

Expectations and Commodity Price Dynamics: The Application of Portfolio Balance Model

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Abstract. The concept and application of portfolio balance has becoming one of the main streams in the field of international finance after 1970s. People's demand for the assets will be determined by the relative returns among assets. Lai (1994) indicated that the asset demand equals the stock of asset supply through the instant asset adjustments in any period. There are several theoretical and empirical studies on the dynamic adjustment of commodity prices. Van Duynes (1979) was one of them which used the portfolio balance model to analyze how commodity prices will react as the economy experiences a bad harvest and a commodity speculation.

This study tries to extend the works of Van Duynes (1979) and Hu, Lai, and Wang (1999) to develop a two-sector portfolio balance model. First objective will be the analysis of the relationship between the flow and stock of agricultural products in explaining the effects of different monetary policy pre-announcement and different formation of public expectation on the dynamic adjustment of commodity prices. Second objective will be the linkage between the market disturbance on the impact of agricultural prices and regime collapse to set up a two-sector model of including agricultural products and manufactured products and to analyze the dynamic movements of the economy when the disturbance, such as the price of agricultural product threshold, exists in the agricultural product market in applying the analytical method of regime collapse.

Keywords: Portfolio Balance Model, Inside and Outside Money Creation, Market Disturbance, Regime Collapse

1. Introduction

Over the years, the survival of mankind has always been inseparable from agriculture. Agriculture has not only economic functions, but also other non-economic features, such as food security, environmental and ecological conservation. Therefore, governments hold a high priority for agricultural development, and through many agricultural policies to make sure the development of agriculture in most other countries-both developing and developed. In order to increase the agricultural production, the government encouraged farmers to use chemical fertilizers early years, it was success, and also improved people's living standard, established a foundation for Taiwan's economic development. For example, in 1952, agricultural production of GDP is 32 %, agricultural employment of total working population is 56%, value of agricultural exports of total exports accounted for 95%. Agricultural production base on the soil fertility was also the foundation of agricultural development. Consequently, the government actively implemented the fallow policy, green manure crop cultivation promotion in casual agricultural, subsidies of organic fertilizer and other related maintenance measures, to stable agricultural production and maintains the sustainable development of agriculture.

In the case of Taiwan, the government began to promote the "rice production and crop paddy with fallow or rotation for six-year plan" in 1984, encouraged the rice fields converted to other crop and fallow to maintain the soil fertility. In 1984-1989, the average fallow area only 33,131 hectares per year, after promoted the plan, the average fallow area increased to 63,209 hectares. Government in order to achieve the food security and stability of food prices, conform to the World Trade Organization (WTO) norms, and strengthened ecology conservation of farm and sustainable utilization of agricultural land continuing forever, in 1998-2001, Government implemented "water dry farmland use adjustment programs", in this period, fallow area increased from 63,584 to 222,109 in 1996-2006.

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In the promotion of green manure, summer planted the sesbania, and winter planted rape, Egyptian clover and vetch, which way is determined by Seed Improvement breeding ground and crops imported from foreign supply the free seeds to farmers. Since 2004, the standard payment of fallow to planting green manure is \$ 45,000 per hectare for each period. In the promotion of organic fertilizers, according to the “essentials of organic fertilizer promotion”, the long-term crops (such as wax apples, mangoes, bananas and other fruit trees), use organic fertilizer more than 6 tons per hectare, given incentive payment \$ 6,000 once at most every year; short-term crops (such as rice, vegetables, fruits and beans, etc.) use organic fertilizer more than 3 tons per hectare, given incentive payment \$ 3,000 twice at most every year. However, the current literatures on the conservation of soil fertility, fallow policy, organic fertilizer subsidies and other factors might have contributions to agricultural production, there is no related theoretical literatures, one purpose of this paper is try to establish theoretical models for the description of soil fertility and related measures of agriculture, see how they affect agricultural production.

What is the reason to promote economic growth; economists have been focus on this topic for a long time. Development of the economic growth theory after classical growth theory, Keynesian school, new-classical growth theory and endogenous growth theory (or new growth theory), which far-reaching are new-classical growth theory and endogenous growth theory.

Solow (1956) corrected the absence of classical growth theory, use the production function of new classical theory, make the long-run equilibrium is no longer instability, then the result shows that economic growth is still determined by exogenous population growth rate, and it cannot explain the increase phenomenon of real income per person. Until the Romer (1986) and Lucas (1988) put a new point of economic growth, from exogenously determined conclusion amended to the endogenous economy determined conclusion, the economic growth theory shows a new face to the world, the new growth theory is so-called endogenous growth theory in this literature.

