Lecture Note 2

Mercantilism, Money and Specie-flow

1. Mercantilism in the framework of contemporary macroeconomics

Even if the general attitude towards mercantilism has been critical, some newer contributors have reconsidered the main ideas of the period using the methods and machinery of contemporary economic analysis. Here we briefly review the work of Xou (1997), which transforms an earlier model Jacob Viner (1937) into a dynamic one.

The point of departure is a given nation with its utility function specified as

$$U((c_h, c_f, b) = \int_0^\infty \Big(u(c_h, c_f) + \beta w(b)\Big) e^{-\rho t}\, \mathrm{d}t, \tag{1}$$

where u is the instantaneous utility, depending on per capita consumption of domestic goods (c_h) and foreign goods (c_f), and where w is the utility of wealth b, which may take the form of per capita foreign asset holdings, possibly in the form of gold. The parameter β indicated the weight of the wealth component in utility as compared to consumption, and it may be taken as a measure of the mercantilist 'sentiment' or 'mentality'. The variables are connected by the equation

$$\dot{b} = \frac{y}{p} + rb - \frac{c_h}{p} - (1+\tau)c_f + \frac{x}{p}, \tag{2}$$

where y is per capita endowment, r is the interest rate on foreign assets, τ the tariff on foreign goods and x per capita government transfer.

We assume that the objective of mercantilism is the maximization of (1). Whether this is a correct interpretation of mercantilism is of course open to debate, but the objective of power *and* plenty seems to have been characteristic for both thinkers and political decision makers of the period. We obtain first order conditions using the maximum principle, and for this we need the derivatives of the Hamiltonian

$$u(c_h, c_f) + \beta w(b) + \lambda\left[\frac{y}{p} + rb - \frac{c_h}{p} - (1+\tau)c_f + \frac{x}{p}\right],$$

where $\lambda(t)$ is the shadow price of assets at time t, which taken together gives us the equations

$$\frac{\partial u}{\partial c_h} = \frac{\lambda}{p}, \ \frac{\partial u}{\partial c_f} = \lambda(1+\tau), \tag{3}$$
$$\dot{\lambda} = (p-r)\lambda - \beta w'(b), \tag{4}$$

together with the dynamics for b given in (2). From (3) we can express c_h and c_f as functions $c_h(\lambda, p, \tau)$, $c_f(\lambda, \tau, p)$ of λ, p and τ. With standard assumptions on utility functions we have that the partial derivatives of c_h and c_f with respect to λ and τ are negative whereas the partial derivatives w.r.t. p are positive. Inserting $c_h(\lambda, p, \tau)$, $c_f(\lambda, \tau, p)$ in (2) and restating (2), we get the equations system

$$\begin{aligned} \dot{b} &= \frac{y}{p} + rb - \frac{c_h(\lambda, p, \tau)}{p} - c_f(\lambda, p, \tau), \\ \dot{\lambda} &= (\rho - r)\lambda - \beta w'(b), \end{aligned} \tag{5}$$

where we have simplified (2) assuming a balanced government budget, so that transfers are equal to tariff revenue.

We are interested in the *steady state* path of the economy, where the left-hand sides in (5) are 0 at any time t, so that b and λ are fixed at values b^* and λ^*, respectively. We may now compare alternative steady states, changing for example the parameter β and following what happens to the solution of the system (2)

$$\begin{aligned} 0 &= \frac{y}{p} + rb - \frac{c_h(\lambda, p, \tau)}{p} - c_f(\lambda, p, \tau), \\ 0 &= (\rho - r)\lambda - \beta w'(b), \end{aligned} \tag{6}$$

which gives us b and λ as functions of β. Technically, we use *implicit function theorem*, which gives that

$$\begin{pmatrix} \frac{\mathrm{d}b}{\mathrm{d}\beta} \\ \frac{\mathrm{d}\lambda}{\mathrm{d}\beta} \end{pmatrix} = -M^{-1} \begin{pmatrix} 0 \\ -w'(b) \end{pmatrix},$$

where M is the matrix of partial derivatives of the system (6),

$$M = \begin{pmatrix} r & -\frac{1}{p}\frac{\partial c_h}{\partial \lambda} - \frac{\partial c_f}{\partial \lambda} \\ -w''(b^*) & \rho - r \end{pmatrix}.$$

