EC933-G-AU INTERNATIONAL FINANCE – LECTURE 2

MACROECONOMIC THEORIES OF BALANCE OF PAYMENTS ADJUSTMENT: FLOW APPROACHES

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Abstract. In this chapter, we summarise the major theories of balance of payments (BoP) adjustment maintained since the inter-war period and, particularly, during the Bretton-Woods era. These theories were mostly based on partial equilibrium (PE) models of an aggregative (ad hoc) nature. Since capital movements were not that important in those times, the BoP was essentially interpreted as equivalent to the current account (CA), and often even as the balance on goods and services only. It is true that nowadays to abstract from capital flows is unrealistic. Nevertheless, we start here from the easier, and chronologically earlier, models, to progressively build upon them, as well as on the historical and institutional context introduced alongside, and develop richer and more complete models of the open economy. Understanding the current account is thus a necessary first step, a crucial building block, in considering the BoP as a whole and the interactions among open economies. The early theories of BoP (in fact, CA) adjustment focused on two alternative channels along which this adjustment could be achieved: exchange rate changes under the ceteris paribus clause (i.e., in PE) or changes in income under the same ceteris paribus assumption. The former adjustment mechanism was operative under a flexible exchange rate system, whereas the latter under peg. We start in section 1 with a simple model that highlights BoP adjustment through variation in the exchange rate, known also as the elasticity approach. In section 2 we go on to look at the alternative mechanism of BoP adjustment through income changes, often termed the (foreign trade) multiplier approach. In section 3, we sketch an integrated approach to BoP adjustment which nests the two earlier approaches, as proposed in the Laursen-Metzler (1950) model. Throughout these sections we also discuss the so-called "transfer problem" and its alternative explanations, a major debate in the inter-war and post-war period. Section 4 finally presents one of the long-lived workhorses of international macroeconomics, especially at the policy-making level, the original (static) Mundell-Fleming model of the early 1960s, which is, in essence, an extension of the closed-economy sticky-price Keynes (1936) – Hicks (1937) IS-LM framework to the case of the open economy.

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This set of lecture notes is preliminary and incomplete. It is based on parts of the four textbooks suggested as essential and supplementary reading for my graduate course in international finance at Essex as well as on the related literature (see the course outline and reading list at http://courses/essex.ac.uk/ec/ec933/). The notes are intended to be of some help to the students attending the course and, in this sense, many aspects of them will be clarified during lectures. The present second draft may be developed and completed in future revisions. The responsibility for any errors and misinterpretations is, of course, only mine. Comments are welcome, preferably by e-mail at mihailov@essex.ac.uk and/or a_mihailov@hotmail.com.

Contents

1. BoP Adjustment through Exchange-Rate Variation: The Elasticity Approach

1.1. **Assumptions.** We begin by considering the adjustment of the BoP – or, as we assume throughout this section, the balance on goods and services (to which it reduces abstracting from net factor income, current transfers and capital movements) – through *changes* in the *nominal exchange rate* (NER), inducing in turn *changes* in the *relative price* of home in terms of foreign goods. The latter price, in the context of the simple model with each good available only in one of the countries (by *endowment differences*) we are laying out here, coincides with the (international) *terms of trade* (ToT) of the *Home* country defined in chapter 1.

$$q^{ToT} \equiv \frac{P_{EX}}{SP^*_{IM}}. \tag{1.1}$$

Since the NER, S, multiplies the foreign-currency price of the imported $Foreign$ good, P^*_{IM} (and not the domestic-currency price of the exported $Home$ good, P_{EX}), implicit in the definition is the traditional assumption of *producer's* currency pricing (PCP), also called *exporter's* currency pricing or *seller's* currency pricing.[1] Another assumption of the model is that the two countries considered trade in a *not perfectly homogeneous* good, which would in simpler language mean that this good is similar, so that *substitution in consumption* is possible to a high extent, but the good is nevertheless differentiated in the sense of being *distinctive to consumers* according to its origin (H or F).

The above relative price[2] is the key variable through which the mechanism of BoP adjustment operates in the present context. More precisely,

(1) a change in the *exchange rate* S, ceteris paribus,
(2) causes directly a change in the *relative price* of goods, given in this simple model by the ToT, q^{ToT},
(3) which induces further a change in the *quantities demanded* for the two goods, q^D_{EX} and q^D_{IM},
(4) and, under the assumption of *perfectly elastic (geometrically, horizontal) supply (curve)*, also implicit in the simpler model version we expose in brief here,[3] i.e., with $q^D_{EX} \equiv q^S_{EX} \equiv q_{EX}$ and $q^D_{IM} \equiv q^S_{IM} \equiv q_{IM}$,
(5) the *disequilibrium* in the balance (of payments) on goods and services will hopefully adjust.

