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Abstract

This paper develops a simple mercantilism model for a small open economy and examines the real effects of macroeconomic policies. In this setting, the saddle-point stability of the model with wealth effects hinges on an interesting "relative smoothness condition" for foreign asset accumulation. And comparative static analysis shows that an increase of monetary growth rate and a central-bank purchase of foreign exchange have positive real effects on the economy. In contrast, an increase of government expenditure always has negative effects on the economy. Moreover, the stronger of the mercantilist sentiments, the more consumption, real money balance holdings and foreign asset accumulation in the long run. These conclusions are very different from those ridiculous ones of Obstfeld's paper (1981).

Keywords: Mercantilism, Foreign Asset Accumulation, Relative Smoothness Condition.

JEL Classification Numbers: E58, E63, F52, F41.

1 Introduction

Mercantilism is an economic theory that dominated Western European economic policies from the 16th to the late-18th century. Mercantilist ideas holds that the prosperity of a nation is dependent upon its supply of economic assets (or capital), which are represented by bullion (gold, silver and trade value) held by the state. And it tells that the global volume of international trade is "unchangeable" and a positive balance of trade with other nations (exports minus imports) is the only way to increase the wealth of a nation. At the same time, the theory has strong policy implications that the ruling government should advance these goals by playing a protectionist role in the economy by encouraging exports and discouraging imports, notably through the use of subsidies and tariffs respectively. Therefore, it is very interesting and meanful to reexamine its historical developments and realistic implications and construct models to investigate its effects mathematically.

Historically, a number of scholars like Hume, Dudley North, and John Locke found important flaws with mercantilism. But Adam Smith and David Hume are considered to be the founding fathers of anti-mercantilist thought. Hume famously noted the impossibility of the mercantilist's goal of a constant positive balance of trade. [1] But based on our point of view, it is highly probable that Hume neglected an important process of inherent economic growth of the nations with Mercantilist ideas. It is obvious that accumulated assets (or money) can be transformed into all sorts of production factors, such as physical (and human) capital, raw material, vehicles and new technology, etc. That is to say, the nation with mercantilist ideas can expand production scale, invest in new technology and purchase more raw materials from other nations. Then, product scale will be enlarged and production cost will be decreased and product efficiency will be improved. Thus, it must be better economic growth which embodies more income (or wealth) and consumption in the long run. Just like Reynolds (2000) lists major tenets of mercantilism: "$\cdots\cdots$import raw material, export finished good; low wages, large population, educated workers, increased productivity, mobility of inputs domestically$\cdots\cdots$".

It is well known that Adam Smith rejected the mercantilist focus on production, arguing that consumption was the only way to grow an economy. In his 1776 book, Wealth of Nations, Adam Smith first laid out the theory that mercantilism hurts the economy of the country practicing it

[1] The logic of Hume's argument is as follows. As bullion flowed into one country, the supply would increase and the value of bullion in that state would steadily decline relative to other goods. Conversely, in the state exporting bullion, its value would slowly rise. Eventually it would no longer be cost-effective to export goods from the high-price country, and the balance of trade would reverse itself. Hence, Hume drew the conclusion that it is not necessary that the nation with more money supply will be richer.

because it hurts consumers in order to benefit producers. He correctly wrote:

Consumption is the sole end and purpose of all production; and the interest of the producer ought to be attended to only so far as it may be necessary for promoting that of the consumer. The maxim is so perfectly self-evident that it would be absurd to attempt to prove it. But in the mercantile system the interest of the consumer is almost constantly sacrificed to that of the producer; and it seems to consider production, and not consumption, as the ultimate end and object of all industry and commerce. (iv.8.49)

But Smith missed an important fact. The mercantilist country only misses out on consumption for a while and the victim country only gets increased consumption for a while. Eventually the growth of industry and income in the mercantilist country and the loss of industry and income in the victim country reverses the tide. [2]

In spite of Adam Smith's repudiation of mercantilism, prominent figures continued to favor it: in the U.S., the likes of Alexander Hamilton, Henry Clay, Henry Charles Carey, and Abaham Lincon; and in Britain Thomas Malthus. Especially, Keynes argued that encouraging production was just as important as consumption and also noted that in the early modern period the focus on the bullion supplies was reasonable. In an era before paper money, and increase for bullion was one of the few ways to increase the money supply. Furthermore, Keynes and other economists of the period also realized the balance of payments is an important concern. Since the 1930s, all nations have closely monitored the inflow and outflow of capital, and most economists agree that a favorable balance of trade is desirable. Keynes also supported government intervention in the economy as necessity, as did mercantilism. In his 1936 book, John Maynard Keynes updated Smith's mercantilism theory, pointing out:

(A) favorable (trade) balance, provided it is not too large, will prove extremely stimulating; whilst an unfavorable balance may soon produce a state of persistent depression. (p. 338)

The similarties between Keynesianism, and its successor ideas, with mercantilism have sometimes led critics to call them neo-mercantilism. Indeed, Paul Samuelson (1964), writing within a Keynesian framework, defended mercantilism, writing:

"With employment less than full and Net National Product suboptimal, all the debunked mercantilism arguments turns out to be valid. Tariffs can then reduce unemployment, can add to the NNP, and increase the total of real wages earned".

