opinion of expectations forms either a coherent unipolar or fragmented bipolar pattern. When fragmented, there is a relatively small number of unstable and indecisive individuals.

This condition implies that the expectation distribution peaks at a frequency with either a unipolar or bipolar focus.

Fig. 2.1 displays two types of expectation distributions that are consistent with the axioms and condition described above. The quartic function of $v = v(\theta)$ $(v \geq 0)$ approximates these curves, where v vrepresents the number of agents and θ represents the expectation measure (level). A combination of the coefficients of $v(\theta)$ determines these frequency functions.

Below we include the following physical and psychological conditions for the dynamic change of social expectation distribution.

Condition 2: Economic growth positively affects people's optimism.

Condition 3: Environmental load caused by economic growth stimulates people's pessimism.

Condition 4: Social friction increases the fragmentation of the public opinion of expectations.

The acceleration of real GDP growth strengthens a bias toward people's optimism, whereas the deepening negative growth increases a bias toward pessimism (Condition 2). Environmental deterioration induces people to regretfully suppress their hopes and expectations for more economic growth (Condition 3). Moreover, diverse social friction may develop between people in a society that includes individuals of different values and economic positions. Social friction includes social phenomena such as the destruction of morality, custom, and tradition, imposing different psychological pressures on different people. Social friction increases the polarization of optimists and pessimists for the future (Condition 4).

Historically, large-scale production facilitating economic growth has caused environmental pollution, which is closely associated with social friction on diverse issues (Mishan, 1969; Meadows et al., 1972). However, social friction decreases when economic growth successfully expands the middle class (Kuznets, 1955). Therefore, we reveal two sides to the issue. This causality varies subject to initial states, the stage of economic growth, human individuality, and cultural tradition.[3]

2.2 Expectations Potential

We approximate the social distribution of people's expectations at period t by the following quartic function:

$$(2.1)\quad v_t = v(\theta_t; c_{1,t}, c_{2,t}, t) = -c_0(\theta_t - A_{\theta,t})^4 + \frac{1}{2}c_{1,t}(\theta_t - A_{\theta,t})^2 + c_{2,t}(\theta_t - A_{\theta,t}) + v_0,$$
$$c_{1,t} \geq 0, \quad c_0 > 0, \quad v_0 > 0, \quad -\infty < \theta_t < +\infty,$$

where $A_{\theta,t}$ is the ultimate exogenous shift parameter, $c_{1,t}$ and $c_{2,t}$ are coefficient variables, and c_0 and v_0 are constant terms. $A_{\theta,t}$ is a reset subject to the occurrence of unexpected major shocks such as innovation or destruction. Assuming specified c_0 and v_0, plausible pair movements of $c_{1,t}$ and $c_{2,t}$, and an absence of shock ($A_{\theta,t} = 0$), a certain concrete form of Eq. (2.1) can satisfy Axioms 1 and 2, and Conditions 1 through 4. Such a distribution function, which may be referred to as the expectations potential, can be a case yielding the cusp catastrophe in Thom's theorem (1975).[4]

Let the level of expectations be measured on the x-axis. In this distribution function, the mean $E(\theta_t) \equiv \mu_{\theta,t} = 0$ if $c_{2,t} = 0$. Specifically, if $c_{2,t} = 0$ and $c_{1,t} = 0$, the mountain-formed distribution displays a single peak with mode $\hat{\theta}_t = 0$. We consider a larger positive θ_t from the original $\theta_t = 0$ to be more optimistic and a smaller negative θ_t to be more pessimistic. The situation of $\mu_{\theta,t} = \hat{\theta}_t = 0$ in the case $c_{2,t} = 0$ and $c_{1,t} = 0$ may be considered the calmest. A larger positive value of $c_{1,t}$ expands the divergence from the calmest state, implying

Table 2.1 Form of expectations potential

Normal factor $c_{2,t}$	Splitting factor $c_{1,t}=10$				$c_{1,t}=15$			
	Maximum		D	$\theta_2-\theta_1$	Maximum		D	$\theta_2-\theta_1$
	θ_1	θ_2			θ_1	θ_2		
−8	−0.958		3.820		−1.062		2.633	
−7	−0.935		2.808		−1.042		1.620	
−6	−0.911		1.930		−1.022		0.743	
−5	−0.885		1.188		−1.000	0.500	0	1.500
−4	−0.857		0.580		−0.977	0.673	−0.608	1.650
−3	−0.826		0.108		−0.953	0.740	−1.080	1.692
−2	−0.791	0.570	−0.230	1.361	−0.926	0.790	−1.418	1.716
−1	−0.753	0.651	−0.433	1.403	−0.898	0.831	−1.620	1.728
0	−0.707	0.707	−0.500	1.414	−0.866	0.866	−1.688	1.732
1	−0.651	0.753	−0.433	1.403	−0.831	0.898	−1.620	1.728
2	−0.570	0.791	−0.230	1.361	−0.790	0.926	−1.418	1.716
3		0.826	0.108		−0.740	0.953	−1.080	1.692
4		0.857	0.580		−0.673	0.977	−0.608	1.650
5		0.885	1.188		−0.500	1.000	0	1.500
6		0.911	1.930			1.022	0.743	
7		0.935	2.808			1.042	1.620	
8		0.958	3.820			1.062	2.633	

Other coefficients: $c_0=5,\ v_0=350$

increased social tension among people.

The expectation level corresponding to the peak of the mountain-shaped potential is found as an extreme value of $v(\theta_t)$ in Eq. (2.1). By calculating the first derivative of $v(\theta_t)$, we obtain solution θ_t of the following equation:

$$(2.2)\quad -4c_0\theta_t^3+c_{1,t}\theta_t+c_{2,t}=0\,.$$

In the general equation $x^3+px+q=0$, the condition under which x has a double root involves the discriminant equation $4p^3+27q^2=0$. In this study, the condition (i.e., bifurcation set) under which Eq. (2.2) has a double root is as follows:

$$(2.3)\quad D_t\equiv 4\left(-\frac{c_{1,t}}{4c_0}\right)^3+27\left(\frac{c_{2,t}}{4c_0}\right)^2=0\,.$$

We can determine the form of $v(\theta_t)$ by examining the sign of D_t.

The variables $c_{1,t}$ and $c_{2,t}$ of the expectations potential $v(\theta_t)$ are called normal and splitting factors, respectively. In Eq. (2.1), two real roots corresponding to the maximum values of v_t can be calculated as follows:

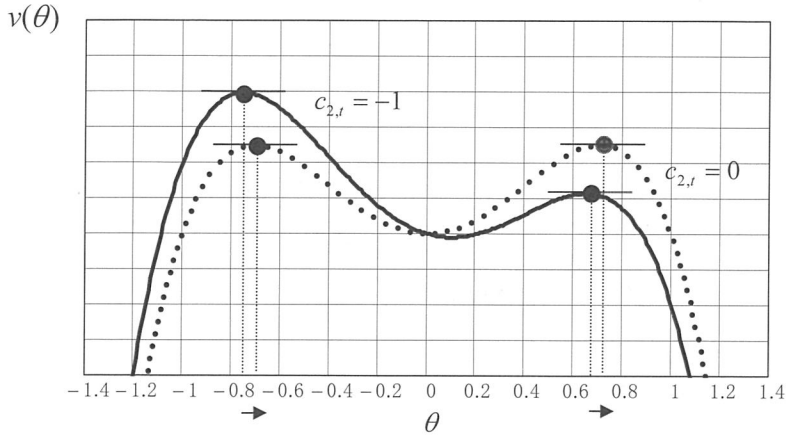


Fig. 2.2 Increments in the normal factor and changes in local maximum values: constant $c_{1,t}=10$

$$(2.4)\quad \theta_{1,t}=-\left[c_{1,t}\left(1+\sqrt{3}i\right)+\left(12-12i\sqrt{3}\right)c_0(\Delta_1)^{\frac{2}{3}}\right]\Big/\left[24c_0(\Delta_1)^{\frac{1}{3}}\right],$$

$$\theta_{2,t}=\left[c_{1,t}+12c_0(\Delta_1)^{\frac{2}{3}}\right]\Big/\left[12c_0(\Delta_1)^{\frac{1}{3}}\right]$$

$$\Delta_1\equiv\frac{c_{2,t}}{8c_0}+\sqrt{\frac{(c_{2,t})^2}{(8c_0)^2}-\frac{(c_{1.t})^3}{(12c_0)^3}}\,.$$

A single real root corresponding to the maximum of v_t is either $\theta_{1,t}$ or $\theta_{2.t}$.

