Margin Trading and Misadjustment in the Open Economy

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ABSTRACT

This paper probes into the effect of margin trading in the open economy. Based on the model of Blanchard (1981), taking the financial behavior of buying on margin into account in the stock market and endowing extension with the open economy, this paper analyzes the effect of the financing operation on the domestic stock price and the exchange rate. It finds that when the capital is relatively immobile, the expected increasing financing ratio and the stock price may appear to be misadjustment, which is greatly attributed to the capital mobility. The source of exogenous shocks plays a very important role in the occurrence of the misadjustment in the economic variables.

Keywords: Misadjustment, Margin trading, Financing ratio

INTRODUCTION

Exchange rate fluctuation directly influences the performance of one country’s import and export. Too substantially changes between appreciation and depreciation will result in the difficult existence of the import-export manufacturers because of the foreign exchange losses and the falling competitiveness. Thus the stability maintenance of the foreign exchange market has always been an important scheme for the authority. Aoki (1985) slightly modified the model of Dornbusch (1976), and researched into the relation between the expected productive disturbance and the dynamic adjustment of the exchange rate based on the assumption of instantaneous adjustment of prices. In the model with the characters of global instability, he found that there are contrasting reactions of the exchange rate in the long term and short term, with the exchange rate more greatly deviating from the equilibrium in the long-term, which was called by him as misadjustment.

Blanchard (1981) brought the stock market into the model to extend the traditional IS-LM Model, by which he probed into the dynamic impacts of the expected and unexpected expansionary monetary and fiscal policies on the output and stock market, showing the motility between the output and the stock market.

Margin trading is that the investor purchases stocks by financing a proportion of money to brokers, with holding their own capital as the warrant. Short sale is that the investor finances and sells the stocks to the financial credit institutions with holding their own capital as the warrant. These two ways have close connection with each other. Generally speaking, margin buying shows the increasing demand of the stocks, which will lead to the increase of the stock price; as for the short sale, it reveals the increase in the stock supply, the investor use the short sales to short the stocks to produce selling, which will spur the dropping of the share price. The margin trading and the short sale can be called as two sizes of an organic whole. Short sale also has more restricted. In consideration of the importance of the margin trading superior to the short sales in the stock market, namely, the homogeneity between these two kinds, for the sake of brevity, this paper will begin with the financing behavior, to discuss how buying on margin influence the open economy.

The reason from general laws is the adjustment behavior of exchange rate can not be interpreted satisfactorily by the available models, which is attributed to the leaving out of the stock market closely related to the foreign exchange market in the traditional adjustment documents of exchange rate. Therefore, this paper brings the stock market into the open economy system, takes the existence of margin trading into account more comprehensively.

THE MODEL

Extend the Blanchard (1981) framework to a small open economy under floating exchange rate, and bring the financing behavior into the stock market. It consists of the following four equations:
\[ \ddot{Y} = C(\dot{Y}) + I(Q) + G + T(EP'/P, \dot{Y}) \]  
(1)

\[ L(\dot{Y}, r) = M/P \]  
(2)

\[ (1 - \alpha)(1 + r) - 1 = \beta \dot{Y}/Q + Q/\dot{Q} - \alpha r' \]  
(3)

\[ T(EP'/P, \dot{Y}) + K(r - r' - E/E) = 0 \]  
(4)

The variables are defined as follows: \( \ddot{Y} \) = full-employment output, \( C \) = consumption, \( I \) = investment, \( G \) = government spending, \( T \) = net exports, \( Q \) = stock price, \( E \) = exchange rate (defined as the domestic currency price of foreign currency), \( P' \) = foreign price level, \( P \) = domestic price level, \( L \) = real money demand, \( M \) = nominal money supply, \( r \) = domestic interest rate, \( \alpha \) = financing ratio, \( \beta \) = the output share that the Equity owners can assign, \( r' \) = financing interest rate (margin rate), \( K \) = net capital inflows, \( r' \) = foreign exchange rate, \( X = dX/dt \) and \( t \) refers to time, among which, \( I_0 = \partial I/\partial Q > 0 \), let \( \varepsilon = EP'/P \), \( T_e = \partial T/\partial \varepsilon > 0 \), \( L_e = \partial L/\partial \varepsilon < 0 \), let \( \Delta = r - r' - E/E \), \( K_\alpha = \partial K/\partial \Delta > 0 \).