1.2. **Expenditure Switching and Expenditure Reducing Policies.** BoP adjustment to equilibrium could be *automatic*, or spontaneous, i.e., a movement (correction) of the exchange rate in a freely operating forex market originating only in the law of supply of and demand for foreign currency. This case corresponds to a situation of *perfectly floating* exchange rates.

BoP adjustment could as well be in response to certain *policy* measure(s), targeted at eliminating the disequilibrium. Such an intervention by the (monetary) authorities would be possible under a dirty float or under some form of a *limited-flexibility* exchange rate regime, e.g., an adjustable peg.

It is natural to introduce in the present context some terminology, due to Johnson (1958), with a very wide use in international macroeconomics. In the latter case of a *policy-induced* BoP adjustment, one may distinguish between expenditure switching policy and expenditure reducing policy. *Expenditure switching* policy is aimed at restoring BoP equilibrium by inducing agents to *switch* (consumption) expenditure between the goods whose relative price has changed, e.g., the domestic and the foreign good, as a result of a change (devaluation or revaluation) of

[1]Later in this course, we shall also consider in more detail an alternative invoicing convention in international trade denoted *consumer's* (or *local*) currency pricing (CCP or LCP) or *importer's* currency pricing or still *buyer's* currency pricing.

[2]It may vary because of a change in the NER, S, as considered below, or because of a change in either the price of the exported good, P_{EX}, or the price of the imported good, P^*_{IM}, both expressed in the respective *national* currency consistent with traditional PCP. For the latter two cases, refer to Gandolfo (2001), section C.1.3 in the Appendix, pp. 435-436.

[3]For the general case when supply is an *increasing* function of the price (expressed in the *national* currency for suppliers), see Gandolfo (2001), section C.1.2 in the Appendix, pp. 431-435.

the nominal exchange rate. Expenditure switching could also arise independently of any policy, from the optimal behaviour of economic agents facing an exchange rate change or a variation in a key relative price. There is another policy, however, in the case of a *deficit* (not surplus) of the BoP that could be implemented to curb (or absorb) this deficit: it is known as *expenditure reducing* policy and consists in undertaking *fiscal and/or monetary restriction* which aims to reduce *total* (consumption) expenditure, thus also decreasing expenditure on *imports*, as part of total expenditure.

1.3. **The Marshall-Lerner Critical Elasticities Condition.** Observe that exports vary in the *same* direction as the NER, i.e., an increase in NER (by definition, a depreciation of the domestic currency) leads to an increase in the quantity exported as well. The intuition is that *depreciation* makes the domestic good *cheaper* for the rest of the world, which can now, ceteris paribus, buy *more* units of it.

By contrast, imports vary in the *opposite* direction to the nominal exchange rate, i.e., a domestic currency depreciation reduces the quantity of goods imported from abroad. Again, the intuition is that *depreciation* makes the foreign good *more expensive* for domestic agents, who can now, ceteris paribus, buy *less* units of it.

From examining the relative price between the domestic and foreign good, coinciding with the ToT in the simple model considered here, one could reach the conclusion that, given the implicit *PCP* (or *seller's* currency) assumption underlying these early models, the NER and the ToT would be *positively* correlated.[4]

What is important to see is that the above "directional analysis" of the effect of NER movements on the real *quantity* of goods exported and imported is not sufficient to determine whether a NER change will ultimately cause an improvement or a deterioration of the BoP. This is so because, by definition, the BoP is expressed in monetary terms and therefore records the *values* – that is, the product of *prices* and *quantities* – of exports and imports. Recall from microeconomics that what determines the changes in the value of exports and imports following a change of the exchange rate are the corresponding elasticities of the quantities of exports and imports with respect to the mentioned NER change.

We shall denote the exchange-rate elasticity of exports by η_{EX} and the exchange-rate elasticity of imports by η_{IM} and will usually define them by:

$$\eta_{EX} \equiv \frac{\frac{\Delta q_{EX}}{q_{EX}}}{\frac{\Delta S}{S}} \equiv \frac{\Delta q_{EX}}{\Delta S}\frac{S}{q_{EX}}, \qquad \eta_{IM} \equiv -\frac{\frac{\Delta q_{IM}}{q_{IM}}}{\frac{\Delta S}{S}} \equiv -\frac{\Delta q_{IM}}{\Delta S}\frac{S}{q_{IM}}. \tag{1.2}$$