The determinant of M is $|M| = r(\rho - r) - w''(b^*)\left[\frac{1}{p}\frac{\partial c_h}{\partial \lambda} + \frac{\partial c_f}{\partial \lambda}\right]$, which we assume to be positive, and the inverse of M can be found using Cramer's rule as

$$M^{-1} = \frac{1}{|M|}\begin{pmatrix} \rho - r & \frac{1}{p}\frac{\partial c_h}{\partial \lambda} + \frac{\partial c_f}{\partial \lambda} \\ w''(b^*) & r \end{pmatrix},$$

so that

$$\begin{pmatrix} \frac{\mathrm{d}b}{\mathrm{d}\beta} \\ \frac{\mathrm{d}\lambda}{\mathrm{d}\beta} \end{pmatrix} = \frac{1}{|M|}\begin{pmatrix} w''(b^*)\left[\frac{1}{p}\frac{\partial c_h}{\partial \lambda} + \frac{\partial c_f}{\partial \lambda}\right] \\ rw''(b^*) \end{pmatrix}. \tag{7}$$

Under the standard assumption of decreasing marginal utility of wealth, we get from (7) that the steady state level of assets increases with β, and the shadow price of assets falls, so that consumption of both domestic and foreign goods will increase.

2. The quantity theory of money

A crude version of the quantity theory of money, pointing out that an increased inflow of precious metals will lead to increases in the level of prices, had been around beforfe the mercantilist era – and indeed it was a straightforward conclusion given the inflow of gold and silver from the Americas. But the contribution of Locke is important since it goes into the details of the formation of prices and links it to the amount of money and its *vent*, a somewhat obscure concept which plays an important role. Here is a simple version (due to Negishi) of the theory.

Consider a seller with a stock S which can be sold now (x_1) or in the future (simplified to a single next period) x_2, with prices

$$p_1 = a - bx_1,\ p_2 = q,$$

having a cost of storage $C = c_1 + c_2x_2 + c_3x_2^2$. Demand equal to supply means that $x_1 + x_2 = S$, and inserting this, we get a profit function

$$(a - bx_1)x_1 + \beta(qx_2 - c_1 - c_2x_2 - c_3x_2^2) = (a - \beta q + \beta c_2 + 2\beta S c_3)x_1 - (b + \beta c_3)x_1^2 + \text{constant},$$

where β is the discount factor. First order condition for maximum is

$$(a - \beta q + \beta c_2) - 2(b + \beta c_3)x_1 + 2\beta c_3 S = 0. \tag{8}$$

Following Locke, p_1 should be higher when $\frac{x_1}{S}$ (the proportion of 'vent' to quantity) is higher. Using implicit function theorem on (8), we get

$$\frac{\mathrm{d}x_1}{\mathrm{d}S} = \frac{\beta c_3}{b + \beta c_3} > 0,$$

so that an increase in S will reduce p_1. To get Locke's proposition, we rewrite (8) as

$$\frac{a - \beta q + \beta c_2}{S} - 2(b + \beta c_3)\frac{x_1}{S} + 2\beta c_3 = 0, \tag{9}$$

and use implicit function theorem once again to get

$$\frac{\mathrm{d}\left(\frac{x_1}{S}\right)}{\mathrm{d}S} = -\frac{a - \beta q + \beta c_2}{2S^2(b + \beta c_3)}$$

which is < 0 if $a > \beta q$, which may reasonably be assumed. Turning it around, we also have that $\frac{\mathrm{d}S}{\mathrm{d}\left(\frac{x_1}{S}\right)} < 0$. Now we have Locke's proposition: If $\frac{x_1}{S}$, the proportion of vent to stock, increases, then S decreases, consequently x_1 decreases and therefore p goes up.

The current demand (or "vent") may be increased for fixed S by changing a or b. Taking (8) as a function of x_1 and a, we get that

$$\frac{\mathrm{d}x_1}{\mathrm{d}a} = \frac{1}{2b + 2\beta c_3} > 0$$

and $\frac{\mathrm{d}p_1}{\mathrm{d}a} = \frac{b + 2\beta c_3}{2b + 2\beta c_3} > 0$. Similarly, we find that $\frac{\mathrm{d}p_1}{\mathrm{d}b} = -\frac{\beta c_3 x_1}{b + \beta c_3} < 0$.