In the numerical examples where $c_0>0$ and $c_{1,t}>0$, partial derivatives of the solutions $\theta_{1,t}$ and $\theta_{2.t}$ with respect to $c_{2,t}$ reveal their signs, respectively, as follows:

$$(2.5)\quad \frac{\partial\theta_{1,t}}{\partial c_{2,t}}>0 \text{ and } \frac{\partial\theta_{2,t}}{\partial c_{2,t}}>0.$$

An increase (decrease) in $c_{2,t}$ accompanies an increase (decrease) in $\theta_{1,t}$ and $\theta_{2,t}$. Table 2.1 displays a special case. Fig. 2.2 illustrates rises in $\theta_{1,t}$ and $\theta_{2,t}$ when that $c_{2,t}$ increases from -1 to 0 (from the solid to the broken line). Furthermore, this increase in $c_{2,t}$ allows $v(\theta_{2,t})$ be larger than $v(\theta_{1,t})$. Therefore, we call $c_{2,t}$ as the normal factor.

A single peak and double peaks of $v(\theta_t)$ are formed when $c_{1,t}=0$ and $c_{1,t}>0$, respectively. In the distribution form of double peaks, an increment in $c_{1,t}$ expands the difference between $\theta_{1,t}$ and $\theta_{2,t}$. Specifically, as indicated in Table 2.1 and Fig. 2.3,

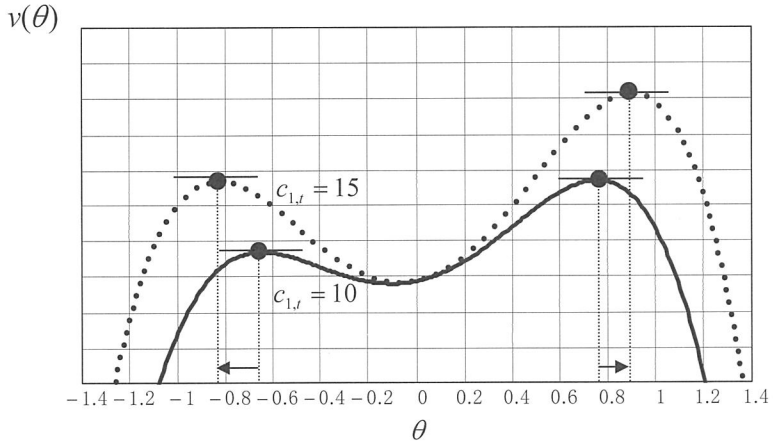


Fig. 2.3 Increase in the splitting factor and the expanding divergence between the local extreme values: constant $c_{2,t}=1$

$$(2.6)\quad \frac{\partial d_t}{\partial c_{1,t}} > 0, \quad d_t \equiv \theta_{2,t} - \theta_{1,t}.$$

In the numerical case of the change from $c_{1,t}=10$ to $c_{1,t}=15$, the difference d expands from 1.361 to 1.716 when $c_{2,t}=2$. As an increase in $c_{1,t}$ increases the bipolarization of public opinion, the variable $c_{1,t}$ may be called the splitting factor.

III. Long-term Expectations of Business Profit

Fluctuations in aggregate investment cause considerable changes in economic growth and employment. A firm's psychology of long-term expectations on investments is highly complicated and unstable compared with a consumer's psychology of his propensity to consume (Keynes, 1936). However, challenging the business cycle theory, it is propulsive to identify a fundamental mechanism of entrepreneurial expectations formation rather than to simply assume that expectations are certain or spontaneous.

Firms subjectively expect profits and risks. Their expectation formations depend on the structure of people's expectations and hopes about their future economy and new markets. If a firm fails to read the content of social expectations and value judgments accurately, it may suffer a serious loss in production and investment.[5] In the worst case, it may declare bankruptcy. Therefore, any firm conjecturally estimates the social distribution of expectations by ascertaining the extent of people's optimistic and pessimistic opinions about their future economy. Firms outwit their rivals while challenging uncertainty. However, they do not act recklessly when facing business risks and usually exercise

caution to minimize the potential cost of bankruptcy, which is very critical to not only entrepreneurs but also stockholders and credit suppliers.

Firms carefully construct financial plans on future and current cash flows. By comparing investments with their present values and interest rates with their expected rate of returns, they calculate the financial risks of expanding production as well as their ability to bear risks. A more optimistic outlook implies a reduced perception of risk. Thus, expectations influence not merely demand but also supply. Firms' optimism and pessimism affect all aspects of purchase, production, and sale, and therefore cause a simultaneous shift in aggregate demand and supply (Greenwald and Stiglitz, 1993; Stiglitz and Greenwald, 2003).

Although the distribution of people's expectations limits entrepreneurial expectations, firms' state of expectations indirectly and interdependently influences social expectation formation. In this process, fluctuations in the firms' prospective returns alter the scale of investment and therefore economic growth and employment, which shift the combination $(c_{1,t}, c_{2,t})$ determining the position and form of the distribution of people's expectations.

We make assumptions for firms' behaviors of expectations formation.

Assumption 1: Firms perceive one of the multiple modes of social distribution of expectations despite their incompleteness.

Assumption 2: Firms' expectations react with a mode of the social distribution.

For simplicity, we consider expectation formation for a representative firm. Assume that the frequency of people's expectations is distributed as a single-peak mountain figure at time $t-1$; that is, $v(\theta_{t-1})$ in Fig. 3.1. It is a relatively unified social state of expectations, whose mode the firm can identify (Assumption 1). At time $t-1$, the firm bases its future expectation on θ_{t-1}, which is the mode of social distribution (Assumption 2). Generally, let the state of the firm's expectation at time t be denoted by $\pi_{e,t}$. Defining the firm's expectation base by $\hat{\theta}_t$ at time t, its expectation level is given by as follows:

$$(3.1)\quad \pi_{e,t} = \pi_e(\hat{\theta}_t),\quad d\pi_{e,t}/d\hat{\theta}_t > 0.$$

The entrepreneurial expectation level is indicated by a helium filled balloon at the mountain top. We call it the *expectation balloon*.

In this case, the firm expects that producing and investing on the basis of the mode of social distribution $\hat{\theta}_t$ can maximize or improve its profits. Based on values other than the mode, it expects to pay an opportunity cost, which increases the possibility of higher risk. Therefore, we assume that the firm forms level of expectation $\pi_{e,t}$ on the basis of the value of $\hat{\theta}_t$, which corresponds to the peak of the distribution mountain.