Since endogenous growth theory published, many people have their different focus, but it has rarely literatures of endogenous growth are talking about agricultural issues. Endogenous growth theory has recently discussed the use of agricultural growth by Sun and Hu (2006), who focuses on the development of biotechnology, if the government's subsidies the low- pollution farming technology, improve its competitive power technology with existing farming competitiveness, and subsidies farmers through the tax, the result shows tax subsidization will improve the environmental pollution of agricultural production, improve the environmental quality and long-term agricultural productivity, promote economic growth. The second purpose of this paper is to construction of an agricultural economy endogenous growth model, and consider soil fertility and public infrastructure, discuss the agricultural policy with the adjustment of the government transfer of payments and the percentage of public infrastructure spending in the distribution of income tax, what is the effect the long-run economic growth and social welfare of the economy? And discuss the income tax rate, the fraction of public expenditure on infrastructures, and fallow ratio how to govern the changes of social welfare when the economic growth is maximizing.

The remainder of this paper is organized as follows. Section 2 presents the analytical framework. Section 3 examines the growth and welfare effects of the allocation of government on infrastructure investments and transfers. In addition, the growth and welfare effects of income taxation are discussed. Section 4 offers some concluding remarks.

2. The Model

Basically, the framework we shall develop can be treated as a modified Van Duyne (1979) and Hu, Lai, and Wang (1999) model, which is a portfolio balance model of the financial sector. The model is now popular in the macroeconomic setting, and its origin should be attributed to Tobin (1969). Specifically, we consider a closed economy in which: (i) two types of goods, namely agricultural products (or “auction products”) and manufactured products (or “customer products”), are produced in the economy; (ii) there are three assets held by domestic residents: money, bonds, and agricultural goods, and these assets are regarded as gross substitutes; (iii) market agents form their expectations with perfect foresight.

In accordance with the above description of the economy, the model can be specified by the following macroeconomic relationships:

$$D^n \left(\frac{P_n}{P_c}, \frac{W}{P_c} \right) = X^n \left(\frac{P_n}{P_c} \right), \quad D_1^n < 0, D_2^n > 0, X_1^n > 0, \quad (1)$$

$$m \left(r, \frac{\dot{P}_c^e}{P_c} - k \right) W = M, \quad m_1 < 0, m_2 < 0, \quad (2)$$

$$b \left(r, \frac{\dot{P}_c^e}{P_c} - k \right) W = P_c B^p, \quad b_1 > 0, b_2 < 0, \quad (3)$$

$$c \left(r, \frac{\dot{P}_c^e}{P_c} - k \right) W = P_c C, \quad c_1 < 0, c_2 > 0, \quad (4)$$

$$\dot{C} = X^c \left(\frac{P_n}{P_c} \right) - D^c \left(\frac{P_n}{P_c}, \frac{W}{P_c} \right), \quad X_1^c < 0, D_1^c > 0, D_2^c > 0, \quad (5)$$

$$W = M + B^p + P_c C, \quad (6)$$

where D^n is the demand for manufactured products; P_n is the price of manufactured products; P_c is the price of agricultural goods; W is the nominal wealth; X^n is the supply of manufactured products; m is the desired portfolio share of the residents' financial wealth on money balance; M is the nominal money supply; r is the interest rate; k is the difference between the convenience yield and the storage costs; b is the desired portfolio share of the residents' financial wealth on bonds; B^p is the bonds of domestic resident holding; c is the desired portfolio share of the residents' financial wealth on agricultural products; C is the stock of agricultural products; X^c is the supply of agricultural products; D^c is the demand for agricultural products; B^m is the bonds of government holding; B is supply of domestic bonds. An overdot indicates the rate of change with respect to time.

Equation (1) is the equilibrium condition for the manufactured good market. The equilibrium condition for money, bonds, and agricultural products, which are imperfect substitutes for each other, is given respectively by equations (2) – (4). As specified in all portfolio balance models, they require that available stocks of money, bonds, and agricultural products equal stock demands for three assets. The demands for these three assets are proportional to the wealth where the shares add up to unity. Furthermore, the allocation of portfolios among three assets depends upon the return on holding bonds r and the return on holding agricultural (auction) goods $\frac{\dot{P}_c^e}{P_c}$. Equation (5) specifies that the stock of agricultural products will change over time as there is a flow excess supply of agricultural products. This specification is similar to those in Van Duyne (1979) and Baland (1993). Equation (6) defines that the nominal wealth of the domestic residents is the sum of the nominal value of three assets they hold. It is clear from equations (2) – (4) and (6) that the relations $m_1 + b_1 + c_1 = 0$, $m_2 + b_2 + c_2 = 0$, and $m + b + c = 1$ should be held at all time.