Note that η_{EX} and η_{IM} are defined as positive numbers, following Gandolfo's textbook and the traditional literature: the minus sign in the definition of the import (demand) elasticity η_{IM} serves to express it as a positive number (Δq_{IM} and ΔS have, in fact, opposite signs, as made clear earlier, so that their ratio and, hence, the fraction by itself are negative), directly comparable to η_{EX}.[5] Sticking to the PCP assumption, we can write the BoP (or, more precisely its *current account*, CA, excluding unilateral transfers) in domestic currency value:

$$CA \equiv P_{EX}q_{EX} - SP^*_{IM}q_{IM}. \tag{1.3}$$

Consider now a depreciation of the domestic currency by a small amount, say ΔS. Correspondingly, the quantities of exports and imports change by Δq_{EX} and Δq_{IM}. The new value of the BoP will thus be:

$$CA + \Delta CA \equiv P_{EX}\left(q_{EX} + \Delta q_{EX}\right) - (S + \Delta S)P^*_{IM}\left(q_{IM} + \Delta q_{IM}\right). \tag{1.4}$$

Subtracting (1.3) from (1.4), one can obtain the change in the value of the BoP ΔCA following a small depreciation ΔS:

[4]If *CCP* (or price setting in the *buyer's* currency) is assumed instead, the NER-ToT correlation will be *negative*. We shall return to this point further in our course.

[5]Recall that there is another definition of (*point* vs arc) elasticity, which takes the limit of the above expression as the price (NER, in our case) change goes to zero.

$$\Delta CA \equiv P_{EX}\Delta q_{EX} - SP^*_{IM}\Delta q_{IM} - \Delta SP^*_{IM}q_{IM} - \Delta SP^*_{IM}\Delta q_{IM}.$$

Since ΔS and Δq_{IM} are small magnitudes, their product in the last term above is of second order of importance (i.e., is negligible) and could be skipped for convenience. The resulting expression is then algebraically manipulated as follows:

$$\Delta CA \approx P_{EX}\Delta q_{EX} - SP^*_{IM}\Delta q_{IM} - \Delta SP^*_{IM}q_{IM} =$$

$$= \Delta SP^*_{IM}q_{IM}\left(\frac{P_{EX}\Delta q_{EX}}{\Delta SP^*_{IM}q_{IM}} - \frac{SP^*_{IM}\Delta q_{IM}}{\Delta SP^*_{IM}q_{IM}} - 1\right) =$$

$$= \Delta SP^*_{IM}q_{IM}\left(\underbrace{\frac{\Delta q_{EX}}{\Delta S}\frac{S}{q_{EX}}}_{\equiv \eta_{EX}}\frac{q_{EX}}{S}\frac{P_{EX}}{P^*_{IM}q_{IM}} - \underbrace{\frac{\Delta q_{IM}}{\Delta S}\frac{S}{q_{IM}}}_{\equiv \eta_{IM}} - 1\right) =$$

$$= \Delta SP^*_{IM}q_{IM}\left(\eta_{EX}\frac{P_{EX}q_{EX}}{SP^*_{IM}q_{IM}} + \eta_{IM} - 1\right).$$

$\Delta S > 0$, because we assumed a depreciation, and since $P^*_{IM} > 0$ and $q_{IM} > 0$ by definition as well, $\Delta SP^*_{IM}q_{IM} > 0$ too. Then, for the BoP change, ΔCA, to be positive, one must have the expression in brackets above satisfying:

$$\eta_{EX}\frac{P_{EX}q_{EX}}{SP^*_{IM}q_{IM}} + \eta_{IM} - 1 > 0.$$

Hence,

$$\eta_{EX}\frac{P_{EX}q_{EX}}{SP^*_{IM}q_{IM}} + \eta_{IM} > 1. \tag{1.5}$$

If one further considers an *initial* situation (i.e., *before* the minimal change in NER, ΔS) near equilibrium, such that

$$\underbrace{P_{EX}q_{EX}}_{\equiv H\text{-currency } Hexports} \approx \underbrace{SP^*_{IM}q_{IM}}_{\equiv H\text{-currency } Himports},$$

(1.5) simplifies to

$$\eta_{EX} + \eta_{IM} > 1. \tag{1.6}$$

Inequality (1.6) has been known in the literature as the *Marshall-Lerner(-Harberger)* condition. It states that for a nominal exchange rate *depreciation* to result in an *improvement* of the BoP (understood in a narrow sense as the balance on goods and services), it must be that the *sum* of the NER elasticities of exports and imports (more precisely, the elasticities of export and import demand with respect to the relative price under perfectly elastic supply) is greater than unity. Gandolfo argues on p. 84 of his textbook that the name of the condition does not truly reflect the contribution made by several other economists to the literature in question. He does not deny that Lerner (1944) has independently arrived at the condition but claims that other researchers, namely Joan Robinson (1937) and Bickerdicke (1920), have reached the same conclusion chronologically earlier. Gandolfo's textbook does not include Harberger in the name of the condition although other authors do. Anyway, Harberger's (1950) analysis comes later. Gandolfo attributes to Bickerdicke (1920) the first full and correct formal conditions for an exchange rate depreciation to improve the BoP. As for Marshall, his (more distantly) analogous contributions refer to the pure theory of trade and concern the stability of international barter equilibrium analysed in terms of offer curves, which does not appear convincing to Gandolfo for considering Marshall as directly involved in deriving the condition named after him and Lerner. What is suggested, therefore, in Gandolfo's textbook is to more appropriately call (1.6) the *Bickerdicke-Robinson* condition, or – neutrally – the *critical elasticities* condition. We would agree, in principle, with Gandolfo's historical clarification. But since the inequality in question has become so widely referred to in the literature as the Marshall-Lerner condition, we shall keep on using that terminology in our course.