The social distribution of expectations changes subject to movements in the combination

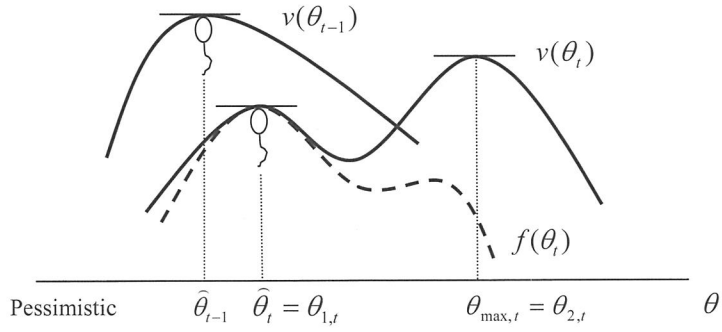


Fig. 3.1 Social distribution of expectations and the firm's expectation balloon

$(c_{1,t}, c_{2,t})$ motivated by social and economic variable fluctuations. The firm modifies its expectations after identifying a change in the social structure of expectations. In other words, it follows the direction of public opinion.[6] Encountering a new environment, the firm adaptively behaves to improve, or at least not to worsen its present position—consistent with the principle of satisficing (Simon 1955, 1958, 1986; Tobin 1980). On encountering a social expectations potential of the quartic function as given by Eq. (2.1), the formation of $\pi_{e,t}$ requires another assumption:

Assumption 3: In the case of two peaks, the firm considers the value of the peak near the previously based peak as its new expectation base.

The firm can identify a mode by collecting available information, although the entire figure of the distribution of expectations cannot be determined. It can recognize distributional changes near the mode when it confirms them (see $\hat{\theta}_t$ in Fig. 3.1). The firm understands that the occurrence of real changes in the economy affect people's psychology, thus altering the form of social distribution of expectations and consequently the position of the expectation balloon. [7]

Assumption 3 implies that the firm judges the social state of expectations by its limited local observation. In the case of a unified single peak, the firm's expectation fairly corresponds to the social one. In the split case, the firm persists in its previous judgment, aware of uncertainty as it can locally perceive a change in the distribution form and its number of peaks. It is reasonable for the firm to depend on past examples because it cannot clearly predict the future. Thus, even if it knowingly takes business risks, a firm requires sufficient evidence to change its current view. Furthermore, the firm would face explicit and implicit costs to change its previous judgment, thereby making its persistence near-rational (Akerlof and Yellen, 1985).

Formally expressing the foregoing process, the frequencies other than that

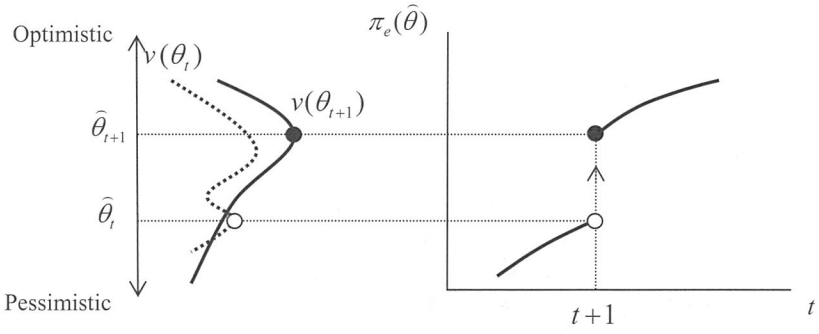


Fig. 3.2 Upward jump in entrepreneurial expectation

corresponding to the presently based $\hat{\theta}_t$ are discounted subject to the following rule:

(3.2) $C(\theta_t) = \delta(\theta_t - \hat{\theta}_t)^2, \ \delta > 0.$

Therefore, the firm has its own distribution curve:

(3.3) $f(\theta_t) = [1 - C(\theta_t)]v(\theta_t).$

Its incomplete information and predictability under extrinsic uncertainty allow the firm to intentionally have $f(\theta_t)$ for an objective social distribution $v(\theta_t)$. In this setting, $\hat{\theta}_t$ is subjectively chosen as the best base as long as $f(\hat{\theta}_t) > [1 - C(\theta_{\max,t})]v(\theta_{\max,t})$ despite $\hat{\theta}_t < \theta_{\max,t}$, as depicted in Fig. 3.1.

Such a hysteresis eventually causes a sudden change (jump) in the firm's expectation. When the peak on which the firm has been fixated completely disappears, the firm's expectation changes discontinuously (Fig. 3.2).[8] This sudden change is a phenomenon coincident with a cusp catastrophic change from a double-peak to a single-peak mountain of the distribution. This would cause a dramatic change in the economy.[9]

IV. Elliptic Movements in Control Variables and Cyclical Expectations

4.1 Economic growth and movements in control variables

This section discusses a cyclical example of how the social distribution of expectations changes over time. A hypothetical example shows a secular regular cycle including discontinuous sudden upturn and downturn.

There is a distribution $v(\theta_t)$ with its mode $\hat{\theta}_t$, mean $\mu_{\theta,t}$, and variance $\sigma^2_{\theta,t}$ under a pessimistic state of low or negative growth at the beginning (Fig. 4.1). Assume that the rate

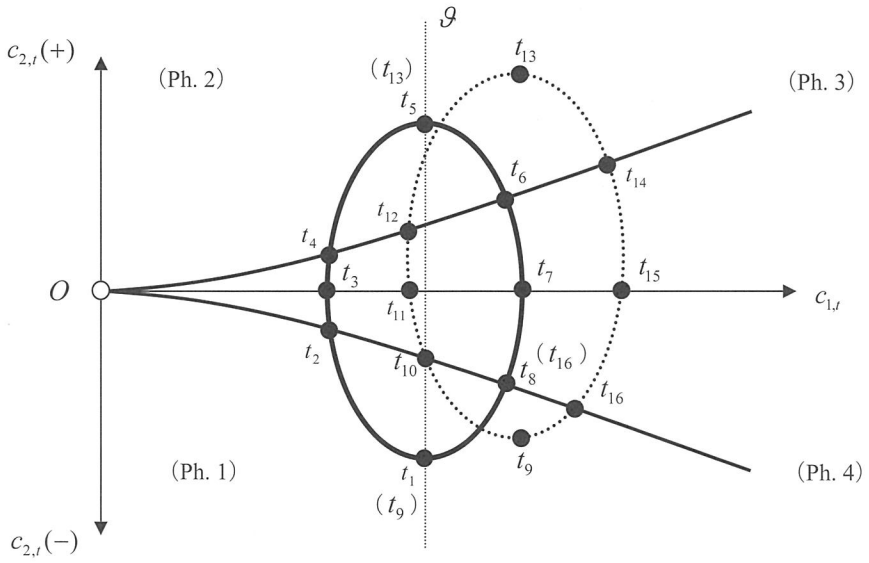


Fig. 4.1 control surface ($c_{1,t}$, $c_{2,t}$) and shift in ellipse

of economic growth $\dot{x}_t$ increases for a positive reason. The Equation below depicts a situation when the normal variable is positively related with economic growth:

(4.1) $c_{2,t} = c_2(\dot{x}_t)$ $(c_2'(\dot{x}_t) > 0)$,

and therefore the position of social distribution is shifted to the right, subject to Condition 2.