[2] In a Viner model of mercantilism, Zou (1997) tells that mercantilism can succeed on its own terms for a small economy because accumulating foreign assets (running a trade surplus) leads to long term positive outcomes. And a nation with strong mercantilist sentiment ends up with large foreign asset accumulation and high consumption in the long run.

Some other systems that do copy several mercantilist policies, such as Japan's economic system, are also sometimes called neo-mercantilist. In an essay appearing in the 14 May 2007 issue of Newsweek, business columnist Robert J. Samuelson argued that China was pursuing an essentially mercantilist trade policy that threatened to undermine the post-World War 2 international economic structure. As of 2010, the word "mercantilism" remains a pejorative term, often used to attack various forms of protectionism. Especially, Krugman (2009) talked about the negative effect on the world economy of China's mercantilist policies when the world's major economies were in a liquidity trap. He wrote as follows:

we know that China is pursuing a mercantilist policy: keeping the renminbi weak through a combination of capital controls and intervation, leading to trade surpluses and capital exports in a country that might well be a natural capital importer. We also know, or should know, that this amounts to a beggar-thy-neighbor policy—or, more accurately, a beggar-everyone but yourself policy— when the world's major economies are in a liquidity trap.····· You can think of this as a negative shock to rest-of-world net exports. In turn, this negative shock is like a negative shock to government purchases of goods and services. So it should have a similar multiplier. Multiplier estimates are all over the place, but tend to cluster around 1.5. So we are looking at a negative impact on gross world product of around 1.4 persent. Not huge—China isn't the principal obstacle to recovery—but significant.

It is hard to find another theory which was studied by researches and utilized by policy makers constantly like mercantilism. But few mercantilism models have been developed in the literature. To our best knowledge, Zou (1997) developed a formal mercantilism model in a framework of modern theory of international finance. It is shown that, in the Viner model of mercantilism, a nation with strong mercantilist sentiment ends up with large foreign asset accumulation and high consumption in the long run; an import tariff leads to more foreign asset holding and more total consumption; and the Harberger-Laursen-Metzler effect exists unambiguously. Different from Zou (1997), this paper introduces money into the private utility function and government expenditure and foreign reserves into the government behavior, in order to examine the effects of monetary policy, government expenditure policy and foreign exchange intervention. And there exits only one good and then ignores the discussion on the effects of imports tariff. The reason for this modelling stratigy is that we think that the most important thing for mercantilist is (assets) accumulation and how to protect this accumulation. And we want to compare our results with the well-known paper by Obstfeld (1981). In an often-cited paper, Obstfeld (1981) presents three interesting results regarding the effects of government policies on foreign asset

holding: (1) foreign exchange intervation is found to have no real effects when official foreign reserves earn interest that is distributed to the public; (2) inflation leads to higher long-run consumption and foreigh claims; (3) an increase in government consumption induces a surplus account in the short run and larger foreign asset accumulaton in the long run. Moreover, the intertemporal optimization framework used by Obstfeld in this study and some related studies (Obstfeld, 1982, 1990) have also influenced the open economy macroeconomics in the past three decades.

In this paper, we utilize the basic framework of Obstfeld (1981) with the usual assumption of a constant discount rateand examine the effects of macroeconomic policies on long-run consumption and foreign asset accumulation in a small open economy. However, we introduce foreign asset holdings into utility, which called the mercantilist sentiments (or wealth effect). It is shown that the policy implications of Obstfeld's model hinge on the special assumption of Uzawa's (1968) time preference and they are totally reversed and substantially changed in a dynamic optimization model with the wealth effect. The wealth effect approach developed in our paper is adapted from the models of Bardhan (1967), Kurz (1968), Calvo (1980), Blanchard (1983) and Zou (1997) and defines the representative agent's utility function on foreign asset in addition to consumption and real balances. The main results derived from our model are very different from many existing studies such as Turnovsky (1985, 1987) and especially contrast to the ones in Obstfeld (1981) paper: (1) foreign exchange intervation leads to more foreign asset holdings and more consumption in the long run; (2) if the utility function is separable in consumption and real balances as in Obstfeld (1981), inflation has no effect on the real variables in both short run and long run; if the utility function is nonsaparable, inflation results in more consumption and foreign asset accumulation when the cross derivative of consumption and real balances is positive; (3) government spending always reduces foreign asset accumulation and crowds out private consumption, even in the case of the government services into the utility function. Acctually, in the discussion on the stability of the dynamic system, we assume the stability condition of the dynamic system named the relative smoothness condition for foreign asset accumulation relative to consumption.

This paper is organized as follows. Section 2 sets up the basic framework of a simple model of mercantilism. Section 3 discusses the dynamic system and stability. Section 4 makes detailed comparative studies on the effects of macroeconomic policies. And we conclude our paper in Section 5.