Let us also note that the Marshall-Lerner condition (1.6) is, certainly, an *approximation* which is applicable in the case when initially the BoP is *near* equilibrium. It is *only* then that we could replace $\frac{P_{EX}q_{EX}}{SP^*_{IM}q_{IM}}$ by 1, as done in the transition from inequality (1.5) to inequality (1.6). Another problem is that a depreciation or devaluation is unlikely to occur – spontaneously under free float or intentionally under adjustable peg or managed float – when the BoP does not deviate much from equilibrium. On the contrary, such depreciation/devaluation is much more likely if the BoP (understood here as the balance on goods and services, CA) is in deficit. However, the trade deficit would imply $P_{EX}q_{EX} < SP^*_{IM}q_{IM} \Leftrightarrow \frac{P_{EX}q_{EX}}{SP^*_{IM}q_{IM}} < 1$, so the value of η_{EX} will be multiplied by a factor smaller than one; hence, if the sum of the critical elasticities is just above unity and if the trade deficit is sufficiently large, it may happen that condition (1.6) is not satisfied. That is why in such situations one should rather refer to the more general condition (1.5).

A final point is that the above argumentation could have been done for the BoP expressed in foreign currency:

$$CA^* \equiv \frac{1}{S}P_{EX}q_{EX} - P^*_{IM}q_{IM} = \frac{1}{S}\underbrace{(P_{EX}q_{EX} - SP^*_{IM}q_{IM})}_{\equiv CA,\ \text{from (1.3)}} = \frac{1}{S}CA. \tag{1.7}$$

The corresponding critical elasticity condition would then have come out to be, in its general form,

$$\eta_{EX} + \eta_{IM}\frac{SP^*_{IM}q_{IM}}{P_{EX}q_{EX}} > 1, \tag{1.8}$$

so that, with initial equilibrium, its approximation is exactly the same as the one derived using the BoP in home currency, i.e., (1.6) above:

$$\eta_{EX} + \eta_{IM} > 1.$$

1.4. **Elasticity Optimism vs Elasticity Pessimism.** A major debate has been under way since the specification of the critical elasticities condition as to whether $\eta_{EX}+\eta_{IM} > 1$ (elasticity *optimism*: elasticities are *sufficiently high* so that the Marshall-Lerner condition is not violated) or $\eta_{EX} + \eta_{IM} < 1$ (elasticity *pessimism*: elasticities are *too low* to satisfy the Marshall-Lerner condition). The debate has been particularly active, and research on it is ongoing even now.

Earlier empirical studies to estimate the elasticities of exports and imports were generally based on single equations in partial equilibrium contexts, thus neglecting (potential) interrelationships among different variables. A recent work by Hooper et al. (2000) recognises the simultaneity of income, prices and trade and applies cointegration methods to estimate the long-run elasticities of exports and imports for the G-7 countries. Their finding is that, with the exception of France and Germany, the critical elasticities satisfy the Marshall-Lerner condition.

1.5. **Foreign Exchange Market Equilibrium and Stability.** Under PCP the demand, supply and excess demand for *foreign exchange* are as follows:

$$D_{fx}(S) = P^*_{IM}IM(S), \qquad S_{fx}(S) = \frac{1}{S}P_{EX}EX(S), \tag{1.9}$$

$$ED_{fx}(S) \equiv D_{fx}(S) - S_{fx}(S) = P^*_{IM}IM(S) - \frac{1}{S}P_{EX}EX(S). \tag{1.10}$$

Under CCP the respective schedules are:

$$D_{fx}(S) = \frac{1}{S}P_{IM}IM(S), \qquad S_{fx}(S) = SP^*_{EX}EX(S), \tag{1.11}$$

$$ED_{fx}(S) \equiv D_{fx}(S) - S_{fx}(S) = \frac{1}{S}P_{IM}IM(S) - SP^*_{EX}EX(S). \tag{1.12}$$

Hence, under both PCP and CCP, a positive (negative) excess demand for foreign exchange in the domestic economy coincides with – or, which is the same, is equivalent to – a trade (BoP) deficit (surplus):

$$ED_{fx}(S) \gtreqless 0 \Longleftrightarrow CA \lesseqgtr 0. \tag{1.13}$$

The main peculiarity of demand and supply schedules for *foreign exchange* is that they are *derived* or *indirect* schedules, since they are induced by the underlying demand schedules for *goods and services*: demand for domestic goods by nonresidents and demand for foreign goods by residents. This means that transactors demand and supply foreign currency *only* in relation with purchases or sales of *goods* abroad (e.g., not in relation with purchases/sales of *assets*). The important consequence of such an assumption is that even if the underlying schedules for *goods* are well-behaved, the resulting schedules for *foreign exchange* may show abnormal behaviour and give rise to multiple equilibria.

