



# Monetary policy announcements and stock price dynamics in a small open economy

Chi-Chur Chao <sup>a,\*</sup>, Shih-Wen Hu <sup>b</sup>, Meng-Yi Tai <sup>c</sup>, Vey Wang <sup>b</sup>

<sup>a</sup> Department of Economics, Chinese University of Hong Kong, Shatin, Hong Kong

<sup>b</sup> Department of Economics, Feng Chia University, Taichung, Taiwan

<sup>c</sup> Department of Economics, Fo Guang University, Yilan, Taiwan

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## ABSTRACT

Using a monetary framework with stock markets, this paper investigates dynamic behaviors of a small open economy with various adjustments in the manufacturing prices. For an instantaneous adjustment of the manufacturing prices, stock values and exchange rates may appear to misjump or misadjust at the instant of the monetary policy announcement. When the manufacturing prices adjust sluggishly, exchange rates may overshoot but stock values can exhibit various dynamic patterns, including overshooting or undershooting.

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## 1. Introduction

Since the seminal paper of Jones (1965), the two sector model has become a representative framework to study economy's real activities of production, consumption and trade. The model was then utilized by Harris and Todaro (1970) to investigate sectoral interactions between rural agriculture and urban manufacturing in the dual economy. On the other hand, the monetary version of the general-equilibrium model was introduced by Frankel (1986), in which price adjustments of agricultural and manufactured goods can be over- or under-reacted during transitions.

The above models, however, do not consider the impacts of the stock market on price dynamics and economic activities. In both developing and developed economies, stock markets play an important role in reflecting the value of wealth, which not only affects consumption but also investment and production. Stock prices can therefore serve as a good indicator to predict economic performance.

In the literature of macroeconomics, Blanchard (1981) incorporated the stock market in the IS-LM analysis. Gavin (1989) investigated the effects of monetary and fiscal expansions on stock prices and exchange rates under the general price rigidity. Agénor (1995) examined the anticipatory dynamics associated with monetary policy shocks in an economy with an informal currency market. Su, Yip, and Wong (2002) discussed the impact of government intervention on stock returns.

The purpose of this paper is to embody stock markets into the two-sector general-equilibrium model. We will investigate the impacts of monetary policy on the economy under different speeds of price adjustments. Specifically, the adjustment speed of manufacturing prices can be instant or sluggish, while the price of agricultural product adjusts instantaneously. Under these assumptions, dynamic

\* Corresponding author. Tel.: +852 2609 8195.

E-mail address: [ccchao@cuhk.edu.hk](mailto:ccchao@cuhk.edu.hk) (C.-C. Chao).

behaviors of stock values and exchange rates will be examined. We will identify the conditions that lead to over-adjustments in these two variables in the sense of Dornbusch (1976) or misadjustments by the context of Aoki (1985).

The organization of this paper is as follows. Section 2 describes the economy with instantaneous adjustments for both the prices of agricultural and manufactured goods. Section 3 characterizes the steady-state equilibrium and the dynamic behavior of the economy associated with an expansion in money supply. Section 4 extends the analysis to the case that the price of the manufactured good adjusts sluggishly. Main results are summarized in Section 5.

## 2. The model with instantaneous price adjustments

Consider the home economy that has two sectors: agriculture and manufacturing. The agricultural product is non-traded while the manufactured good is traded internationally. Following Frankel (1986) and Lai, Hu and Wang (1996), prices of both goods are assumed to be instantaneously adjusted. In addition, assets such as money and stocks are perfect substitutes to domestic residents.

The economy can be described by the following equations:

$$-\theta(p^c - p^m) + \sigma(m - p^m) + \omega(q - p^m) = \beta(p^c - p^m) \tag{1}$$

$$\delta(p^c - p^m) + \mu(m - p^m) + \eta(q - p^m) + \psi(p_m^* + e - p) = -\zeta(p^c - p^m) \tag{2}$$