2 A Model of Mercantilism

We consider a small open economy in a competitive world market. The economy is populated with many identical people. We follow Bardhan (1967), Kurz (1968), Calvo (1980) and Blanchard (1983) and define a representative agent's instanteneous utility function as

$$U(c_t, m_t, b_t) = u(c_t, m_t) + \alpha w(b_t),$$

where c_t is consumption, m_t is real money balance holdings, b_t is the foreign asset holdings, and α ($\alpha > 0$) measures the mercantilist sentiments or wealth effect. A negative b_t is foreign debt, and $\alpha w(b_t)$ is the disutility of debt as in Bardhan (1967) and Blanchard (1983); and for a positive b_t, $\alpha w(b_t)$ reflects the wealth effects introduced by Kurz (1968) or mercantilist sentiments by Zou (1997). In order to advance our discussion, we impose the following assumptions on the time preference rate and the utility function:

Assumption 1: $\rho > r$. The constant time discount rate is strictly greater than the interest rate of the foreign bonds.[3]

Assumption 2: $u_i(c_t, m_t) > 0, u_{ii}(c_t, m_t) < 0, u_{ij}(c_t, m_t) < 0, i, j = c_t, m_t, i \neq j;$

$$w'(b_t) > 0, w''(b_t) < 0;\ u_{cc}(c_t, m_t)u_{mm}(c_t, m_t) - u_{cm}(c_t, m_t)^2 > 0.$$

The representative agent maximizes a discounted utility over an infinite horizon:

$$\int_0^\infty [u(c_t, m_t) + \alpha w(b_t)]e^{-\rho t}dt,$$

where ρ is the time discount rate and $\rho \in (0, 1)$. The budget constraint is

$$\dot{a_t} = y + rb_t + x_t - c_t - \pi_t m_t, \tag{1}$$

$$a_t = b_t + m_t, \tag{2}$$

and the initial asset is given by $b(0)$. Where a dot over a variable is the time derivative, y is ,exogeneous and fixed real output, x_t is the real transfers from the government, a_t is the total wealth of the representative agent, π_t is the expected inflation rate and r is the returns on foreign bonds, which is given in the world capital market. Expect for the utility function and time discount rate, the setup of the model is identical to the one in Obstfeld (1981).

The home price of the goods is p_t, and the corresponding world price is p_t^*. Assuming purchasing power parity, we have

[3]This is a necessary condition for the existence of a steady state. And this condition is also required for the finite horizon model in Blanchard (1985). We will talk about this condition in the later discussion.

$$p_t = E_t p_t^*,$$

where E_t is the exchange rate. With proper normalization, P_t^* can be set to one. Then,

$$p_t = E_t.$$

The Hamiltonian function is[4]

$$H = u(c, m) + \alpha w(b) + \lambda(y + rb + x - c - \pi m) + \mu(a - b - m),$$

where λ and μ are the Hamilton multiplier and the Lagrange multiplier of the two budget constraint respectively.

The necessary conditions for optimization are

$$u_c(c, m) - \lambda = 0, \tag{3}$$

$$u_m(c, m) - \lambda\pi - \mu = 0, \tag{4}$$

$$\alpha w'(b) + r\lambda - \mu = 0, \tag{5}$$

$$\mu - \rho\lambda + \dot{\lambda} = 0, \tag{6}$$

$$\lim_{t\to\infty} e^{-\rho t}\lambda b = 0.$$

From (3), (4) and (5), we have

$$\alpha w'(b) + r u_c(c, m) = u_m(c, m) - \pi u_c(c, m), \tag{7}$$

which says that the marginal benefit of holding foreign assets $[\alpha w'(b) + r u_c(c, m)]$ is equal to the marginal benefit of holding money $[u_m(c, m) - \pi u_c(c, m)]$ at optimum. From (3), (5) and (6), we get

$$\alpha w'(b) + (r - \rho)u_c(c, m) = -u_{cc}(c, m)\dot{c} - u_{cm}(c, m)\dot{m}. \tag{8}$$

To fully spell out the dynamics, we need to specify the behavior of government. Government revenue comes from money creation and interest earnings from the central bank's reserves, i.e., $\frac{\dot{M}}{p} + rR$, and R denotes the amount of foreign reserves. And government consumes goods, g, and makes transfers, x, to the representative agent. Hence its budget constraint is given by

[4] We will leave out the time subscript in the following part of the paper.

$$g + x = \frac{\dot{M}}{p} + rR. \tag{9}$$

Let the money growth rate be a positive constant θ, namely,

$$\frac{\dot{M}}{M} = \theta. \tag{10}$$

From (10) and the definition of the real balances, i.e., $m = \frac{M}{p}$, equation (9) can be writen as

$$x = \theta m + rR - g. \tag{11}$$

On the perfect foresight path, the expected inflation rate is equal to the actual inflation rate:

$$\frac{\dot{p}}{p} = \frac{\dot{E}}{E} = e = \pi, \tag{12}$$

where e is expected rate of exchange rate depreciation. Therefore,

$$\dot{m} = [\frac{\dot{M}}{M} - \frac{\dot{p}}{p}]m = (\theta - \pi)m. \tag{13}$$