Furthermore, assume a dynamic relationship between economic growth $\dot{x}_t$ and social friction z_t conditioned by the following set of assumptions:

Assumption 4.1: Economic growth begins from a poor level and encounters a stage at which social friction eases. $[z'(\dot{x}_t) < 0]$

Assumption 4.2: Consistent economic growth beyond a certain level strengthens social friction. $[z'(\dot{x}_t) > 0]$

Assumption 4.3: An economic turnaround and recession after continued growth does not immediately cope with social friction. $[z'(\dot{x}_t) < 0]$

Assumption 4.4: Consistently low or negative growth reduces social friction. $[z'(\dot{x}_t) > 0]$

Recall that Condition 4 implies $c_1'(z_t) > 0$.

Consistent movements in the combination $(c_{1,t}, c_{2,t})$ with the aforementioned assumptions and preceding axioms and conditions can be represented as an elliptic equation as

$$(4.2)\quad \frac{(c_{1,t}-\vartheta)^2}{r_1^2}+\frac{(c_{2,t})^2}{r_2^2}=1.$$

The coefficients r_1 and r_2 determine the form and size of the ellipse; ϑ sets its center position on the horizontal axis. We call this the benchmark example. Fig. 4.1 depicts a dynamic movement in $\chi_t=(c_{1,t}, c_{2,t})$.

Classifying the elliptical clockwise movement in χ_t starting from time t_1 to t_8 into four phases, we can develop a possible scenario of each phase involving the specified relationship between $\dot{x}_t$ and χ_t.

Phase (1): In the first stage when a poor economy witnesses growth, the public opinion of expectations is motivated toward optimism. Both optimism and economic growth cultivate the middle class in society and reduce the existing social friction (Assumption 4.1). At this stage, the economy is insensitive to or lenient about environmental deterioration. Economic differentials are reduced. This situation describes the $c_1'(z_t)z'(\dot{x}_t)<0$ case, in which the splitting variable $c_{1,t}$ falls and the normal variable $c_{2,t}$ rises at accelerated paces.

Phase (2): The economy in which the interaction of economic growth and increasing expectations continues to proceed in a solid upward trend. According to Assumption 4.2, optimists become predominant despite the increase in friction due to growth. This economy soon reaches a higher stage of economic growth when pessimists are dispelled and firms turn around and start expanding without hesitation. Such a unified optimistic state of expectations results in an active economy. In an efficient economic state, people want luxurious and durable goods and can accelerate their accumulation of assets. People may occasionally face a bubble phenomenon of bullish expectations; thus, in $c_1'(z_t)z'(\dot{x}_t)>0$ case, $c_{1,t}$ rises more than $c_{2,t}$.

Phase (3): However, growth is not persistent. The economy experiences constraints and stagnates because of living and technological difficulties such as environmental deterioration and diminishing returns. The saturation of physical comforts and economic differentials expanded by growth affect the trend of de-growth. Therefore, people who once indulged in the unified optimistic state become polarized into two groups—optimists and pessimists. The economy turns, and its economic growth slows down, which first compels medium- and small-size firms to declare bankruptcy and laborers to lose their jobs. As shown in Assumption 4.3, its social friction level increases sequentially. The pessimism group mountain increases. Thus, in $c_1'(z_t)z'(\dot{x}_t)<0$ case, $c_{1,t}$ rises and $c_{2,t}$ falls at decelerated paces.

Phase (4): Following the tendency described in Phase (3), optimistic behaviors eventually

Table 4.1 Control variables and expectations levels

t	c_1	c_2	θ_1	θ_2	$F(\theta)$	μ_θ	σ_θ	D	ρ	$\bar{\theta}$
1	10.00	−7.00	−0.94		1705.07	−0.072	1.466	2.808	−123.53	−0.94
2	7.08	−1.62	−0.69	* 0.34	1678.83	−0.017	1.450	0.000	−27.88	−0.69
3	7.00	0.00	−0.59	0.59	1678.08	0.000	1.450	−0.172	0.00	−0.59
4	7.08	1.62	* −0.34	0.69	1678.83	0.017	1.450	0.000	27.88	−0.34
5	10.00	7.00		0.94	1705.07	0.072	1.450	2.808	123.53	0.94
6	12.52	3.81	* −0.46	0.91	1726.91	0.040	1.466	0.000	68.78	0.91
7	13.00	0.00	−0.81	0.81	1731.02	0.000	1.480	−1.099	0.00	0.81
8	12.52	−3.81	−0.91	* 0.46	1726.91	−0.040	1.483	0.000	−68.78	0.46
9	10.00	−7.00	−0.94		1705.07	−0.072	1.466	2.808	−123.53	−0.94
10	7.08	−1.62	−0.69	* 0.34	1678.83	−0.017	1.450	0.000	−27.88	−0.69
11	7.00	0.00	−0.59	0.59	1678.08	0.000	1.450	−0.172	0.00	−0.59
12	7.08	1.62	* −0.34	0.69	1678.83	0.017	1.450	0.000	27.88	−0.34
13	10.00	7.00		0.94	1705.07	0.072	1.450	2.808	123.53	0.94
14	12.52	3.81	* −0.46	0.91	1726.91	0.040	1.466	0.000	68.78	0.91
15	13.00	0.00	−0.81	0.81	1731.02	0.000	1.480	−1.099	0.00	0.81
16	12.52	−3.81	−0.91	* 0.46	1726.91	−0.040	1.483	0.000	−68.78	0.46

Note: (1) The asterisk (*) denotes equal roots. (2) The full scale (national level) of people's future expectations, their average, and standard deviation from Eq. (4.3) are, respectively, $\rho_t \equiv \int_{\theta_{L,t}}^{\theta_{H,t}} \{\theta_t v(\theta_t)\} d\theta_t$,

$\mu_{\theta,t} \equiv \frac{1}{F(\theta_t)} \int_{\theta_{L,t}}^{\theta_{H,t}} \{\theta_t v(\theta_t)\} d\theta_t$, and $\sigma_{\theta,t} \equiv \sqrt{\frac{1}{F(\theta_t)} \int_{\theta_{L,t}}^{\theta_{H,t}} (\theta_t - \mu_{\theta,t})^2 v(\theta_t)\} d\theta_t}$

fade, and pessimism pervades the entire economy immediately after people face catastrophic phenomena such as high volumes of bad debts and unemployment. However, sufficiently low or negative growth reduces social frictions (Assumption 4.4), at least repressing people's frictional consciousness. In the $c_1'(z_t)z'(\dot{x}_t) > 0$ case, $c_{1,t}$ declines at a slower pace than $c_{2,t}$. This process prepares the necessary conditions for renewed growth by adjusting product prices, stocks of equipment and facilities, and nonperforming loans.

