Myopic Expectation and Production Fluctuation

by

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Abstract

This paper applies an overlapping generations model to analyse the production fluctuation. A small economy with one asset market and one product market faces external shocks. The production level will have larger fluctuation under myopic behaviour on the asset market if the people do not have information on the future prices. One implication of the result is that a financial crisis such as the sudden short-term capital outflows in the Asian economies may be due to myopic behaviour which may be a rule under uncertainty. This paper also supports the argument that the Asian financial crisis is due to creditor panics which can be interpreted as myopic behaviour.

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1. Introduction

As Sachs (1998) reported, there had been ten cases of significant changes in capital inflows and outflows in the past four years. But the current Asian financial crisis gets much more attention. The first reason is that the crisis happened in an area with the highest economic growth in the past two decades. The second reason is that the effect has become deeper in the Asia region and the financial crisis already spread outside Asia, e.g. Russia and South Africa were also hurt.

According to Wong's (1998) suggestion, the start of the Asian financial crisis was on July 2, 1997 after the Bank of Thailand failed to defend baht. The crisis became widespread after a drop of 23% of the Hong Kong Hand Seng Index from October 20 to October 23, 1997. The affected economies at least include Hong Kong, Indonesia, Malaysia, the Philippines, Singapore, South Korea and Taiwan.

One serious result of the financial crisis in the affected Asian economies is that the real production also dropped very fast following the sudden outflows of capital. For example, the Hong Kong GDP growth slowed down from +5.7% in the 3rd quarter of 1997 to +2.7% in the 4th quarter, further to negative growth of -2.8% in the 1st quarter of 1998, and even -5.2% in the 2nd quarter of 1998. The trends are similar for the other economies, Malaysia: +7.4%, +6.9%, -1.8% and -6.8%; the Philippines: +4.9%, +4.7%, +1.7%, and -1.2%; Singapore: +10.1%, +7.4%, +5.6%, and +1.6%; South Korea: +6.3%, +3.9%, -3.8%, and -6.6%; Taiwan: +6.9%, +7.1%, +5.9%, and +5.2%. Thailand's annual growth rate dropped from +6.7% in 1996 to -0.4% in 1997. The Indonesia declined the most among all the economies: from annual growth rate of +6.6% in 1997 to -6.2% in the 1st quarter of 1998 and even -16.5% in the 2nd quarter (*The Economists*, various issues).

As far as we know, the arguments on the big slump of the economies in East and Southeast Asia can be grouped into two main streams. The first stream is based on a mistake of the deviation from fundamentals. Krugman (1998) may be the first one to use a formal model to explain the Asian financial crisis. Krugman argues that in face of government guarantees for supporting liabilities, there are moral hazards that the financial intermediaries overinvest and the price of fixed assets will rise excessively.

Krugman's argument is related to the literature of bubbles. Tirole (1982) shows that bubbles (in which asset prices deviate from fundamentals) in finite horizons are not consistent with rational expectation. Santos and Woodford (1997) point out that asset-pricing bubbles do exist only under special circumstances that the economy is not sufficiently productive (i.e. the aggregate endowment is not bounded by a portfolio trading plan). Allen and Gale (1998) develop a model to explain the appearance of asset-pricing bubbles from the viewpoint of asymmetric information between lenders and borrowers.

The other stream of thinking is that the financial crisis is due to unknown situation under uncertainty. One representative idea is the appearance of creditor panics (Radelet and Sachs, 1998 and Sachs, 1998). The short-term creditors move out of the market in a large scale following a trigger point of price falling such as exchange rate devaluation and then the asset market devaluation is overshot. The idea can be traced back to Diamond and Dybvig (1983) which argue that bank failures may lead to panics of withdrawing credits. The result is a reduction of production, which can be a lower equilibrium level.

It is difficult to understand creditor panics from the viewpoint of rational expectation. Actually, the short-term capital investors may not be based on fundamentals for their investment decisions. Some investment advisors tell the individual investors not to worry about technical analysis on fundamentals (for example, Malkiel, 1990). There is evident that the asset markets have fluctuations larger than movements of fundamentals (for example, Wong, 1995 and Choe et al., 1998). Orosel (1998) uses an overlapping generations model to show that with fixed participation costs, the investors more likely participate in asset markets when the price is rising and less likely participate when the price is falling. This will lead to larger price fluctuation. Herd behaviour is one of the explanations for the asset price fluctuations. Scharfstein and Stein (1990) show that under uncertainty, the investment managers may follow others' decisions such that they can share the blame of mistakes in order to avoid ruin of reputation. If there are short-term speculations, the investors may tend to use only one source of information and the information may not be related to fundamentals (Froot et al., 1992). Banerjee (1992) argues that if some agents have less information than others, a randomly first mover may lead the behaviours of others against the their own information. All these models on herd behaviours are consistent to rational behaviours.