Suppose that the economy is at full employment with flexible wage. The speed of adjustment of the price in the goods market is infinite. Due to the instantaneous adjustment of prices, the domestic prices are freely flexible to maintain the goods market in equilibrium at all times. The international capital is immobile. Except the currency, the domestic people own other three assets: domestic stocks, domestic bonds and foreign bonds, moreover, domestic stocks and domestic bonds are perfect substitutes, while the domestic bonds and foreign bonds are imperfect substitutes. The model is under perfect foresight expectations. Equation (1) is used to define the equilibrium of the goods market, and \( T_i > 0 \) indicates the Marshall-Lerner condition holds. Equation (2) is the standard equilibrium for the money market. Equation (3) sets that the bond return is equal to the stock return. Equation (4) is the foreign exchange market equilibrium.

Solve Equations (1) and (2) by simultaneous total differential, the reduced form of stock price and interest rate can be obtained, and substitute it into the result got from the total differential of Equations (3) and (4), in this way, the dynamic adjustment of simultaneous equations of stock price and exchange rate:

\[ Q = F(Q, E, M, G, \alpha, r', P') \]  
(5)

\[ E = Jt(Q, E, M, G, r', P') \]  
(6)

, among which, \( J_0 \) represents the degree of capital mobility. Capital is relatively immobile when \( J_0 < 0 \), and capital is relatively mobile when \( J_0 > 0 \). From the Equation (7) two eigenvalues of the dynamic system, \( \lambda_1 \) and \( \lambda_2 \), are both positive. The system is associated with the feature of global instability.

\[ \lambda_1 + \lambda_2 = F_0 + J_E > 0 \]  
(7a)

\[ \lambda_1 \lambda_2 = F_0 J_E - J_0 F_E > 0 \]  
(7b)

The general solution of the stock price and exchange rate are:

\[ Q = Q(G, \alpha, r', r^*) + A_1 e^{\lambda_1} + A_2 e^{\lambda_2} \]  
(8)

\[ E = E(M, G, \alpha, r', r^', P') + (\lambda_1 - F_0)/F_E \times A_1 e^{\lambda_1} + (\lambda_2 - F_0)/F_E \times A_2 e^{\lambda_2} \]  
(9)

\( \dot{Q} \) and \( \ddot{E} \) in Equations (8) and (9) respectively represent the long-run values of stock price and exchange rate, while \( A_1 \) and \( A_2 \) are unknown parameters.

We can find from Equation (8) that monetary policy does not influence the long-run equilibrium of the stock price, this conclusion that monetary policy is ineffective differs from that of Blanchard (1981). This is probably attributed to the fix of output at full employment level. The increase of currency supply could have been driven the output increase, and further forced the stock price up through the dividend effect, however, the output rigidity lead to the inexistence of dividend effect, cutting off the connection with the stock market, and finally giving rise to the ineffectiveness of the monetary policy. Nevertheless, expansionary fiscal policy decreases the stock price. The increase of government spending produces excess demand, to maintain the equilibrium of the goods market, the goods price will increase, this
likewise lead to the excess demand in the money market, whose equilibrium at this moment, will be maintained through the increase of the interest rate, which however, will increase the capital cost, thus the stock price decrease is caused, hereby the dividend effect does not exist, only leaving interest effect, just as the result of expansionary fiscal policy, one of the situations of Blanchard (1981) bad news that the interest effect is greater than the dividend effect. The increase of financing ratio enables the investors to buy more stocks, stimulate the stock market buying and create the increasing of the stock price, by using higher leverage. The effect of financing ratio on the exchange rate, however, should depend on the degree of capital mobility.