This oval movement recurs in case of no changes in the given conditions. In the case of innovational development, such as new products and markets, that enables more optimistic expectations and economic growth, this circulation may change its position upward. However, this change suggests that, even though an IT innovation produces improvements in total factor productivity (increased rate of potential growth), a more serious catastrophe may occur in the process of circulation if accompanied with a side effect that more deeply splits people (increase in $c_{1,t}$). The dashed line in Fig. 4.1 represents this turn of events for a scenario of the oval cycle. [10]

4.2 Hypothetical example of numerical values

Table 4.1 cites numerical examples in the benchmarked ellipse circulation. It keeps the

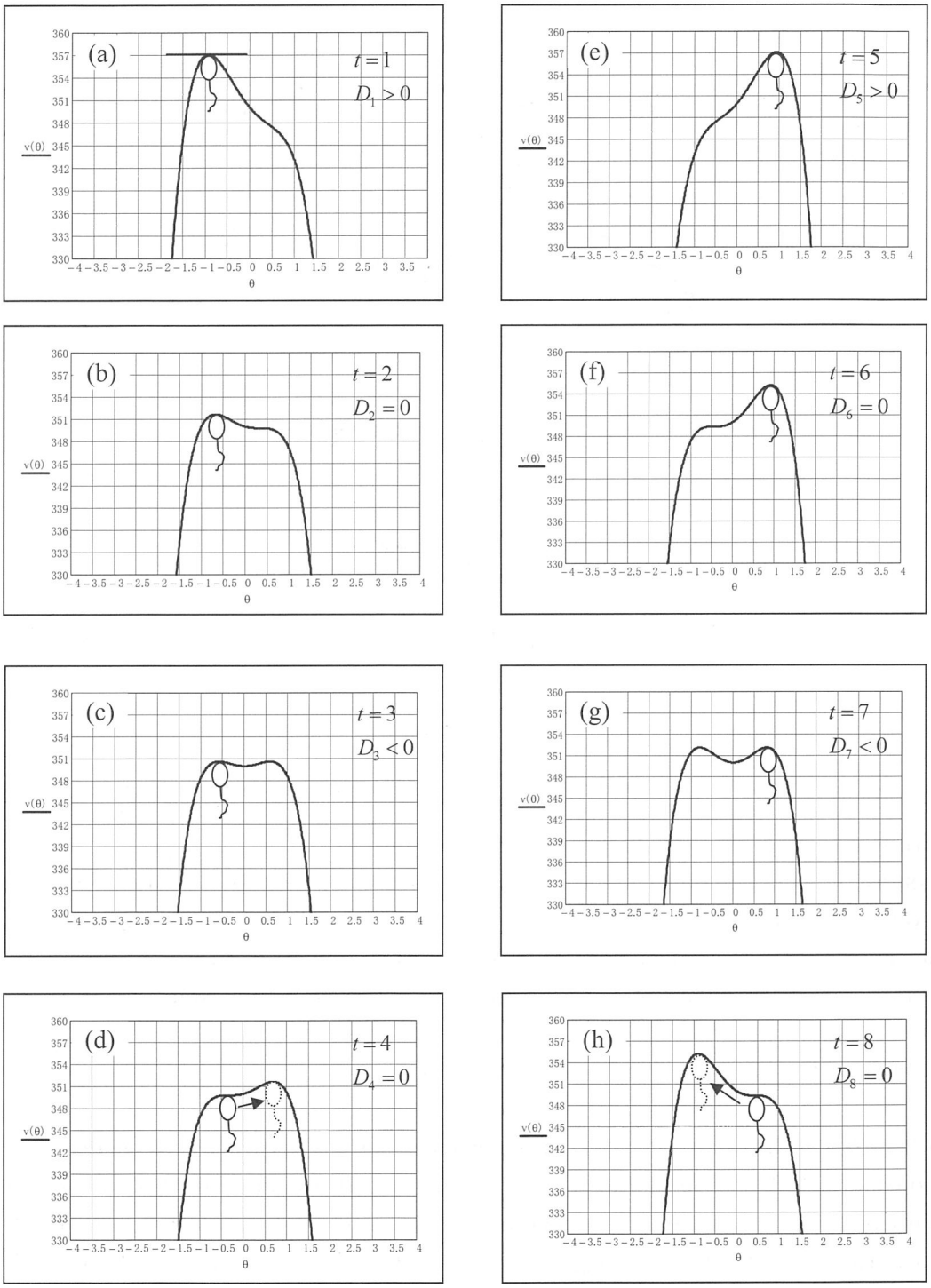


Fig. 4.2 Changes in the potential of expectations from time 1 to time 8

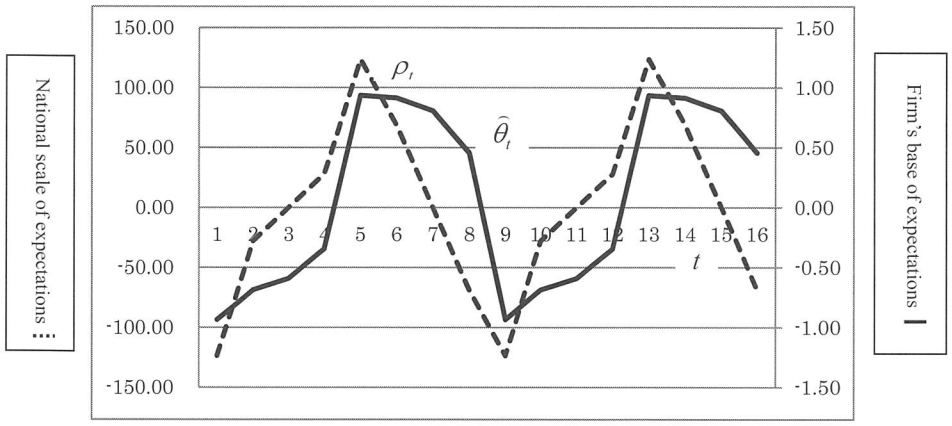


Fig. 4.3 Changes in expectations

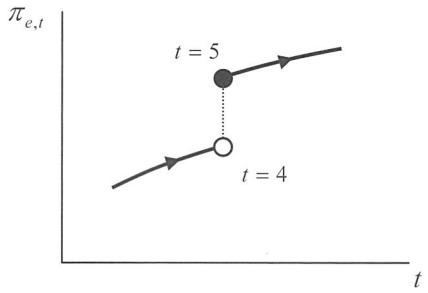


Fig. 4.4 Upward jump in the entrepreneurial base of expectations

arbitrary set of real numbers: $c_0 = 5$, $v_0 = 350$, $\vartheta = 10$, $r_1 = 3$, and $r_2 = 7$. They are consistent with the aforementioned conditions and assumptions for the parameters of the oval equation and the expectations distribution function $v(\theta_t)$. In addition, Fig. 4.2 depicts the graphs of the distribution function at selected times from t_1 to t_8.

In Table 4.1, the number of agents forming expectations is calculated by

$$(4.3)\quad F(\theta_t) \equiv \int_{\theta_{L,t}}^{\theta_{H,t}} \left(-c_0\theta_t^4 + \frac{1}{2}c_{1,t}\theta_t^2 + c_{2,t}\theta_t + v_0 \right) d\theta_t ,$$

where $\theta_{H,t}$ is the maximum and $\theta_{L,t}$ is the minimum at $v(\theta_t) = 0$. When $c_{1,t}$ increases at a constant $c_{2,t}$, the value of $F(\theta_t)$, which is the area surrounded by curve v_t and the horizontal axis, increases by expanding the divergence between $\theta_{H,t}$ and $\theta_{L,t}$ and by increasing the variance of v_t, $\sigma_{\theta,t}^2$ (i.e., standard deviation $\sigma_{\theta,t}$) (Fig. 2.3). However, the present analysis requires only the general shape and the extreme value of $v(\theta_t)$ distribution. Dispensing with calculating $F(\theta_t)$ does not impair the essence of our discussion.[11]

Table 5.1 Conditions of a bubble economy

	Judging points		Remarks
(1) Definition	1. Values or levels not explained by a theory or principle. 2. Better economic performance than fundamental levels. 3. Continuing larger expansions than expected fundamentals. 4. Economy where market prices largely exceed fair levels assumed by fundamentals.		Deviation with fundamentals (true values; expected values of a long run general equilibrium), which depend on a priori set of hypothetical parts. Assumptions: Utility maximization, inter-temporal substitution, efficient market, purchasing power parity, etc. However, the validity of theories may be equivocal.
(2) Phenomenon	Rise in asset prices, high speculation, money easing		Recognition of "overbuying and overselling."
(3) Aspect of expectations	Whole society	Unified optimism	In the unified state of single-peak distribution. Positive interaction between real economic activities and expectations. The expected rate of economic growth structurally exceeds its potential rate.
	Firms	On the path led to sudden optimistically upward jump from voices of caution.	
(4) Economic state	Higher employment, eager incentive to transact, credit expansion		

Note: Bubble is referred to even in the negative case, where one may conversely understand the examples.