The results can be used to see that prices of commodities are influenced by changes in the parameters, possibly caused by changes in the quantity of money. It should not be seen as a price or value theory. In the particular case where the commodity itself is money (as a medium of exchange), and its price is expressed in terms of some numeraire, we have that b is very small, and the left-hand side of (8),

$$(a - \beta q + \beta c_2) - 2bx_1 + (2\beta c_3 S - 2\beta c_3 x_1)$$

is positive for $x_1 = S$, meaning that the maximum is found at the boundary, so the rate of turnover is highest possible for this money commodity. Thus, increasing S induces the same increase in x_1, at and the numeraire price of money is reduced. accordingly.

3. David Hume and the specie-flow mechanism

A common point of all the economists of the classical era was that the mercantilist emphasis on surplus in the trade balance and inflow of precious metals was bases on an intellectual failure: The so-called *mercantilist dilemma* points out that a trade surplus leads to an increase in the quantity of money in the country, which will lead to a general rise in the price level and with the consequence that the country increases its imports and reduces exports, resulting in an outflow of precious metals. This specie-flow argument was formulated in detail by Hume in several essays.

There are some details where a modern economist might want further clarity: How can prices change and differ from those of the other countries when there is free trade and everything is bought and sold against gold (or other precious metals)? So it seems that what is meant is *terms of trade* rather than general price level.

To check the consistency of the specie-flow mechanism, one should of course keep the economies involved as close to that of the classical economists as possible. Following Dornbusch, Fischer and Samuelson (1976) (here taken from N), we consider a Ricardian two-country model of trade, countries are fully specialized, production takes place under constant returns to scale and labor is the only input used. Consumption depends on the quantity of money and its velocity, and is split in fixed proportions a and $1 - a$ between exportables (commodity 1) and imports (commodity 2). The equilibrium condition in the home country is then

$$wL = \underbrace{aV\frac{M}{G}G}_{\text{our consumption of commodity 1}} + \underbrace{a^*V^*\left(1 - \frac{M}{G}\right)G}_{\text{the other country's consumption}},$$

where w is the wage rate, M the quantity of money in the home country, G world amount of gold, and V velocity of money, an asterisk * denotes similar variables in the foreign country. There is a similar equilibrium condition for the other country,

$$w^*L^* = (1-a)V\frac{M}{G}G + (1-a^*)V^*\left(1 - \frac{M}{G}\right)G.$$

If we assume that $a = a^*$ (identical consumption structure in the two countries, a standard assumption in trade theory) and $V = V^*$, then it is easy to see that w and w^* are independent of the distribution of gold between the two countries.

The specie-flow mechanism is now added:

$$\frac{\mathrm{d}M}{\mathrm{d}t} = wL - VM,$$

the inflow of gold is determined by the difference between incomes and its uses. With this dynamical adaptation, we have that eventually one will reach a level of M where the trade balance is 0. In other words, the distribution of specie between the countries is uniquely determined by the specie-flow mechanism. We have thus vindicated the classical refutation of mercantilism.

As Negishi points out, it is somewhat unfair to assume perfect international markets, where consumers buy with no difference between domestic and foreign products, when dealing with the rather primitive trade processes of the mercantilist era. Instead one may introduce specific *exporters* and *importers* doing this trade, something which allows for price changes in one country only. If we think of production taking time, we may assume that domestic importers have to advance to foreign producers a share $1 - s$ of the capital used in setting up the production, a similarly, foreign importers share $1 - r$ of the cost. Assuming as above that $a = a^*$, $V = V*$, we get now get that

$$wL = \underbrace{aMV}_{\text{our consumption of good 1}} + \underbrace{aM^*Vr}_{\text{our outlay on export}} + \underbrace{(1-a)MV(1-s)}_{\text{our advance on imports}},$$

total income is used for consumption of the exportable, own cost of initiating export production, and our share of setting up production of importables. Similarly for the other country,

$$w^*L^* = (1-a)M^*V + (1-a)MVs + aM^*V(1-r).$$

Together with the equation $M + M^* = G$ this gives a system which can be solved to give equilibrium values of w and w^* (average price of services obtained from one unit of labor). An increase in M with resulting fall in M^* will now increase w and reduce w^*. Now we have a version of the classical specie-flow argument which is gives the terms-of-trade effect of the balance-of-trade surplus.

References

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