Use the phase diagram of Dornbusch (1976) to describe the dynamic characters of the economy. We can get the slopes of $Q = 0$ and $E = 0$ respectively from Equations (5) and (6).

$$\frac{\partial Q}{\partial E}\bigg|_{Q=0} = -\frac{F_e}{F_q} < 0$$  \hspace{1cm} (10)

$$\frac{\partial Q}{\partial E}\bigg|_{E=0} = -\frac{J_e}{J_q} \cdot 0 \quad \text{if } J_q < 0$$  \hspace{1cm} (11)

When the capital mobility is relatively high, the slope of locus $E = 0$ is negative, and the line $E = 0$ is steeper than the line $Q = 0$, but when the capital mobility is relatively low, $E = 0$ is positive slope.

The unstable branches $UU_1$ and $UU_2$ are associated with $A_2 = 0$ and $A_1 = 0$ in Equations (8) and (9), respectively. When the capital mobility is relatively high, the slopes of loci $UU_1$ and $UU_2$ are sure to be one positive and the other negative; when the capital mobility is relatively low, the slopes of loci $UU_1$ and $UU_2$ are sure to be either both positive or both negative.

Figure 1(a) is the dynamic behavior of the system when capital mobility is relatively low ($J_0 < 0$), and when the slopes of loci $UU_1$ and $UU_2$ are both negative. Here line $UU_2$ is steeper than line $Q = 0$, but leveler than line $UU_1$. Figure 1(b) means that the slopes of loci $UU_1$ and $UU_2$ are both positive, when line $UU_2$ is steeper than line $UU_1$, but leveler than $E = 0$ with low capital mobility. Figure 1(c) reflects that the capital mobility is relatively high ($J_0 > 0$), the slopes of loci $Q = 0$ and $E = 0$ are both negative, and line $E = 0$ is steeper than line $Q = 0$, the slope of locus $UU_1$ is positive, while the one of line $UU_2$ is negative, among which, line $UU_2$ is steeper than line $Q = 0$, but leveler than line $E = 0$.

**EXPECTED PERMANENTLY RAISING FINANCING RATIO**

At time $t = 0$ the policy authorities announce the financing ratio will increase from $\alpha_0$ to $\alpha_1$ at a specific date $t = T$ in the future. The initial equilibrium is at $e_0$ where $Q = 0(\alpha_0)$ intersects $E = 0$. The domestic stock price and exchange rate on this point are respectively $Q_e$ and $E_e$. Make $0^-$ and $0^+$ respectively represent the moment before and after policy change. $T^-$ and $T^+$ respectively denote the instant before and after the announcement to raise the financing ratio. During $0^- < T < 0^+$, the financing ratio is not increased actually and the point $e_0$ should be treated as the reference point to govern the dynamic adjustment of $Q$ and $E$. The economy should reach new steady state at $T^+$ in order to guarantee the convergence.

Figure 2(a) reveals that the capital mobility is relatively low, and the slopes of loci $UU_1$ and $UU_2$ are both negative. After the time $T$, the line $Q = 0(\alpha_0)$ will move up to line $Q = 0(\alpha_1)$, and intersect with line $E = 0$ on the point $e_1$, determining the new equilibrium, on which the domestic stock price and exchange rate are respectively $Q_e$ and $E_e$. When people receive the information that at time $T$, the financing ratio will be increased, the economy will jump to one point on the dynamic path from point $e_0$, and then diverge along this path until arrive at the point $e_1$ at time $T$.

There are two threshold points $T_e$ and $T_o$ in the domestic stock price in the figure. Aoki (1985) called $T_e$ as minimum lead time. It corresponds to point $e_1$, which locates on the line $Q = 0(\alpha_0)$. While $T_o$ corresponds to point $e_1$,
on which the short term stock price is exactly equal to the previous level \((Q_0 - c T)\), \(T_c\) is larger than \(T_0\).