The right-most column of Table 4.1 displays numerical examples of the firm's expectation base $\hat{\theta}_t$. In Fig. 4.3, ρ_t and $\hat{\theta}_t$ depicts the national scale and the entrepreneurial base of expectations, respectively. Fig. 4.4 depicts the upward jump in the firm's expectations corresponding to the movement in the social level of expectations [also see panels (d) and (h) of Fig. 4.3].

Thus, accepting the benchmark example of an oval-shaped circulation, we can predict the inevitable discontinuous changes in variables such as investment, GDP, and employment. Considering, historically, that economies have experienced periods of optimism and pessimism, the discontinuous phenomena in our hypothetical example represent that reality. A change in economic variables that initially appear as continuous may have been a large or small discontinuous change. However, its qualitative characteristic may make it difficult to test it statistically, though that test must be performed.

V. Interpretation of the Bubble Phenomena

"Bubble" is now a common word. Expectation formation relates to bubble phenomena.[12] The speculative buying and selling of tulip bulbs in the Netherlands in the 1630s is often cited as a famous example of such a phenomenon. In Japan 350 years later, a modern version of the bubble developed from the latter half of the 1980s to the beginning of 1991, finally resulting in a collapse. The Japanese underwent many austerities to recover from the collapse of this bubble.

However, the term "bubble" is vague in common usage. It is often represented as a superabundant image in comparison with a natural rate considered as a normal, fair, or reasonable rate or price. An asset price bubble would be a divergence from its theoretical (fundamental) value calculated as the present discounted value of its return. Sometimes, it describes a divergent phenomenon from the experiential average. From its original image, it seems ephemeral and is expected to finally explode. The descriptions under "(1) Definition" in Table 5.1 provide examples of lexical explanations.

A collapse of a bubble economy results entirely from (1) endogenous fluctuations in control variables of the expectation potential examined in this study, (2) a policy change to facilitate monetary tightening and interest rate increases, and (3) a negative exogenous shock. An actual slowdown of economic variables results in a social trend of pessimistic views, which consequently provoke wide-ranging financial crises, such as serious declines in stock prices, real estate, and other assets, in addition to a large stock of unrecoverable and nonperforming loans.

Theoretically, a natural rate or order is expected. However, merely referring to its deviation from a specified theory or hypothesis is not convincing. This study has demonstrated the interaction between people's expectations and the operation of an economy while confronting discontinuous catastrophic changes. Referring to the state of social and entrepreneurial expectations displayed in Table 5.1-(3), we can clarify the singularity of the bubble phenomenon.[13]

In Fig. 3.1, the firm's level of expectation $\pi_{e,t}$ depends on a local peak $\hat{\theta}_t$ near the peak of the distribution mountain $\hat{\theta}_{t-1}$, which is used to form $\pi_{e,t-1}$ at the previous time. It does not reflect the size or level of the national scale of expectations ρ_t, the average $\mu_{\theta,t}$, and the variance $\sigma^2_{\theta,t}$ of the social distribution. The firm subjectively forms $\pi_{e,t}$ subject to the lowest local maximum of the distribution $\hat{\theta}_t$, even when it is lower than the average $\mu_{\theta,t}$ and the other local maximum $\theta_{\max,t}$ that may represent public opinion more plausibly. Thus, the firm's misperception resides in the deviation of its perceived meaning from the social structure of expectations due to informational incompleteness. The size of the firm's expectation discrepancy or perception gap, in principle, may be given as follows:

(5.1) $\hat{B}_{1,t} \equiv \pi_e(\hat{\theta}_t) - \pi_e(\mu_{\theta,t})$ or $\hat{B}_{2,t} \equiv \pi_e(\hat{\theta}_t) - \pi_e(\theta_{\max,t})$.

Hereinafter, we call this discrepancy the entrepreneurial expectation gap.

Comparing $\pi_e(\hat{\theta}_t)$ with $\pi_e(\mu_{\theta,t})$ or $\pi_e(\theta_{\max,t})$, we identify a positive or negative gap. In the benchmark example, because $\hat{B}_{j,t} \neq 0$, there are always positive or negative gaps. Specifically, $D_t < 0$ and $\hat{B}_{j,t} < 0$ yields a negative gap, and $D_t < 0$ and $B_{j,t} > 0$ yields a positive gap.

Table 6.1 Economic fluctuation

t	c_1	c_2	$F(\theta)$	μ_θ	σ_θ	D	ρ	$\bar{\theta}$
1	4.0	−6.0	1653.29	−0.061	1.433	2.398	−100.34	−0.77
2	4.0	−4.0	1652.94	−0.041	1.433	1.048	−66.89	−0.70
3	5.0	−2.0	1661.13	−0.020	1.438	0.208	−33.75	−0.64
4	6.0	−1.0	1669.55	−0.010	1.438	−0.041	−17.03	−0.62
5	7.0	0.0	1678.08	0.000	1.444	−0.172	0.00	−0.59
6	8.0	2.0	1686.74	0.021	1.450	0.014	34.67	0.73
7	9.0	4.0	1686.78	0.041	1.455	0.716	69.96	0.83
8	10.0	5.0	1704.64	0.052	1.460	1.188	88.23	0.88
9	11.0	4.6	1713.44	0.048	1.466	0.763	81.90	0.90
10	12.0	4.0	1722.29	0.042	1.472	0.216	71.86	0.91
11	13.0	2.0	1731.10	0.021	1.477	−0.829	36.25	0.87
12	14.0	0.0	1740.13	0.000	1.483	−1.372	0.00	0.84
13	15.0	−3.0	1749.47	−0.032	1.489	−1.080	−55.36	0.74
14	15.0	−7.0	1750.20	−0.074	1.495	1.620	−129.18	−1.04
15	16.0	−8.0	1759.74	−0.085	1.494	2.272	−148.96	−1.08

The zero-gap situation, $\bar{\theta} = \theta_{max}$, satisfies one of the conditions of an economic bubble.[14] Such a bubble may resemble Keynes's beauty contest, broadly considered as a rational bubble. Any bubble accompanies a sudden upward (or downward) jump in entrepreneurial expectation. It is evident that the general economic bubble does not exclude the coexistence of irrational bubbles involving households' transactions in the assets market.

We posit the following propositions:

Proposition 1: *Equality* $\bar{\theta} = \theta_{max}$ *and an upward jump are associated with an economic bubble.*

Proposition 2: *When* $c_1 > 0$ *and the difference* $\theta_{max} - \bar{\theta}$ *approaches zero, the possibility of a positive economic bubble is increased. A larger* c_1 *produces a greater catastrophic jump and a more optimistic bubble.*

In the backdrop of the bubble, there is a socially unified optimistic state of expectations exhibiting a single-peak mountain that experiences a dramatic jump in entrepreneurial expectations. People are awash inflated economic phenomena. However, it is very difficult to foresee and effectively escape its collapse in a healthy manner.