We try to develop a simple overlapping generations model to show that myopic behaviour can lead to larger production fluctuation compared with rational expectation. The rationale of myopic behaviour is related to herd behaviour. For example, if an agent has no information about the future price, a simple decision is to predict that the price in the ext period is equal to present price. Once an agent adopts myopic expectation, the other agents follow as herd behaviour. This model setting aims to focus on production fluctuation rather than asset price fluctuation. Thus the return from the asset market is directly related to the product market. Compared with the rational expectation which the agents have information on the future prices, the production fluctuation is larger. The implication of myopic behaviour is that the argument of creditor panic is closer to the fact of lack of information.

2. Model

Consider a country, Country H, which has a population of 2N at any period. There are two cohorts in each period. Each cohort includes N individuals and each individual has a life span of two periods. Each individual of cohort t has an endowment of m unit of capital in period t and the individual has to determine the amount of immediate consumption and investment in period t. The consumption in period t+1 comes from the investment. All individuals are identical and a represented individual born in period t has a utility function as below:

$$u_{ti} = [(c_{ti}^{1})^{\alpha} + \gamma(c_{t+1,i}^{2})^{\alpha}]^{1/\alpha} \qquad (1)$$

where u_{ti} is utility of individual i of cohort t, i = 1,…, N; c_{ti}^{1} is consumption of good X of cohort-t individual i at the 1st period (period t), i = 1,…, N; $c_{t+1,i}^{2}$ is consumption of cohort-t individual i at the 2nd period (period t+1), i = 1,…, N; α represents the preference extent and γ is time discount factor with $0<\alpha<1$ and $0<\gamma<1$. The consumption is subject to marginal diminished utility and a represented individual has preference of earlier consumption.

Countries H only produces one good, good X, with capital the only factor of production. 1 unit of capital is required for producing 1 unit of good X. The domestic consumption is financed by the central bank and the central bank does not make any profit. Thus the domestic price is equal to 1 unit of capital. Country H also exports good X to abroad in exchange back of capital. The central bank does not contribute any finance for exports and it is up to the private sector investing in exports. An individual has to determine the investment amount one period before. The individual gets back all returns in the next period for consumption. It is assumed that Country H is a small country. Thus Country H does not affect the world price of good X and it is able to export any amount. The world price is uncertain with either a high price P^H or a low price P^L, $P^H > P^L > 1$. The return rate of every unit of capital invested in period t is therefore equal to $(1+r_{t+1})$, $r_{t+1}>0$. Let s_{ti} be investment of cohort-t individual i in period t and X_{t+1}^E be total exports of good X in period t+1. Because all individuals are identical, the return of s_{ti} is equal to:

$$(1+r_{t+1})s_{ti} = 1/N\,(P_{t+1}X_{t+1}^E). \qquad (2)$$

Since each unit of capital is able to produce 1 unit of good X and there are N individuals per cohort, $Ns_{ti} = X_{t+1}^E$ and thus

$$1+r_{t+1} = P_{t+1}. \tag{3}$$

A cohort-t individual determines the amount of investment in the 1st survival period (period t) and the consumption in the 2nd period comes from the returns of investment. The income constraint of cohort-t individual i in period t and period t+1 are as follows:

$$m - s_{ti} = c_{ti}^{1} \tag{4}$$

$$(1+r_{t+1})s_{ti} = c_{t+1,i}^{2} \tag{5}$$

Because all individuals are identical, we will not put down the notation i in the later equations for simplification. Let X_t be the total production of good X in Country H at period t. The equilibrium output is:

$$X_t = Nc_t^1 + Nc_t^2 + X_t^E. \tag{6}$$

c_t^1 is consumption of a cohort-t individual in period t; c_{ti}^2 is consumption of a cohort-(t-1) individual in period t. The international trade is balanced with exporting X_t^E units of good X in return of $P_tX_t^E$ units of capital.