$$m - p = -\lambda r + \phi y \tag{3}$$

$$\dot{q} + v(p + y - q) = r \tag{4}$$

$$r = r^* + \dot{e} \tag{5}$$

$$p = \alpha_m p^m + \alpha_c p^c; \alpha_m + \alpha_c = 1 \tag{6}$$

where the lowercase variables are expressed in logarithms, except for the domestic nominal interest rate ( $r$ ) and the foreign nominal interest rate ( $r^*$ ), and all the coefficients are positive with the parameters  $\alpha_m$ ,  $\alpha_c$  and  $v$  lying between 0 and 1. The variables are defined as follows:  $p^c$  = agricultural price;  $p^m$  = manufacturing price;  $m$  = nominal money supply;  $q$  = nominal value of stocks;  $p_m^*$  = foreign manufacturing price;  $e$  = exchange rates;  $p$  = the general price level; and  $y$  = output.<sup>1</sup> The dot denotes the rate of change with respect to time.

Eq. (1) states the equilibrium condition of the agricultural market, which specifies that demand for the agricultural product is equal to its supply. The agricultural demand depends negatively on its relative prices and positively on the real money balances and stock values, while the supply varies positively with its relative prices.<sup>2</sup> Eq. (2) is the equilibrium condition of the manufactured good, and in particular its demand depends on the relative price between foreign and domestic manufactured goods.<sup>3</sup> Eq. (3) describes the equilibrium condition of the money market, in which the demand for the real money balances is a decreasing function of the nominal interest rate and an increasing function of real output, where  $\lambda$  is defined as the semi-elasticity of money demand (in logarithm) to the interest rate.

Eq. (4) is the equilibrium condition for the stock market. The expected rate of return on holding stocks comprises capital gains and dividends. Capital gains are the percentage change in stock value ( $\dot{q}$ ) while dividends come from profits. Following Blanchard (1981), profits are positively related to production income, thereby dividends can be expressed by  $v(p + y - q)$  in logarithms, where  $v$  measures the contribution of dividends to stock returns. Since assets are perfect substitutes, in equilibrium the rate of stock returns is equal to the nominal interest rate  $r$ .

Lastly, Eq. (5) states the interest rate parity under perfect capital mobility, while Eq. (6) defines the general price level as a weighted average of domestic manufacturing and agricultural prices.

From Eqs. (1) to (6), we have the following dynamic system with differential equations involving  $e$  and  $q$ :

$$\begin{bmatrix} \dot{q} \\ \dot{e} \end{bmatrix} = \begin{bmatrix} \Psi_1 & \Psi_2 \\ \Phi_1 & \Phi_2 \end{bmatrix} \begin{bmatrix} q \\ e \end{bmatrix} + \begin{bmatrix} \Psi_3 y + \Psi_4 m + \Psi_5 p_m^* \\ \Phi_3 y + \Phi_4 m + \Phi_5 p_m^* + \Phi_6 r^* \end{bmatrix} \tag{7}$$

where  $\Psi_1 > 0, \Psi_2 > 0, \Psi_3 > 0, \Psi_4 < 0, \Psi_5 < 0, \Phi_1 > 0, \Phi_2 > 0, \Phi_3 > 0, \Phi_4 < 0, \Phi_5 > 0$  and  $\Phi_6 < 0$ .<sup>4</sup> In particular,  $\Psi_1 (= \partial \dot{q} / \partial q)$  and  $\Phi_2 (= \partial \dot{e} / \partial e)$  express respectively the percentage changes in stock values and exchange rates.

We turn next to the long-run properties of the system. In the long-run equilibrium,  $\dot{q} = \dot{e} = 0$  and the stationary values of them are denoted by  $\hat{q}$  and  $\hat{e}$ . From Eqs. (1)–(3) and (7), we can derive the following results:

$$\frac{\partial \hat{q}}{\partial m} = \frac{\partial \hat{e}}{\partial m} = \frac{\partial \hat{p}^c}{\partial m} = \frac{\partial \hat{p}^m}{\partial m} = 1; \frac{\partial \hat{r}}{\partial m} = 0 \tag{8}$$

<sup>1</sup>  $y$  is the real output in logarithm, i.e.  $y = \ln Y$ , where  $Y = (P^c Y^c + P^m Y^m) / P$ .

<sup>2</sup> See Appendix A.

<sup>3</sup> According to Blanchard (1981), the link between the asset and goods markets is the value of the stock market.

<sup>4</sup> See Appendix B.

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