If \(T > T_0\), then when at the moment of the policy announcement, the economy will jump up to the place ahead of point \(e_c\), such as the point \(e_i\) in the figure. After passing point \(e_c\), the stock price shows a rising trend, from point \(e_i\) to point \(e\). That is the why the misadjustment phenomenon emerges in the domestic stock price. If \(T_c > T > T_0\), the economy will jump to one point between point \(e_c\) and point \(e_i\) from point \(e_o\) at the moment after the time 0, such as the point \(e_2\) in the figure. Monotonic rise of stock price trend will occur as long as \(T_c > T\), but the misadjustment won’t happen; the misjump phenomenon of stock price however, will emerge during the time \(0^+\). If \(T < T_0\), the economy will jump to one point between point \(e_i\) and point \(e_o\) from point \(e_o\) at the time \(0^+\), such as the point \(e_i\) in the figure, and the domestic stock price will only show a trend of monotonic rise.

Unlike the adjustment of the stock price, the one of exchange rate is obviously much simpler. After the announcement of the policy, the exchange rate immediately jumps up to the trajectory between \(e_o\) and \(e_e\), such as the point \(e_1\), \(e_2\), \(e_3\), \(e_i\), and \(e_o\) in the figure. At this moment, the exchange rate level is between \(E_0\) and \(E_e\), revealing the late adjustment of the rate, diverging along the trajectory, rising monotonically and exactly arriving at the point \(e\), at time \(T\).

Figure 2(b) shows the capital mobility is relatively low, and the slopes of loci \(UU_1\) and \(UU_2\) are both positive, both the stock price and the exchange rate show the same trend. After the announcement of the policy, both the exchange rate and the stock price immediately jump up to point \(e_i\) on the trajectory between \(e_o\) and \(e_e\). At this instant the stock price is between \(Q_0\) and \(Q_e\), with the exchange rate level between \(E_0\) and \(E_e\), revealing the situation that both the stock price and the exchange rate are undershooting, and afterwards diverging along the trajectory, rising monotonically and arriving at the point \(e\) at time \(T\).

Figure 2(c) is the example for the situation of relatively high capital mobility. In this case, after the announcement, the jumping emerges and undershooting occurs monotonically afterwards. After the announcement of the policy, both the exchange rate and the domestic stock price immediately jump to point \(e_i\) on the trajectory between \(e_o\) and \(e_e\), with the domestic stock price jumping up while the exchange rate jumping down, revealing the situation that both the stock price and the exchange rate are undershooting, afterwards diverging along the trajectory, and respectively rising and decreasing monotonically until arriving exactly at the point \(e\) at time \(T\).

**CONCLUSION**

The long-term effects of the expected raising financing ratio are as follows: Cause the increase of the domestic stock price, stimulate the stock market; the effect on the exchange rate should depend on the degree of capital mobility, if the capital mobility is relatively low, it will force the exchange rate up, lead to the depreciation of the domestic currency, if high, then the exchange rate down with the appreciation of domestic currency. Regarding the dynamic adjustment of the stock price and the exchange rate, it is found that the misadjustment may occur on the stock price when the capital mobility is relatively low; while in high situation, the stock price is sure to rise monotonically; meanwhile, regardless of low or high capital mobility, there will be only monotonically rise or decrease in the exchange rate.

The misadjustment only emerges in the low capital mobility, but never emerges when the capital is relatively mobile. The capital mobility plays a vital role in the occurrence of the misadjustment. Aoki considers that the important reason for the misadjustment lies in the fact that the short-term response of the economic variables will bring wrong information. Thus the decision-maker should apply proper policies to avoid the occurrence possibility of misadjustment. If the authorities can devote themselves to the liberalization of capital mobility, they will be able to avoid the occurrence of the misadjustment, getting rid of the misallocation of resources caused by the wrong information brought by the short-term adjustment.

The trial of analyzing the foreign interest rate disturbance, or the disturbance from the foreign exchange market,
has also been carried out, but it only gives rise to the possibility of the exchange rate misadjustment. Domestic financial
disturbance, namely, the disturbance from the stock market, also merely leads to the possibility of misadjustment in the
domestic stock price. Here comes to a conclusion: the source of exogenous shocks plays a very significant role in
whether the misadjustment or not in the economic variables.

NOTES

1. The percentage margin is defined as the ratio of the equity value of the marginal account to the market value of the
securities. Let L=loan from broker and E=equity, then the percentage margin can be defined as \( m = E / (L + E) \).
The financing ratio = \( \alpha = L / (L + E) = 1 - m \).