Bubbles should not be treated as a special case. They are natural events produced by the intrinsic operation of our social economy where "money does matter" in the environment of essential uncertainty as many old Keynesians have shared.

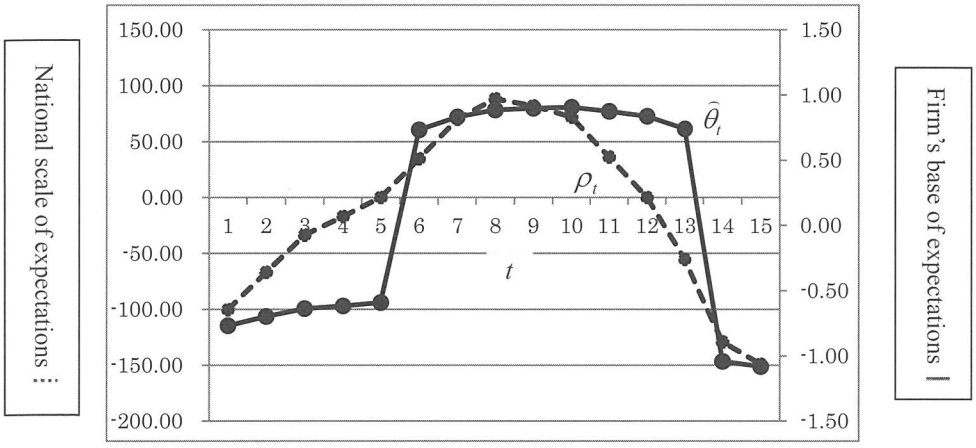


Fig. 6.1 Non-elliptic changes in expectations

VI. Trap of Pessimism

This section describes a different economy from the benchmark case of the elliptic cycle discussed in Section 5. Table 6.1 and Figs. 6.1 and 6.2 depict an economy in a persistently pessimistic state caused by a downward jump that occurs after an upward jump. The operational path of the Japanese economy after 1980 resembles such an upheaval example.

The Japanese economy recovered from the oil shocks and entered a new stage of re-growth in the 1980s. The people had abundant confidence, with significant economic growth. Its re-growth due to fair increases in aggregate demand, including exports, investments, and consumptions, succeeded in solidifying the middle income class. However, in the latter half of the 1980s, this economy was described as a bubble. By around 1989, it exhibited the elements by which a bubble can be identified as defined in this study. Both financial institutions and the mass media encouraged an optimistic behavior toward private households, which strongly influenced the social formation of expectations in that period.

However, many people had a prudent perspective. Even under credit easing, they preferred not to participate in such an optimistic game. Several years later, the bubble economy collapsed amid social criticism of over speculation in many markets. At the end, it recorded a negative growth, which made social expectations pessimistic, enlarged economic differentials[(15)], and fell into a deep trap of unified pessimism.

The Japanese economy did not exhibit an elliptic expectations-driven business cycle. However, accepting any elliptic cycle might result in a downward shift. In the two lost

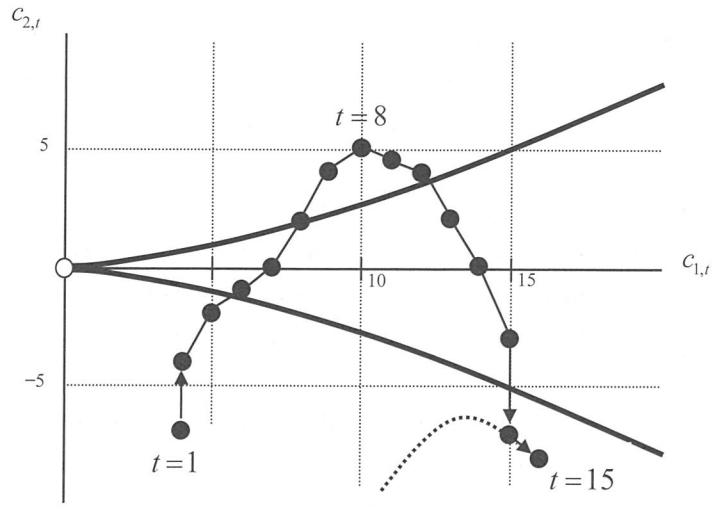


Fig. 6.2 Control surface of the Japanese economy: "Two lost decades"

decades (1991 up until recently), Japan was enveloped by pessimism, under which economic differentials were fixated and the middle class shrank. The Japanese were likely to have fallen into the deep pessimistic trap owing to the combined effects of the earthquake disasters, the Fukushima nuclear power generation accident, and people's distrust of government administration and policies—it caused a further shift toward greater melancholy. As entrepreneurial expectations have been naturally stuck at a very low level, firms' willingness to invest has remained significantly weak despite nominal interest lowering and credit expansion policies.

However, a recent recovery sign in Japan (April 2013) may help the Japanese escape from the deep trap. The so-called "Abenomics" attempts to achieve higher nominal and real economic growth and a solid departure from chronic deflation by relying on these means of flexible fiscal expansion, daringly easing monetary conditions, and feasible growth strategies. For now, this study addresses only concerns about whether the government scheme could send a sufficiently strong message to enable the social state of expectations $v(\theta_t)$ to move to an optimistic position. Although this study does not assume people's rational expectation formation, it supports the probability that they would never be manipulated by long-term policies with no solid foundation.

Ⅶ. Another Policy Perspective

Improvements in living and working conditions and income and asset differentials ease social friction (decrease the splitting factor c_1), and therefore smooth economic fluctuation.

A policy package of anti-deflation, environmental improvement, and reduction of market friction helps increase real economic growth with optimistic expectations (increase in the normal factor c_2). An inflation targeting policy may be acceptable if an increase in prices effectively relieves market friction and raises people's expectations. However, it is true that that stagflation and a bubble cost us dearly.[16]

We regard employment as the most important economic variable; however, advanced countries' unemployment rates currently hover at a high level. In case of an inefficient recovery by traditional demand stimuli, a new social policy should be designed to raise people's expectations.[17] However, such a policy will greatly exceed the conventional scope of economic logic. Such a policy must address these aspects of *raison d'être*: education, technology, taxation, social security, the land and housing system, management labor relations, and the family system.

Some analysts retrospectively investigate the causes of failures. However, their efforts should ideally be used more productively to create a future-oriented design than to criticize the past. Many would be willing to accept a social apparatus based only on a well-grounded stance and belief. Only in such an environment can the Japanese economy expect a pure effect from traditional measures of monetary easing and fiscal expansion, despite large public debts. It is the government's duty to guide the populace toward a hopeful future. Therefore, a credible and trustworthy government is important to meet all conditions. The most inefficient government is one that imposes such severe negative shocks on people's state of expectations that it damages the strategic complementarity of their incentives to communicate, transact, invest, and develop.

The recent CEA reports the right mix of economic policies and leadership in the US, after acknowledging that economics is more appropriately viewed as a "hopeful science" although it has long been called "the dismal science" (CEA, 2013, p. 21).[18] Our implications obtained here are compatible with it. However, a hopeful policy could materialize on the basis of an economic analysis getting out of the spellbinding of "natural law" in the mainstream.

Ⅷ. Concluding Remarks and Future Tasks

I encountered Keynes (1936) forty years ago, specifically in terms of his description on the monetary economy affected by self-fulfilling prophecies about both real and monetary variables. Distinguishing between *enterprise* and *speculation*, he predicted that the risk of the predominance of the latter would increase. Having lived through the two "lost decades" in Japan and observing world cyclical movements, I reconfirm how insightful Keynes's prediction was. However, it has provoked some economists to argue

an underpinning framework of secular business cycles driven by human psychological expectations, the nature of which causes drastic economic changes to their paths.