3. Concluding Remarks

Expansion of government monetary policy can be divided into outside money creation and inside money creation. The two methods will produce different effects which meaning outside money creation (i.e. the currency with neutral) and inside money creation (i.e. monetary non-neutrality). In the static expected side, the long-run original equilibrium point will jump directly to the new long-run equilibrium under outside money creation, while the economy overshooting under inside money creation. Under the expectations with perfect foresight, the results of unanticipated announcement are similar to cases of static expect. The economy has various dynamics patterns under anticipated announcement, such as undershooting in the case of outside money creation, and overshooting or undershooting in the case of inside money creation.

4. References

- [1] Barnhart, S. W., (1989), "The Effects of Macroeconomic Announcements on Commodity Prices," *American Journal of Agricultural Economics*, 71, 389-403.
- [2] Bessler, D. A., (1984), "Relative Prices and Money: A Vector Autoregression on Brazilian Data," *American Journal of Agricultural Economics*, 66, 25-30.
- [3] Blackburn, K., (1988), "Collapsing Exchange Rate Regimes and Exchange Rate Dynamics: Some Further Examples," *Journal of International Money and Finance*, 7, pp. 373-385.
- [4] Bordo, M. D., (1980), "The Effects of Monetary Change on Relative Commodity Prices and the Role of Long-Term Contracts," *Journal of Political Economy*, 88, 1088-1109.
- [5] Chambers, R. G., (1984), "Agricultural and Financial Market Interdependence in the Short Run," *American Journal of Agricultural Economics*, 66, 12-24.
- [6] Dornbusch, R., (1976), "Expectations and Exchange Rate Dynamics," *Journal of Political Economy*, 84, 1161-1176.
- [7] Frankel, J. A., (1986), "Expectations and Commodity Price Dynamics: The Overshooting Model," *American Journal of Agricultural Economics*, 68, 344-348.
- [8] Frankel, J. A. and G. A. Hardouvelis, (1985), "Commodity Prices, Money Surprises and Fed Credibility," *Journal of Money Credit, and Banking*, 17, 425-437.
- [9] Frankel, J. A., (1984), "Commodity Prices and Money: Lessons from International Finance," *American Journal of Agricultural Economics*, 66, 560-566.
- [10] Helmlinger, P. G. and J. P. Chavas, (1996), *The Economics of Agricultural Prices*. New Hersey: Prentice-Hall.
- [11] Jha, S. and P. V. Srinivasan, (1999), "Grain Price Stabilization in India : Evaluation of Policy Alternatives," *Agricultural Economics*, 21, 93-108.
- [12] Krugman, P., (1991), "Target Zones and Exchange Rate Dynamic," *Quarterly Journal of Economics*, 106, 669-682.
- [13] Hu, S. W., C. C. Lai and V. Wang, (1999), "Monetary Announcement and Commodity Price Dynamics: A Portfolio Balance Model," *The American Economist*, 43, 71-81.
- [14] Lai, C. C., S. W. Hu and V. Wang, (1996), "Commodity Price Dynamic and Anticipated Shocks," *American Journal of Agricultural Economics*, 78, 982-990.
- [15] Lapp, J. S., (1990), "Relative Agricultural Prices and Monetary Policy," *American Journal of Agricultural Economics*, 72, 622-630.
- [16] Moutos, T. and D. Vines, (1992), "Output, Inflation and Commodity Prices," *Oxford Economic Papers*, 44, 355-372.
- [17] Obstfeld, M., (1988), "Competitiveness, Realignment, and Speculation: The Role of Financial Markets," in Giavazzi, F., Micossi, S. and Miller, M. eds., *The European Monetary System*, Cambridge: Cambridge University Press, pp. 232-247.
- [18] Saghaian, S. H., M. R. Reed and M. A. Marchant, (2002), "Monetary Impacts and Overshooting of Agricultural Prices in an Open Economy," *American Journal of Agricultural Economics*, 84, 90-103.
- [19] Taylor, J. S. and J. Spriggs, (1989), "Effect of the Monetary Macro-economy on Canadian Agricultural Prices," *Canadian Journal of Economics*, 22, 278-289.
- [20] Tomek, W. G. and K. L. Robinson, (1990), *Agricultural Product Prices*. 3rd ed., New York, Ithaca: Cornell University Press.
- [21] Van Duyne, C., (1979), "The Macroeconomic Effects of Commodity Market Disruptions in Open Economies," *Journal of International Economics*, 9, 559-582.