From (7), it is easy to say that $\pi = \frac{u_m(c,m) - \alpha w'(b)}{u_c(c,m)} - r$, which can be subsituted into (13). Then,

$$\dot{m} = \frac{m[(r+\theta)u_c(c,m) + \alpha w'(b) - u_m(c,m)]}{u_c(c,m)}. \tag{14}$$

Subtituting (14) into (8) and substituting (2), (11) and (13) into (1) give

$$\dot{c} = -\frac{1}{u_{cc}(c,m)} \left\{ \alpha w'(b) + (r-\rho)u_c(c,m) + m\frac{u_{mc}}{u_c} \left[(r+\theta)u_c + \alpha w'(b) - u_m \right] \right\}. \tag{15}$$

$$\dot{b} = y + rb + rR - c - g. \tag{16}$$

3 Dynamics and Stability

The global stability of the dynamic system formed by equations (14), (15) and (16) is hard to examine. However, we can examine the local stability property of the system. Let $\dot{c} = \dot{m} = \dot{b} = 0$. The steady state of the dynamic system, (c^*, m^*, b^*), is defined by

$$\alpha w'(b^*) + (r-\rho)u_c(c^*, m^*) = 0, \tag{17}$$

$$(r+\theta)u_c(c^*, m^*) + \alpha w'(b^*) - u_m(c^*, m^*) = 0, \tag{18}$$

$$y + rb^* + rR - c^* - g = 0. \tag{19}$$

It is easy to say that (17) and (18) can be transformed into

$$\frac{\alpha w'(b^*)}{u_c(c^*, m^*)} = \rho - r, \tag{20}$$

$$\alpha w'(b^*) + ru_c(c^*, m^*) = u_m(c^*, m^*) - \theta u_c(c^*, m^*). \tag{21}$$

Then, we can obtain the following proposition 0.

Proposition 0 If there exists a steady state, It must satisfy (20), (21) and *assumption 1*. Furthermore, (20) tells that the marginal rate of substitution of consumption and foreign assets is equal to a positive constant $\rho - r$, and (21) tells that the marginal benefit of holding foreign assets is equal to the marginal benefit of holding money in the equilibrium. [5]

It is easy to know the existence and uniqueness of steady state based on the *assumption 1 and 2*. To understand the stability of the system, we linearize (15), (14) and (16) around the steady state, (c^*, m^*, b^*),

$$\begin{bmatrix} \dot{c} \\ \dot{m} \\ \dot{b} \end{bmatrix} = \begin{bmatrix} -\frac{1}{u_{cc}}A & -\frac{1}{u_{cc}}B & -\frac{1}{u_{cc}}C \\ \frac{m^*}{u_c}[(r+\theta)u_{cc} - u_{mc}] & \frac{m^*}{u_c}[(r+\theta)u_{cm} - u_{mm}] & \frac{m^*}{u_c}\alpha w''(b^*)] \\ -1 & 0 & r \end{bmatrix} \begin{bmatrix} c - c^* \\ m - m^* \\ b - b^* \end{bmatrix}, \tag{22}$$

where $A = (r-\rho)u_{cc} + \frac{m^* u_{mc}}{u_c}[(r+\theta)u_{cc} - u_{mc}], B = (r-\rho)u_{cm} + \frac{m^* u_{mc}}{u_c}[(r+\theta)u_{cm} - u_{mm}]$,

[5] Equation (21) is the quilibrium version of the optimality condition (7), with $\theta = \pi^*$ in the equilibrium.

$C = \alpha w''(b^*) + \alpha m^* w''(b^*)\frac{u_{mc}}{u_c}$ and the partial derivatives in the Jacobian matrix J of (22) are evaluated in the steady state, (c^*, m^*, b^*). The trace of the J is

$$trace(J) = \rho - \frac{m^*}{u_c u_{cc}}[u_{cc}u_{mm} - u_{cm}^2] > 0, \tag{23}$$

which shows that there exists an engenvalue with a positive real part at least. And the determinant of the J is $\det(J) = -\frac{m^*}{u_{cc}u_c}\left\{r(\rho - r)\left[u_{cc}u_{mm} - u_{cm}^2\right] + \alpha w''(b^*)\left[(\rho+\theta)u_{cm} - u_{mm}\right]\right\}$. In order to attain the saddle-point stability of the dynamic system, we need impose the condition of $\det(J) < 0$, which is equivalent to

$$\frac{\rho - r}{\alpha} < \frac{1}{r}\left\{\frac{-w''(b^*)[(\rho+\theta)u_{cm} - u_{mm}]}{u_{cc}u_{mm} - u_{cm}^2}\right\}. \tag{24}$$

Because, if this condition is satisfied, the Jacobian matrix has a negative real eigenvalue or three eigenvalues with negative real parts, and the second case is excluded by $trace(J) > 0$. Then a negative real eigenvalue corresponding to the unique initial condition $b(0)$ show that the dynamic system is saddle-point stable. Then, we obtain the following stability theorem.