When financing ratio is \( \alpha \), investors can use their own one dollar to borrow \( \alpha / (1 - \alpha) \) dollars. They have total
\( 1 / (1 - \alpha) \) dollars to purchase \( 1 / (1 - \alpha) \)Q units of stocks. Let \( Q' \) is the future stock price. The stock values will be
\( Q' / (1 - \alpha)Q \) in the future. The investors can get \( \beta Y / (1 - \alpha)Q \) dividends in the future and need to pay
\( r^t \alpha / (1 - \alpha) \) interest rates. The expected return of stock=\( Q' / (1 - \alpha)Q + \beta Y / (1 - \alpha)Q - r^t \alpha / (1 - \alpha) - 1 \) is equal to the
expected return of bond. We can get Equation (3) because of perfect foresight expectations (\( (Q' - Q) / Q = Q' / Q \)).

2. \( F_0 = \partial Q / \partial Q = \beta Y / Q - Q(1 - \alpha)M / L / T / E_{0} > 0 \) \( F_M = \partial Q / \partial M = Q(1 - \alpha) / PL_0 \),
\( F_\alpha = \partial Q / \partial \alpha = -Q(1 - \alpha)M / L / T / E_{0} > 0 \) \( F_\lambda = \partial Q / \partial \lambda = -Q(1 - \alpha)M / L / T / E_{0} > 0 \).

3. \( \bar{Q}_0 = \partial \bar{Q} / \partial Q = (F_\lambda J_0 - J_0 F_\epsilon) / \Omega < 0 \) \( \bar{Q}_\alpha = \partial \bar{Q} / \partial \alpha = -F_\lambda J_0 / \Omega > 0 \) \( \bar{Q}_\lambda = \partial \bar{Q} / \partial \lambda = -F_\lambda J_0 / \Omega > 0 \).

4. If \( J_0 > 0 \), then \( \left[ \partial Q / \partial E_{\infty} \right]_{\Omega = 0} - \left[ \partial Q / \partial E_{\infty} \right]_{\Omega = 0} = -\lambda_1 \lambda_2 / F_\lambda J_0 > 0 \).

5. If \( J_0 < 0 \), then \( \left[ \partial Q / \partial E_{\infty} \right]_{\Omega = 0} + \left[ \partial Q / \partial E_{\infty} \right]_{\Omega = 0} = -F_\lambda / J_0 < 0 \).

6. \( \left[ \partial Q / \partial E_{\infty} \right]_{\Omega = 0} - \left[ \partial Q / \partial E_{\infty} \right]_{\Omega = 0} = -F_\lambda / (\lambda_2 - F_\lambda) - F_\lambda / Q - \lambda_2 / F_\lambda / (\lambda_2 - F_\lambda) > 0 \).

7. \( \left[ \partial Q / \partial E_{\infty} \right]_{\Omega = 0} - \left[ \partial Q / \partial E_{\infty} \right]_{\Omega = 0} = -J_0 / J_0 - F_\lambda / (\lambda_2 - F_\lambda) = (F_\lambda J_0 - J_0 F_\epsilon - \lambda_2 J_0 / J_0 (\lambda_2 - F_\lambda) = \lambda_1 / J_0 (\lambda_2 - F_\epsilon) - \lambda_2 / J_0 > 0 \).

8. \( \left[ \partial Q / \partial E \right]_{\Omega = 0} - \left[ \partial Q / \partial E \right]_{\Omega = 0} = J_0 / J_0 + F_\lambda / (\lambda_2 - F_\lambda) = \lambda_2 / J_0 > 0 \), and \( \left[ \partial Q / \partial E \right]_{\Omega = 0} - \left[ \partial Q / \partial E \right]_{\Omega = 0} = -F_\lambda / (\lambda_2 - F_\lambda) - F_\lambda / Q - \lambda_2 / F_\lambda / (\lambda_2 - F_\lambda) > 0 \).

REFERENCES

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Figure 1: Phase diagrams
Figure 2: Dynamic adjustments