In the PCP case, it is the *demand* schedule for foreign currency that may lead to multiple equilibria; in the CCP case, it is the *supply* schedule for foreign currency that may cause multiple equilibria. To illustrate this,[6] take the former, traditional case (the latter is inverse), looking at equations (1.9).

We assume a well-behaved demand for imports, $IM(S)$, i.e., such that monotonically decreases as the exchange rate, S, increases; since the foreign-currency price of imports, P^*_{IM}, is assumed constant, the domestic-currency price of imports, SP^*_{IM}, moves in the *same* direction with the NER, S. We also assume a well-behaved demand for imports on the part of the rest of the world – or, equivalently, for the exports of the home country –, $EX(S)$, i.e., such that monotonically increases as the exchange rate, S, increases; since the domestic-currency price of exports, P_{EX}, is assumed constant, the foreign-currency price of exports, $\frac{1}{S}P_{EX}$, moves in the *opposite* direction to the NER, S. Hence, in the first case, the demand for foreign exchange moves in the *same* direction as the underlying demand for imports. In the second case, the supply of foreign exchange and the underlying demand for home exports from the rest of the world do not necessarily move in the same direction:

- under price-*elastic* export demand from the rest of the world (i.e., with $\eta_{EX} > 1$), a domestic currency depreciation ($S \uparrow$) of 1% would bring about an increase of the volume of exports, $EX(S)$, *greater* than 1%, which more than offsets the decrease in the foreign-currency price of exports, $\frac{1}{S}P_{EX}$ (given their constant domestic-currency price, P_{EX}): total receipts of foreign exchange from exports, $\frac{1}{S}P_{EX}EX(S)$, therefore *increase*;
- under price-*inelastic* export demand from the rest of the world (i.e., with $\eta_{EX} < 1$), a domestic currency depreciation ($S \uparrow$) of 1% would bring about an increase of the volume of exports, $EX(S)$, *smaller* than 1%, which cannot fully offset the decrease in the foreign-currency price of exports, $\frac{1}{S}P_{EX}$ (given their constant domestic-currency price, P_{EX}): total receipts of foreign exchange from exports, $\frac{1}{S}P_{EX}EX(S)$, therefore *decrease*.

With view to the above discussion, two cases need to be distinguished when analysing equilibrium in the forex market:

(1) export demand (from the rest of the world) has *everywhere* an elasticity:
   (a) either *greater* than one;
   (b) or *smaller* than one;
(2) export demand (from the rest of the world) has an elasticity greater than one *in some stretch(es)* and smaller than one *in other stretch(es)* of the demand curve for goods; this is not an unusual case: recall from microeconomics that a *linear* demand curve, for example, has an elasticity greater than one in its upper part, one at an intermediate point, and lower than one in the lower part.

[6] Following Gandolfo (section 7.3.1, pp. 88-90, and Figure 7.1).

The important point in case 2. above is that it may give rise to *multiple* equilibria. To see why, let us use the example in Gandolfo's textbook, Figure 7.1, p. 90 [to be discussed in class]. The following *behavioural assumptions* have to be made before our graphical analysis of *equilibrium* and (its) *stability* can be appropriately done.

- The exchange rate (i.e., the national currency) tends to *depreciate* when there is *positive* excess demand for *foreign exchange*, and to appreciate in the opposite case. This is, of course, only an application to the forex market of standard demand-supply analysis of quantities, resulting in price adjustment, the price now being the NER.
- We are concerned with a *pure* float regime, so that there are no interventions from the central bank.

Under the price-adjustment assumption, the condition for the forex market to be stable is that a price increase tends to reduce excess demand; and, symmetrically, a price decrease tends to reduce excess supply. In our context, a domestic currency depreciation, i.e., an increase in the domestic-currency price of foreign currency, should reduce excess demand for foreign currency. The condition for this to happen is given by the general-form Marshall-Lerner inequality when the BoP is expressed in *foreign* currency, namely (1.8) above: $\eta_{EX} + \eta_{IM} \frac{SP^*_{IM} q_{IM}}{P_{EX} q_{EX}} > 1$. The latter conclusion shows that, given all our assumptions in the context of the elasticity approach, the problems of balance of payments adjustment and forex market stability coincide.