In this study, the leading economic variable is the state of expectations. Its dynamic formation evolves catastrophic changes subject to movements in the normal and splitting factors adapting to environmental changes, which can explain discontinuous changes in entrepreneurs' animal spirits. A specified state of social and entrepreneurial expectations is another necessary condition for a bubble. This study clarified qualitative conditions that ensnared the Japanese economy in a pessimistic trap.

Several issues can be taken up as topics for discussion. First, we must examine firms' direct effect on the social formation of expectations because firms are not always passive in this interaction. Second, this study lacks a microfoundation on how a member of society forms his expectations. An individual must interact with others and reflect the influences of the media and the government.[19] Third, this study neither describes the details of how expectations influence economic decisions, nor explains what social conditions affect the formation of expectations or how they do so. We must construct an economic system involving micro and macro endogenous expectation variables. Finally, an econometric study is required to test the specified causalities. In general, any future economic study should integrate related sciences such as sociology, psychology, and political science.

Although expectation variables appear in many economic analyses, their treatments are largely mechanical. Despite our attempts to make them explicitly endogenous, such trials have sometimes forced economists to defend themselves against being sneered at as "ad hoc" or "non-academic" for lacking rigor and departing from the accepted practice. Nevertheless, human society, in which people must work toward the future, could be approached effectively by applying the commonly used term "expectations." The current prolonged economic stagnation following a financial crisis requires a more urgent consideration of the role of expectations than in the Keynesian era.

Notes

* For useful comments and suggestions, I would like to thank Prof. Akira Tsutsumi, Toshihiro Tsuchihashi, Eiji Tsuzuki, and seminar participants at the Institute of Economic Research, Daito Bunka University.

(1) Keynes's insights on multiplier and self-fulfilling prophetic under-equilibrium were restated by a version of new Keynesian models including Diamond (1982), Cooper and John (1988), Woodford (1988), and Howitt and McAfee (1992), providing the concepts of coordination failures, strategic complementarity or externalities, sunspots, and multiple equilibria. However, they do not overly emphasize how Keynes's "animal spirits" are formed endogenously.

(2) Expectation formation theory has not attracted attention from theoretical economics oriented toward

the natural sciences. However, we can look forward to its deployment in various ways in recent studies on behavioral economics (Camerer and Loewnstein, 2004; Akerlof, 2007).

(3) For these discussions including the environmental Kuznets curve, see Meadows et al. (1992), Grossman and Krueger (1995), Dasgupta et al. (2002), and Japan Cabinet Office (Chap. 3-Section 4, 2007).

(4) Thom (1975), a topologist, has represented the catastrophe theory that may be defined as a qualitative mathematical model of discontinuous phenomena subject to the categories of mapped singularities. Subject to the number of control elements he called the seven basic catastrophe forms; fold, cusp, swallowtail, butterfly, hyperbolic umbilic, elliptic umbilic, and parabolic umbilic. Cusp catastrophic phenomena are deduced from the social distribution of expectations with two control variables in this study. Noguchi (1973) demonstrates the advantage of a graphical approach to capture the qualitative characteristic of social phenomena rather than depending on differential equations with too many variables.

(5) A Keynesian recovery attempted by Howitt (1990) stresses coordination problems beyond mere price adjustments. A firm's decision on investment often entails its prospect of market creation. Howitt simultaneously suggested a Schumpeterian recovery. A Schumpeterian firm is not myopic.

(6) According to Key (1961), public opinion is the citizens' view that the ruler interprets, considering himself as clever. However, the ruler is not only a machine calculating citizens' value judgments. He always seeks to lead public opinion. A firm is not the ruler; however, the desire for opinion leadership exists even in a firm because it wants to increase profits. It is profitable for business firms, not to mention the government, to lead the mass media, which itself manipulates public opinion explicitly and implicitly.

(7) In this study, it is important to confirm whether the mountain-type distribution has a single peak or has double peaks. The kurtosis and height of the distribution are not included in the scope of this study.

(8) Explaining the law of "delay," Zeeman and Noguchi (1974) stress these elements of reasons: (1) lack of information, (2) intuition, (3) sociological pressure, (4) inertia, and (5) history. This explanation implies that people would rather seek local maximization than overall maximization. Their behavioral criterion is to step forward to a better position than the present. This principle is consistent with firm agents' behaviors assumed under the bounded rationality in this study. Also see Zeeman (1974).

(9) Interestingly, Keynes states, "A conventional valuation which is established as the outcome of the mass psychology of a large number of ignorant individuals is liable to change violently as the result of a sudden fluctuation of opinion due to factors which do not really make much difference to the prospective yield; since there will be no strong roots of conviction to hold it steady. In abnormal times in particular, when the hypothesis of an indefinite continuance of the existing state of affairs is less plausible than usual even though there are no express grounds to anticipate a definite change, the market will be subject to waves of optimistic and pessimistic sentiment, which are unreasoning and yet in a sense legitimate where no solid basis exists for a reasonable calculation" (Keynes, 1936, p. 154).

(10) This shift case follows that $(c_{1,t}-\vartheta_1)^2/r_1^2+(c_{2,t}-\vartheta_2)^2/r_2^2=1$, $\vartheta_1>\vartheta$, and $\vartheta_2>0$.

(11) When specifically explaining an increase in $F(\theta_t)$, it may be interpreted that the number of agents forming expectations would increase because a more divided state encourages more people to participate in society to express their own opinions.

(12) See Rosser (2000) for a comprehensive discussion on speculative bubbles and discontinuities of economic fluctuations, including chaotic approaches.

(13) In this regard, we are likely to consider the unified state of bullishness or bearishness as a bubble.

However, it may be the true state reflecting people's rational expectations. Indeed, it is too simplistic to judge the continued rise of asset prices to be an "asset bubble." (Garber, 1989).

(14) A positive gap is not necessarily linked directly with a positive rational bubble because a pessimistic state may develop in the society even while the firm's willingness for production and investment is strong. An analogy may exist for a negative gap. Because entrepreneurial expectations do not reflect that of the whole society, they cannot represent the social state.

(15) It is recently observed that economic differentials swell regardless of growth in advanced countries (Goodman and Oldfield, 2004; Japan Cabinet Office, 2007). Also see Stiglitz (2012) for the current US.

(16) Expectations of rising future prices could yield intertemporal substitution, wealth, and income effects. Knowing that inflation was historically another friction for society, in the present Japanese economy, to combat deflation, wage hikes and the expected depreciation of the yen may be essential.

(17) If a bubble acts on the banking market function and the supply side, and to promote the accumulation of capital and economic growth, it may be rational to take political measures, such that the government pulls back to bubble equilibrium for an expectation psychology shock to break the bubble (Carvalho, Martin, and Ventura, 2012). However, the persistence (as well as accepting) of bubbles will result in aftereffects in the society. The government must be cautious of a bubble and in the event of which, must minimize the damages; however, it probably cannot control the creation and ensuing devastation of a bubble.

(18) It "can help a country to recover from a deep recession and point to the investments and reforms that will build a stronger, more stable, and more prosperous economy that works for the middle class. Conversely, government dysfunction or misguided fiscal policy can cause self-inflicted wounds to the economy" (CEA, 2013, p. 21).

(19) In self-feasibility, expectations of the person himself, other persons, and neighboring expectations may affect personal demeanor behavior (Rosenthal, 1974).

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