Theorem In the simple model of Mercantilism, if the assumptions 1, assumption 2 and condition (24) are satisfied, the existence, uniqueness and saddle-point stability of the steady state of the dynamics system guarantee.

Furthermore, we can gain further economic insight about the stability condition (24), which can be transformed into

$$\frac{-\alpha w''(b^*)}{\left\{\frac{(u_{cc}u_{mm} - u_{cm}^2)}{[(\rho+\theta)u_{cm} - u_{mm}]}\right\}} > r(\rho - r). \text{ (Relative Smoothness Condition)} \tag{25}$$

The lefe side of (25) is the relative concavity of the utility parts $\alpha w(b_t)$ and $u(c_t, m_t)$. And the stability condition tells that in order to guarantee the saddle-point stability of the dynamic system, the relative concavity of the utility part of $\alpha w(b_t)$ to $u(c_t, m_t)$ cannot be too small and its lower bound is $r(\rho - r)$. Actually, it is easier to understand the economic insight underlying in this condition in an economic environment with uncertainty. It is well known that the minus second derivative or divided by the first derivative measures the risk attitude of the agent, and that consumers always smooth their consumption. Hence, it seems that consumers are likely to smooth foreign asset holdings similar to the smoothness of consumption, furthermore, the relative smoothness can not too small and its upper bound is $r(\rho - r)$. Therefore, we are likely to name the stability condition as the relative smoothness condition for foreign asset holding.

4 Policy Analysis

In this section, we investigate the Mercantilism model by the method of comparative static analysis and study the effects of the mercantilist mentality and all sorts of policies including inflation, government spending and foreign exchange intervention.

Totally differetiating the three steady-state condition (17), (18) and (19), we have

$$\begin{bmatrix} (r-\rho)u_{cc} & (r-\rho)u_{cm} & \alpha w''(b^*) \\ (r+\theta)u_{cc}-u_{mc} & (r+\theta)u_{cm}-u_{mm} & \alpha w''(b^*) \\ -1 & 0 & r \end{bmatrix} \begin{bmatrix} dc^* \\ dm^* \\ db^* \end{bmatrix} = \begin{bmatrix} -w'(b^*)d\alpha \\ -u_c d\theta - w'(b^*)d\alpha \\ dg - rdR \end{bmatrix} \tag{26}$$

4.1 The Effect of the Mercantilist Mentality

Let $d\theta = dg = dR = 0$ in (26). Applying Cramer's Rule, we obtain

$$\frac{dc^*}{d\alpha} = \frac{rw'(b^*)[u_{mm} - (\rho+\theta)u_{cm}]}{\Delta} > 0, \tag{27}$$

$$\frac{dm^*}{d\alpha} = \frac{rw'(b^*)[(\rho+\theta)u_{cc} - u_{mc}]}{\Delta} > 0, \tag{28}$$

$$\frac{db^*}{d\alpha} = \frac{-w'(b^*)[(\rho+\theta)u_{cm} - u_{mm}]}{\Delta} > 0, \tag{29}$$

with $\Delta = \frac{-u_{cc}u_c}{m^*}\det(J) < 0$ because of condition (24). Then, we obtain propostion 1.

Proposition 1 The stronger the mercantilist sentiment, the larger the long-run consumption, real money balance holdings and foreign asset accumulation.

The reason for this proposition is quite clear. As a consumer highly values its wealth on foreign assets, he (or she) saves more and consumes less in the short run in order to run a current account surplus and accumulate more foreign assets. More foreign asset holdings means more interest income, which in turn leads to more consumption in the long run. Proposition 1 is a very strong argument for mercantilism if consumers of a nation intends to maximize their long-run consumption. And this proposition is similar to Proposition 1 in Zou (1997).

4.2 The Effect of Inflation

Let $d\alpha = dg = dR = 0$ in (26). Applying Cramer's Rule, we obtain

$$\frac{dc^*}{d\theta} = \frac{r(r-\rho)u_c u_{cm}}{\Delta} > 0, \tag{30}$$

$$\frac{dm^*}{d\theta} = \frac{r(\rho-r)u_c u_{cc} - \alpha w''(b^*)u_c]}{\Delta} ?0, \tag{31}$$

$$\frac{db^*}{d\theta} = \frac{(r-\rho)u_c u_{cm}}{\Delta} > 0. \tag{32}$$

Proposition 2 Inflation increases long-run consumption and foreign asset accumulation, while its effects on real money balances are ambiguous.