3. Equilibrium Conditions

Because the decision of investment is one period before the production, the amount of S_t is dependent on a cohort-t individual's expected price in period t+1: $E(P_{t+1})$. A cohort-t individual plans to maximize the utility function (1) subject to the income constraints (4) and (5) with an expected return $[1+ E(r_{t+1})]$ of each unit of capital invested. Thus the expected total return of a cohort-t individual is:

$$(1+E(r_{t+1}))S_t = 1/N\,(E(P_{t+1})X_{t+1}^{E}). \qquad (2')$$

Accordingly, a cohort-t individual considers the utility as a function of c_t^1 and $E(c_{t+1}^2)$:

$$u_{ti} = [(c_t^1)^{\alpha} + \gamma(E(c_{t+1}^2))^{\alpha}]^{1/\alpha} \qquad (1')$$

where the income constraint in the 2nd survival period is expected as:

$$(1+E(r_{t+1}))s_t = E(c_{t+1}^2) \qquad (5')$$

From the first-order conditions of the constrained utility maximization, we get the equilibrium c_t^1, $E(c_{t+1}^2)$ and s_t as:

$$c_t^1 = \frac{m}{1+\gamma^{\frac{1}{1-\alpha}}(E(P_{t+1}))^{\frac{\alpha}{1-\alpha}}} \qquad (7)$$

$$E(c_{t+1}^2) = \frac{(\gamma E(P_{t+1}))^{\frac{1}{1-\alpha}} m}{1+\gamma^{\frac{1}{1-\alpha}}(E(P_{t+1}))^{\frac{\alpha}{1-\alpha}}} \qquad (8)$$

$$s_t = \frac{\gamma^{\frac{1}{1-\alpha}}(E(P_{t+1}))^{\frac{\alpha}{1-\alpha}} m}{1+\gamma^{\frac{1}{1-\alpha}}(E(P_{t+1}))^{\frac{\alpha}{1-\alpha}}} \qquad (9)$$

The values of c_t^1, $E(c_{t+1}^2)$ and s_t are dependent on $E(P_{t+1})$. In period t, the consumption of an cohort-(t-1) individual is certain and then from (3), (5) and (9), c_t^2 is:

$$c_t^2 = \frac{\gamma^{\frac{1}{1-\alpha}}(E(P_t))^{\frac{\alpha}{1-\alpha}} P_t m}{1 + \gamma^{\frac{1}{1-\alpha}}(E(P_t))^{\frac{\alpha}{1-\alpha}}} \tag{8'}$$

Since (7)and (9) are functions of $E(P_{t+1})$ and (8') is function of P_t and $E(P_t)$, the total production of good X in period t, equation (6), is function of P_t, $E(P_t)$ and $E(P_{t+1})$. The expectation of the price is the critical factor for the output level.

Getting the first derivative of (7) in respect to $E(P_{t+1})$, it is straight-forward to find out that the change of c_t^1 is strictly negative to an increment of $E(P_{t+1})$. It simply follows that the change of s_t is strictly positive to an increment of $E(P_{t+1})$ from (4). A higher expected price in period t+1 leads the people to consume less in period t. The investment is larger in respect to a higher expected price next period. The change of $E(c_{t+1}^2)$ is strictly positive in respect to an increment of $E(P_{t+1})$ following (3) and (5). The intuition is that when the expected price is higher, the expected return is also higher. Thus the expected higher consumption in the next period is able to compensate for the lower consumption in the current period.

4. Production Fluctuation under Rational Expectation

At first, assume that all individuals have the information that P^H has a chance of β, $0<\beta<1$, and P^L has a chance of $(1-\beta)$, $0<\beta<1$, and each individual is risk-neutral. A cohort-t individual determines his or her investment under rational expectation:

$$E(P_{t+1}) = \beta P^H + (1-\beta)P^L = P^R \tag{10}$$

From (10), it is obvious that the expected price is the same in any time: $E(P_t) = E(P_{t+1}) = P^R$, $P^H > P^R > P^L$. As P^R is given, the total production function (6) is dependent on P_t only. The total production is affect by whether the current price is high or low:

(i) $P_t = P^H$

$$X_R^H = Nm\left(1 + \frac{\gamma^{\frac{1}{1-\alpha}}(P^R)^{\frac{\alpha}{1-\alpha}}P^H}{1 + \gamma^{\frac{1}{1-\alpha}}(P^R)^{\frac{\alpha}{1-\alpha}}}\right) \tag{11}$$

(ii) $P_t = P^L$

$$X_R^L = Nm\left(1 + \frac{\gamma^{\frac{1}{1-\alpha}}(P^R)^{\frac{\alpha}{1-\alpha}}P^L}{1 + \gamma^{\frac{1}{1-\alpha}}(P^R)^{\frac{\alpha}{1-\alpha}}}\right) \tag{12}$$