2. BoP Adjustment through Income Changes: The Foreign Trade Multiplier Approach

An alternative early model of BoP adjustment is what is known as the *(foreign trade) multiplier* theory. It constitutes another flow approach to the BoP whereby the exchange rate is assumed *fixed*, in addition to prices. That is why the multiplier theory is suitable to analyse the adjustment process under a *peg* regime. With all prices (including the exchange rate and the interest rate) constant, the only possibility for BoP adjustment in this model is by *changes* in *(national) income*. In this sense, the foreign trade multiplier approach complements the elasticity approach to the BoP, since in the latter income is assumed unchanged, by the ceteris paribus condition, whereas the NER is allowed to vary. The foreign trade multiplier theory was introduced by Harrod (1933), before the Keynesian theory of the multiplier, to which it has many parallels.

2.1. The (Foreign Trade) Multiplier Theory.

We present the simpler, SOE version of the multiplier theory.[7]

Assumptions. The key assumptions, common to similar models, are:

(1) underemployed resources;
(2) rigidity of all prices, including the exchange rate and the interest rate;
(3) absence of capital mobility, so that the BoP is synonymous with the balance on goods and services or the current account (CA);
(4) all exports are made out of current output.

Model and Solution. Linear functions are assumed in what follows, for simplicity of the exposition.[8] With this in mind, the foreign trade multiplier model is the standard Keynesian textbook model with an appended external sector:

$$C = C_0 + C_1 Y, \qquad 0 < C_1 \equiv \frac{\partial C}{\partial Y} < 1, \tag{2.1}$$

$$I = I_0 + I_1 Y, \qquad 0 < I_1 \equiv \frac{\partial I}{\partial Y} < 1, \tag{2.2}$$

[7] For the more general, and more complicated, two-country and n-country cases, refer to Gandolfo's book, sections D.1 and D.2 in the Appendix, pp. 441-444 and 444-450, respectively.

[8] The case of general functions is considered in the appendix sections of Gandolfo (2001) referred to in the previous footnote.

$$IM = IM_0 + IM_1 Y, \qquad 0 < IM_1 \equiv \frac{\partial IM}{\partial Y} < 1, \tag{2.3}$$

$$EX = EX_0. \tag{2.4}$$

$$Y \equiv C + I + \underbrace{EX - IM}_{\equiv CA \approx BoP}. \tag{2.5}$$

Government expenditure (often denoted by G in such set-ups) is not explicit in the above equation, but it is considered as present (i.e., implicit) in the *autonomous* components of the appropriate expenditure functions.[9] (2.5) means that in the open economy total demand for *domestic* output is no longer $C + I$ but $C + I - IM + EX$ which is composed of $C + I - IM$, aggregate demand for *domestic* output by *residents*, and EX, demand for *domestic* output by *nonresidents*.

Equations (2.1)-(2.5) form a complete system, from which the foreign trade multiplier can be analysed. Substituting (2.1), (2.2), (2.3), and (2.4) in (2.5) and solving for Y yields:

$$Y = \frac{1}{1 - C_1 - I_1 + IM_1} \left(C_0 + I_0 - IM_0 + EX_0 \right), \tag{2.6}$$

where

$$1 - C_1 - I_1 + IM_1 > 0 \Leftrightarrow \underbrace{C_1 + I_1 - IM_1}_{\equiv \textit{residents' } \text{marginal propensity to spend on } \textit{domestic} \text{ output}} < 1 \tag{2.7}$$

for the solution to be economically meaningful. Now considering *variations* in the *autonomous* components, (2.6) becomes:

$$\Delta Y = \underbrace{\frac{1}{1 - C_1 - I_1 + IM_1}}_{\equiv \textit{open}\text{-economy multiplier}} \left(\Delta C_0 + \Delta I_0 - \Delta IM_0 + \Delta EX_0 \right). \tag{2.8}$$

Recall that the open-economy multiplier above is smaller than that for the corresponding closed economy with the same $0 < C_1 < 1$ and $0 < I_1 < 1$ because of the additional leakage due to imports (the $0 < IM_1 < 1$ term in (2.8) is absent in the respective closed-economy multiplier formula).

Analysis and Results.

BoP Adjustment Following an Exogenous Increase in Exports. Let us first consider BoP adjustment following an *exogenous* increase in *exports*, with no other exogenous changes so that $\Delta C_0 = \Delta I_0 = \Delta IM_0 = 0$. The resulting change in the balance on goods and services, which we call BoP (or current account) here, is given by:

$$\Delta CA = \Delta EX - \Delta IM = \Delta EX_0 - \underbrace{\Delta IM_0}_{=0} - IM_1 \Delta Y = \Delta EX_0 - IM_1 \Delta Y,$$

where

$$\Delta Y = \frac{1}{1 - C_1 - I_1 + IM_1} \Delta EX_0$$

so that

[9] Gandolfo (2001), pp. 100-101, views the explicit inclusion of G in (2.5) as a source of potential error. The reason is that it may convey the impression that any increase in government expenditure is income generating. This is not necessarily true, insofar government expenditure on foreign goods and services is not income-generating for the domestic economy: in this case, the increase in G is matched by an (exogenous) increase in IM_1. However, in real-world economies government spending is as a rule heavily concentrated on goods and services produced by the home country, so the problem may not be that serious.