As the rate of monetary growth and the inflation rate coincide in the long run, the increase of the monetary growth rate (or inflation) raises the opportunity cost of holding money in the steadys state. Thus, consumers will economize on real balances and consume more in the new long-run equilibrium. Thus, in order to finance for the more consumption, consumers must accumulate more foreign assets and obtain more interest income. Therefore the positive effects on consumption and foreign asset accumulation can be found in the long run. As for real balance holdings, there exist two opposite effects. One the one hand, the increase of the opportunity cost of holding money by monetary disturbance tends to decrease the demand for real money balances; on the other hand, more consumption tends to increase the demand for real money balances because more consumption will increase the marginal utility of real balances. Therefore, the total effects on the real money balance is ambiguous, and the sign of $\frac{dm^*}{d\theta}$ is undetermined.

But, if $u_{cm} = 0$, the utility is saparable between consumption and real balance holdings, i.e., $u(c, m) = u(c) + v(m)$, we can draw surprising conclusions. It is easy to show that the relative smoothness condition (25) is simplified to

$$\frac{\alpha w''(b^*)}{u''(c^*)} > r(\rho - r), \tag{33}$$

whose economic intuition is much clearer than (25) as though they are the same intrinsically. From (30), (31) and (32), we have

$$\frac{dc^*}{d\theta} = 0, \tag{34}$$

$$\frac{dm^*}{d\theta} = \frac{u'(c^*)}{v''(m^*)} < 0, \tag{35}$$

$$\frac{db^*}{d\theta} = 0, \tag{36}$$

which surprisingly tells that the alteration of the rate of monetary growth has no effect on the long-run consumption and foreign asset holdings. Then we have derived a corollary.

Corollary If the utility is additively saparable between consumption and real money balance holdings, money is super-neutrality in the sense of Sidrauski (1967), i.e., an increase of the rate of monetary growth has no effect on long-run consumption and foreign asset holdings.[6]

It is shown that money neutrality does come into existence in our simple model of mercantilism. It is different from Obstfeld (1981), which derives the positive effects on consumption and foreign asset accumulation with saparable utility between consumption and real balances. And the distinction between Obstfeld model and the mercantilism model depends upon the assumption on the time preference rate.

It is useful to examine the reason underlying the distinction between the mercantilism model with nonsaparable utility and the one with saparable utility. The underlying reason is that the change of real balance holdings has no effect on the marginal utility of consumption in the saparable utility case, and hence has no effects on the long-run consumption and foreign asset holdings. Hence, the positive effect of consumption on real money balance holdings does not exist. Hence, the long run level of real balances does decrease, at the same time, money superneutrality obtains. [7]

4.3 The Effect of Foreign Exchange Intervention

Another interesting comparison between Obstfeld's model and ours is the result of the central bank's foreign exchange intervation. In Obstfeld's model, if the central bank intervenes in the

[6] It is easy to find that the comparative statics of other policy alterations in the saparable utility are the same to the nonsaparable utility between consumption and real money balances.

[7] Comparing with Obstfeld (1981) paper which gives money non-superneutrality results with saparable and Uzawa's engogenous time preference, we find that if we want to get the money non-superneutrality result, it is necessary to introduce a mechnism of connecting consumption and real balance holdings into the welfare function (or the objective funtion) of the representative consumer.

foreign exchange market by purchasing foreign bonds from the public with domestic currency, the total real asset in the economy is not affected, and, as the central bank's reserves also earn real income and wealth remains the same. Therefore, the central bank's intervention does not have real effects on foreign asset holdings, consumption and real balances. It only occasions a rise in the price level exactly proportional to the increase in money supply. In our wealth-effect model, the budget constraint does not change as the interest rate income earned by the central bank's reverses is still redistributed to the public, but, as foreigh bonds are directly valued in the utility function, the symmetry of foreign bonds and the central bank's reserves in Obstfeld'd model disappears. Shortly after the intervention of the central bank, the reduction of foreign bonds held by the private sector results in higher marginal utility of foreign asset, and the optimality condition (7) and the quilibrium condition (21) no longer hold. In fact, when the initial equilibrium foreign asset is reduced by dR and real balances are increased by dR, the conditions (7) and (21) become

$$\alpha w'(b - dR) + (r + \theta)u_c(c, m + dR) - u_m(c, m + dR) > 0,$$
$$\alpha w'(b^* - dR) + (r + \theta)u_c(c^*, m^* + dR) - u_m(c^*, m^* + dR) > 0.$$

To restore equilibrium, the representative agent will increase consumption and buy more foreign bonds in the short run. And in the new equilibrium, private consumption, real money balance holdings and foreign asset holdings will reach a higher level.

Alternatively, let $d\alpha = d\theta = dg = 0$ in (25) and Applying Cramer's Rule, we can obtain

$$\frac{dc^*}{dR} = \frac{\alpha r w''(b^*)[(\rho + \theta)u_{cm} - u_{mm}]}{\Delta} > 0, \tag{37}$$
$$\frac{dm^*}{dR} = \frac{\alpha r w''(b^*)[u_{mc} - (\rho + \theta)u_{cc}]}{\Delta} > 0, \tag{38}$$
$$\frac{db^*}{dR} = \frac{r(\rho - r)[u_{cc}u_{mm} - u_{cm}^2]}{\Delta} > 0. \tag{39}$$

Thus, we have the following proposition:

Proposition 3 The central bank's purchase of foreign claims from the public with domestic currency will lead to more foreign asset accumulation (the sum of central bank's reserve and private holdings), more consumption and more real money balances.