It is obvious that $X_R^H > X_R^L$ as proved by using (11) and (12):

$$X_R^H - X_R^L = Nm\left[\frac{\gamma^{\frac{1}{1-\alpha}}(P^R)^{\frac{\alpha}{1-\alpha}}(P^H - P^L)}{1 + \gamma^{\frac{1}{1-\alpha}}(P^R)^{\frac{\alpha}{1-\alpha}}}\right] > 0$$

The production fluctuates between "good" environment (i.e. high price, $P_t = P^H$) and "bad" environment (i.e. low price, $P_t = P^L$) periodically under rational expectation. The production is larger under "good" environment.

5. Production Fluctuation under Myopic Expectation

Next, suppose the people do not know the possibilities of future price level and all predict the price in the next period the same as the present one. In other words, a cohort-t individual expect the price in period t+1 equal to the price in period t:

$$E(P_{t+1}) = P_t. \tag{13}$$

From (6) and (13), the total production function is a function of P_{t-1} and P_t. There are altogether four possibilities of the output level:

(i) $P_{t-1} = P^H$ *and* $P_{t-1} = P^H$

$$X_M^{HH} = Nm\left(1 + \frac{\gamma^{\frac{1}{1-\alpha}}(P^H)^{\frac{1}{1-\alpha}}}{1+\gamma^{\frac{1}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}}\right) \tag{14}$$

(ii) $P_{t-1} = P^L$ *and* $P_{t-1} = P^L$

$$X_M^{LL} = Nm\left(1 + \frac{\gamma^{\frac{1}{1-\alpha}}(P^L)^{\frac{1}{1-\alpha}}}{1+\gamma^{\frac{1}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}}\right) \tag{15}$$

(iii) $P_{t-1} = P^H$ *and* $P_{t-1} = P^L$

$$X_M^{HL} = Nm\left[\frac{1}{1+\gamma^{\frac{1}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}} + \frac{\gamma^{\frac{1}{1-\alpha}}(P^H)^{\frac{1}{1-\alpha}}}{1+\gamma^{\frac{1}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}}\left(1+P^L\right)\right] \tag{16}$$

(iv) $P_{t-1} = P^L$ *and* $P_{t-1} = P^H$

$$X_M^{LH} = Nm\left[\frac{1}{1+\gamma^{\frac{1}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}} + \frac{\gamma^{\frac{1}{1-\alpha}}(P^L)^{\frac{1}{1-\alpha}}}{1+\gamma^{\frac{1}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}}\left(1+P^H\right)\right] \tag{17}$$

Case (i) is the situation that the "good" environment has been prevailing for two continuous periods. Case (ii) is the situation that "bad" environment has been lasting for two consecutive periods. Case (iii) refers to a sliding down economy while case (iv) means a uprising economy. Comparing case (i) and case (ii), the difference between "good" environment and "bad" environment, we get $X_M^{HH} > X_M^{LL}$ from (14) and (15):

(a) Case (i) versus case (ii)

$$X_M^{HH} - X_M^{LL} =$$

$$Nm\left[\frac{\gamma^{\frac{1}{1-\alpha}}\left((P^H)^{\frac{1}{1-\alpha}} - (P^L)^{\frac{1}{1-\alpha}}\right) + \gamma^{\frac{2}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}(P^H - P^L)}{\left(1+\gamma^{\frac{1}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}\right)\left(1+\gamma^{\frac{1}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}\right)}\right] > 0$$

The other comparisons among the different cases are:

(b) Case (i) versus case (iii)

$$X_M^{HH} - X_M^{HL} =$$

$$Nm\left(\frac{\gamma^{\frac{1}{1-\alpha}}\left[(P^L)^{\frac{\alpha}{1-\alpha}} + (P^H)^{\frac{\alpha}{1-\alpha}}\left(P^H - P^L - 1\right)\right] + \gamma^{\frac{2}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}(P^H - P^L)}{\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}\right)\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}\right)}\right) > or < 0$$

(c) Case (i) versus case (iv)

$$X_M^{HH} - X_M^{LH} =$$

$$Nm\left[\frac{\gamma^{\frac{1}{1-\alpha}}\left((P^H)^{\frac{\alpha}{1-\alpha}} - (P^L)^{\frac{\alpha}{1-\alpha}}\right)\left(P^H + 1\right)}{\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}\right)\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}\right)}\right] > 0$$