$$\Delta CA = \Delta EX_0 - IM_1 \Delta Y = \Delta EX_0 - IM_1 \frac{1}{1 - C_1 - I_1 + IM_1} \Delta EX_0 =$$

$$= \left(1 - \frac{IM_1}{1 - C_1 - I_1 + IM_1}\right) \Delta EX_0 = \frac{1 - C_1 - I_1}{1 - C_1 - I_1 + IM_1} \Delta EX_0. \tag{2.9}$$

If the marginal propensity to spend, $C_1 + I_1$, is smaller than 1, then $\frac{1-C_1-I_1}{1-C_1-I_1+IM_1} > 0$, so that $\Delta CA > 0$ but also $\Delta CA < \Delta EX_0$ because only a fraction, $0 < \frac{1-C_1-I_1}{1-C_1-I_1+IM_1} < 1$, of the change in autonomous exports is transmitted to the change in the balance on goods and services. Thus if $C_1 + I_1 < 1$, the adjustment of the BoP is *incomplete*: the increase in imports induced by the exogenous increase in exports is not so big as the initial rise in exports, so that the BoP will be in surplus, $\Delta CA > 0$, but smaller than the initial one, $\Delta CA < \Delta EX_0$. This case is also termed *under*adjustment, and it is not the only possible one. Gandolfo (2001), p. 105, notes that if the country is to be stable *in isolation*, $C_1 + I_1 < 1$ and only *under*adjustment can occur. But imposing this particular *stability* condition to (a model of) an *open* economy is unwarranted. If it is, therefore, *not* imposed on an open economy, then there are also the possibilities of *over*adjustment, when $C_1 + I_1 > 1$ and hence $|\Delta CA| > \Delta EX_0$ (note that with overadjustment the BoP can either go negative, if $|1 - C_1 - I_1| < IM_1$, or remain positive, if $|1 - C_1 - I_1| > IM_1$); and of *complete* (or *exact*) adjustment, when $C_1 + I_1 = 1$ so that the increase in exports generates – through higher income – the *same* increase in imports and, hence, $\Delta CA = 0$.

BoP Adjustment Following an Exogenous Increase in Imports. Let us now consider BoP adjustment following an *exogenous* increase in *imports*. A complication arises here, and one has to consider two extreme cases as well as the possibility of intermediate cases. We would only sketch the two extremes.[10]

A first extreme is to assume that the increase in autonomous imports (i.e., in the exogenous expenditure by *residents* on *foreign* output), $\Delta IM_0 \equiv \Delta C_{0F} + \Delta I_{0F} > 0$, is accompanied by a *simultaneous decrease in the same amount* in the exogenous expenditure by *residents* on *domestic* output, $\Delta DA_0 \equiv \Delta C_{0H} + \Delta I_{0H} < 0$, so that $\Delta C_0 + \Delta I_0 = (\Delta C_{0F} + \Delta I_{0F}) + (\Delta C_{0H} + \Delta I_{0H}) \equiv \Delta IM_0 + \Delta DA_0 = 0$. This is a very restrictive assumption, implying *perfect substitutability* of the home and foreign good. The resulting change in the balance on goods and services, which we here call BoP (or current account), is given by:

$$\Delta CA = \Delta EX - \Delta IM = \underbrace{\Delta EX_0}_{=0} - \Delta IM_0 - IM_1 \Delta Y = -\Delta IM_0 - IM_1 \Delta Y,$$

where

$$\Delta Y = -\frac{1}{1 - C_1 - I_1 + IM_1} \Delta IM_0$$

so that

$$\Delta CA = -\Delta IM_0 - IM_1 \Delta Y = -\Delta IM_0 + IM_1 \frac{1}{1 - C_1 - I_1 + IM_1} \Delta IM_0 =$$

$$= \left(-1 + \frac{IM_1}{1 - C_1 - I_1 + IM_1}\right) \Delta IM_0 = \frac{C_1 + I_1 - 1}{1 - C_1 - I_1 + IM_1} \Delta IM_0. \tag{2.10}$$

Since $1 - C_1 - I_1 + IM_1 > 0$, by the *stability* condition requiring $C_1 + I_1 < 1$ for the *closed*-economy model, underadjustment, exact adjustment and overadjustment will occur whenever $C_1 + I_1 \lesseqqgtr 1$. Note, however, that – similarly to the case of *over*adjustment following an exogenous rise in exports – if this stability condition is *not* imposed on the *open* economy, then we would have again that the BoP may go into surplus, if $C_1 + I_1 > 1$ with $|1 - C_1 - I_1| < IM_1$, yet it may stay in deficit, if $C_1 + I_1 > 1$ with $|1 - C_1 - I_1| > IM_1$.