4.4 The Effect of Government Expenditure

Let $d\alpha = d\theta = dR = 0$ in (26). And applying Cramer's Rule, we obtain

$$\frac{dc^*}{dg} = \frac{\alpha w''(b^*)[u_{mm} - (\rho+\theta)u_{cm}]}{\Delta} < 0, \tag{40}$$

$$\frac{dm^*}{dg} = \frac{\alpha w''(b^*)[(\rho+\theta)u_{cc} - u_{cm}]}{\Delta} < 0, \tag{41}$$

$$\frac{db^*}{dg} = \frac{(\rho - r)[u_{cc}u_{mm} - u_{cm}^2]}{\Delta} < 0. \tag{42}$$

It is assumed initially that government consumption is wasteful, in that it does not enter into the agent's utility function. Hence, government expenditures crowd out private consumption and private asset accumulation. These conclusions are different from Obstfeld's (1981) ridiculous conclusions, which tell that the wasteful government expenditure have no effects on the private consumption and foreign asset holdings and positive effects on foreign asset accumulation.

The preceding discussion has been based on the assumption that the level of government spending does not enter into the utility function, as it would if government consumption resulted in the provision of some public goods. In Obstfeld's model with government expenditure into the utility function, it tells that the alterations of government expenditure have nagative effects on real money balance holding while the effects of this disturbance on private consumption and foreign asset holdings are ambiguous. But in our mercantilism model, the introduction of government expenditure into the utility function does not change the nagative effects on all of the three endogenous variables. To illustrate the strong results, we assume now that the utility function has the form

$$U(c, g, m, b) = u(c, g) + v(m) + \alpha v(m), u_g > 0, u_{cg} > 0. \tag{43}$$

According to (39), public and private consumption are complementary goods. After the same calculation procedure similar to the former case,[8] we obtain

$$\frac{dc^*}{dg} = \frac{-r(\rho - r)v''(m^*)u_{cg}(c^*, g) + \alpha w''(b^*)v''(m^*)}{\Delta} < 0,$$

$$\frac{dm^*}{dg} = \frac{\alpha(\rho+\theta)w''(b^*)[u_{cc}(c^*, g) - u_{cg}(c^*, g)]}{\Delta} < 0,$$

$$\frac{db^*}{dg} = \frac{(\rho - r)v''(m^*)[u_{cc}(c^*, g) - u_{cg}(c^*, g)]}{\Delta} < 0,$$

with $\Delta = r(\rho - r)w''(b^*)u_{cc}(c^*, g) - \alpha w''(b^*)v''(m^*) < 0$. Therefore, we have Propositon 4.

[8] These calculations are in the appendix.

Proposition 4 Government spending always reduces long-run consumption, real money balances and foreign asset holdings, even in the case that both public consumption and private consumption do enter into the private utility function.

It seems that Proposition 3, especially Proposition 4 gives ridiculous results. As a matter of fact, they nicely embody the essentials of the mercantilist sentiments: accumulation. Government consumption is just like the private consumption which means the decrease of the wealth and the decrease of asset accumulation. But the mercantilist spirits tell that we should focus on accumulation not consumption in the short run, then we will obtain more long-run consumption and wealth.

5 Conclusion

As an interesting economic theory with strong policy implications for the nations, mercantilism retained her fascination in the academic and political environment. Past studies are literal description and formal mathematical model for mercantilism is seldom. In this paper, we formulate a simple mathematical model of mercantilism and studies the effects of macroecnomic policies on foreign asset accumulation in a wealth effect model used by Bardhan (1967), Kurz(1968), Calvo (1980), Blanchard (1983) and Zou (1997).

The contributions of this paper can be summerized as follows. First of all, we formulate a mercantilism model in the framework of open international macroeconomics and present a theorem on the existence, uniqueness and stability of the steady state. It is shown that the relative smoothness condition for foreign asset accumulation to consumption is a necessary condition to guarantee the saddle-point stability of the steady state. Secondly, we execute the full comparative statics of many macroeconomic policies and draw very interesting conclusions different from the literature, especially from Obstfeld (1981). The results show that inflation (or an increase of the monetary growth rate) and foreign exchange intervention have positive effects on the long-run consumption and long-run foreign asset accumulation, government expenditure disturbance has negative effects on the long-run consumption, real money balance holdings and foreign asset holdings and the nations with more mercantilist sentiments will have more long-run consumption, real money balances and foreign assets. In particular, we have shown that money is superneutrality when the private utility is saparable between consumption and real money balance holdings. Comparing to the ridiculous results in Obstfeld (1981), we draw intuitional, profound and interesting conclutions. At the same time, it is obvious that the difference between

the paper and the literature is from the model strateties. Acturally, it is clear that evaluating the consequences of macroeconomic policies is complicated and the results are often very sensitive to the optimization framework we have utilized. Our wealth effect model only provides a different perspective to the problems and it should be taken as complementary to many existing models.