(d) Case (ii) versus case (iii)

$$X_M^{LL} - X_M^{HL} =$$

$$Nm\left[\frac{\gamma^{\frac{1}{1-\alpha}}\left((P^L)^{\frac{\alpha}{1-\alpha}} - (P^H)^{\frac{\alpha}{1-\alpha}}\right)\left(P^L + 1\right)}{\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}\right)\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}\right)}\right] < 0$$

(e) Case (ii) versus case (iv)

$$X_M^{LL} - X_M^{HL} =$$

$$Nm\left(\frac{\gamma^{\frac{1}{1-\alpha}}\left[(P^H)^{\frac{\alpha}{1-\alpha}} + (P^L)^{\frac{\alpha}{1-\alpha}}\left(P^L - P^H - 1\right)\right] + \gamma^{\frac{2}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}(P^L - P^H)}{\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}\right)\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}\right)}\right) < 0$$

(f) Case (iii) versus case (iv)

$$X_M^{HL} - X_M^{LH} =$$

$$Nm\left[\frac{\gamma^{\frac{1}{1-\alpha}}\left(2 - (P^H)^{\frac{\alpha}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}\right)\left((P^H)^{\frac{\alpha}{1-\alpha}} - (P^L)^{\frac{\alpha}{1-\alpha}}\right) + \gamma^{\frac{2}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}(P^L - P^H)}{\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}\right)\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}\right)}\right] > or < 0$$

It is not surprising that X_M^{LL} is the smallest among all cases. What is surprising is that X_M^{HH} may not be the largest. It is possible that X_M^{HL} is the largest if P^H-P^L is small enough from the comparison (b):

$$X_M^{HH} < X_M^{HL} \Rightarrow$$

$$P^H - P^L < 1 - \left(\frac{P^L}{P^H}\right)^{\frac{\alpha}{1-\alpha}} - \gamma^{\frac{1}{1-\alpha}}(P^H)^{\frac{\alpha}{1-\alpha}}(P^L)^{\frac{\alpha}{1-\alpha}}\left((P^H)^{\frac{1}{1-\alpha}} - (P^L)^{\frac{1}{1-\alpha}}\right)$$

It means that the production is the smallest during "bad" environment (X_M^{LL}); however, the production need not be the largest during "good" environment (X_M^{HH}). If the difference between "good" condition (i.e. P^H) and "bad" condition (i.e. P^L) is small, a sliding economy (X_M^{HL}) has even a higher production level.

6. Production Comparison between Rational Expectation and Myopic Expectation

It is interesting to compare the "good" environments between rational expectation and myopic expectation and "bad" environments between the two types of expectation. Comparing (11) and (14), we have:

$$X_M^{HH} - X_R^{H} = \frac{NmP^{H}\gamma^{\frac{1}{1-\alpha}}\left((P^{H})^{\frac{\alpha}{1-\alpha}} - (P^{R})^{\frac{\alpha}{1-\alpha}}\right)}{\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^{H})^{\frac{\alpha}{1-\alpha}}\right)\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^{R})^{\frac{\alpha}{1-\alpha}}\right)} > 0$$

Comparing (12) and (15), we have:

$$X_M^{LL} - X_R^{L} = \frac{NmP^{L}\gamma^{\frac{1}{1-\alpha}}\left((P^{L})^{\frac{\alpha}{1-\alpha}} - (P^{R})^{\frac{\alpha}{1-\alpha}}\right)}{\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^{L})^{\frac{\alpha}{1-\alpha}}\right)\left(1 + \gamma^{\frac{1}{1-\alpha}}(P^{R})^{\frac{\alpha}{1-\alpha}}\right)} < 0$$

If there is "good" environment, the production level is higher under myopic expectation rather than under rational expectation. If there is "bad" environment, the production level is lower under myopic expectation. In summary, $X_M^{HH} > X_R^{H} > X_R^{L} > X_M^{LL}$. The production fluctuation is larger under myopic expectation.

7. Concluding Remarks

This paper applies a very simple overlapping generations model to show that myopic behaviour leads to larger production fluctuation. This model supports the argument of creditor panics (Radelet and Sachs, 1998 and Sachs, 1998) if the people do not have information on the future price, which is usually the case in the real world. The policy implication is that the government should restore the investors' confidence in a crisis such as the current Asian financial crisis. Fundamental reforms may be important but these can be out of the mark and then economic recession can be lasted for longer period.

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