The economic theory of mercantilism is abundant and complex. And the simple model in the paper is just a try to grasp its spirits and much work should be done. In future research, it is desirable to extent the endowment-economy and small-economy model in this paper into a big-country model with both capital accumulation and foreign asset holdings. And we think that such research extentions can include the more ideas of mercantilism and may be a way to find and solve the possible paradox in this theory.

Appendix

The corresponding Hamiltonian is

$$H = u(c,g) + v(m) + \alpha w(b) + \lambda(y + rb + x - c - \pi m) + \mu(a - b - m),$$

where λ and μ are Hamiltonian multiplier and Lagrangian multiplier of the two budget constraints. It is easy to derive the dynamic system with respect to (c, m, b) :

$$\begin{aligned}
\dot{c} &= -\frac{1}{u_{cc}(c,g)}[\alpha w'(b) + (r-\rho)u_c(c,g)], \\
\dot{m} &= \frac{m}{u_c(c,g)}[(r+\theta)u_c(c,g) + \alpha w'(b) - v'(m)], \\
\dot{b} &= y + rb + rR - c - g.
\end{aligned}$$

Linearizing the dynamic system around the steady state (c^*, m^*, b^*), we have

$$\begin{bmatrix} \dot{c} \\ \dot{m} \\ \dot{b} \end{bmatrix} = \begin{bmatrix} \rho - r & 0 & -\frac{\alpha w''(b^*)}{u_{cc}(c^*,g)} \\ \frac{(r+\theta)m^* u_{cc}(c^*,g)}{u_c(c^*,g)} & -\frac{m^* v''(m^*)}{u_c(c^*,g)} & \frac{\alpha m^* w''(b^*)}{u_c(c^*,g)} \\ -1 & 0 & r \end{bmatrix} \begin{bmatrix} c - c^* \\ m - m^* \\ b - b^* \end{bmatrix}.$$

Then the trace of the Jacobian matrix J are $trace(J) = \rho - \frac{m^* v''(m^*)}{u_c(c^*,g)}$, which is positive. And the determinant of the Jacobian matrix are $\det(J) = -\frac{r(\rho-r)m^* v''(m^*)}{u_c(c^*,g)} + \frac{\alpha m^* w''(b^*) v''(m^*)}{u_c(c^*,g)u_{cc}(c^*,g)}$. In order to guarantee saddle-point stability, we must impose $\det(J) < 0$, which is equivalent to $\frac{\alpha w''(b^*)}{u_{cc}(c^*,g)} > r(\rho - r)$. Hence, we obtain the relative smoothness condition

$$\frac{\alpha w''(b^*)}{u_{cc}(c^*,g)} > r(\rho - r).$$

The stationary values of consumption, real balances and foreigh assets are determined by the equations:

$$\begin{aligned} \alpha w'(b^*) + (r-\rho)u_c(c^*, g) &= 0, \\ (r+\theta)u_c(c^*, g) + \alpha w'(b^*) - v'(m^*) &= 0, \\ y + rb^* + rR - c^* - g &= 0. \end{aligned}$$

Totally differetiating these equations and let $d\alpha = dr = d\rho = dR = dy = 0$, we have

$$\begin{bmatrix} (r-\rho)u_{cc}(c^*, g) & 0 & \alpha w''(b^*) \\ (r+\theta)u_{cc}(c^*, g) & -v''(m^*) & \alpha w''(b^*) \\ -1 & 0 & r \end{bmatrix} \begin{bmatrix} dc^* \\ dm^* \\ db^* \end{bmatrix} = \begin{bmatrix} (\rho - r)u_{cg}(c^*, g) \\ -(r+\theta)u_{cg}(c^*, g) \\ 1 \end{bmatrix} dg.$$

Define the three dimension matrix of the matrix eqution as Δ. Then, we have

$$\Delta = r(\rho - r)w''(b^*)u_{cc}(c^*, g) - \alpha w''(b^*)v''(m^*) < 0.$$

Hence

$$\begin{aligned} \frac{dc^*}{dg} &= \frac{-r(\rho - r)v''(m^*)u_{cg}(c^*, g) + \alpha w''(b^*)v''(m^*)}{\Delta} < 0, \\ \frac{dm^*}{dg} &= \frac{\alpha(\rho + \theta)w''(b^*)[u_{cc}(c^*, g) - u_{cg}(c^*, g)]}{\Delta} < 0, \\ \frac{db^*}{dg} &= \frac{(\rho - r)v''(m^*)[u_{cc}(c^*, g) - u_{cg}(c^*, g)]}{\Delta} < 0. \end{aligned}$$

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