A second extreme is to assume that the exogenous increase in imports, $\Delta IM_0 \equiv \Delta C_{0F} + \Delta I_{0F} > 0$, is not accompanied by any reduction or increase in exogenous expenditure on domestic

[10] Gandolfo (2001) also briefly discusses the intermediate situations on pp. 449-450 in his Appendix.

output by residents, the latter remaining unchanged, $\Delta DA_0 \equiv \Delta C_{0H} + \Delta I_{0H} = 0$, so that total (i.e., foreign plus domestic) expenditure on domestic output equals exactly the increase in imports, $\Delta C_0+\Delta I_0 \equiv (\Delta C_{0H} + \Delta I_{0H})+(\Delta C_{0F} + \Delta I_{0F}) = 0+(\Delta C_{0F} + \Delta I_{0F}) \equiv \Delta IM_0$. From (2.8) with $\Delta C_0 + \Delta I_0 = \Delta IM_0$ and $\Delta EX_0 = 0$ it is seen that in this case there is no effect on income (the numerator in (2.8) becomes 0); therefore no adjustment is possible through induced changes in imports and the BoP deteriorates by the full amount of the exogenous increase in imports, $\Delta CA = -\Delta IM_0$.

2.2. **The Transfer Problem: Keynes (1929) vs Ohlin (1929).** "The transfer problem" was a debate in international economics that was particularly active in the aftermath of the World War I with respect to the war reparations that Germany had to pay to the victors. Since it is related to the multiplier theory, it is worth considering it right now.

The *transfer problem* consists in understanding the effects, primary (immediate) and secondary (induced), of a (unilateral or, more generally, bilateral) *transfer of funds* from a *transferor* country to a *transferee* country on the balance of payments (that is, on the *current account*) of the *transferor*. The debate actually looks into whether, after the *financial* transfer is done, the transferor country also "transfers" goods to the transferee country, a *real* transfer, of such a value that leads to a trade surplus in the transferor country. The key question is: will the balance of payments, understood as the current account only, of the transferor improve by a sufficient amount to "effect" the transfer.

Three cases are possible:

(1) transferor's balance of *trade* improves by *less than* the amount of the transfer (in monetary value); the transfer is then said to be *under*effected and transferor country's BoP (more precisely, *CA*) *worsens*;
(2) transferor's *trade* balance (TB) improves by *exactly the same* amount as that of the transfer; the transfer is said to be *effected* and transferor country's BoP (i.e., *CA*) *does not change*;
(3) transferor's *TB* improves by *more than* the amount of the transfer; the transfer is *over*effected and transferor country's BoP (*CA*) *improves.*

The early literature on the transfer problem boils down to the opinion of Keynes (1929), based on the classical theory, saying that the transfer will be undereffected, and that of Ohlin (1929), based on the multiplier theory, for an effected transfer. The conflicting outcome of their findings is the result of the different approaches they applied to the economic analysis of the problem.

2.2.1. *Keynes (1929) and the Classical Theory.*
Assumptions.

(1) two countries:
    (a) a transferor country, say $H(ome)$, which finances the transfer;
    (b) and a transferee country, $F(oreign)$, which disposes of it so as to reduce the aggregate expenditure in H and increase the aggregate expenditure in F by the *exact* amount of the transfer;
(2) both countries are in continuous *full* employment;
(3) both countries are in external *equilibrium* before the transfer;
(4) in both countries, *entire* income is spent on purchases of goods.

Analysis. It thus follows that H imports will decrease by an amount equal to its marginal propensity to spend on imports, IM_1, applied to the expenditure reduction in H, $-\Delta Y$, i.e., to the amount of the transfer, $-TR$; and F imports (which are, at the same time, H exports) will increase by the product of its marginal propensity to spend on imports, IM_1^*, and the expenditure increase in F (in F currency), $+\Delta Y^*$, i.e., by the amount of the transfer (in F currency), $+\frac{TR}{S}$. In the context of a fixed exchange rate, as appropriate in the present chapter as well as to the original debate on the transfer problem, we could simplify by normalising the constant NER at $S = 1$.

Overall, there would be three effects on the transferor's (H) BoP (that is, CA, in the setting we describe):

(1) initial deterioration by an amount equal to the transfer, $-TR$;

(2) improvement due to lower expenditure, hence, lower imports, by the amount $+IM_1TR$;
(3) improvement due to higher expenditure abroad, hence higher (demand for) exports, by the amount $+IM_1^*TR$.

Result(s). Summing up the three effects, one can find the *total change* (originating in the transfer) of the transferor's BoP, or rather CA:

$$\Delta CA = -TR + IM_1TR + IM_1^*TR = (IM_1 + IM_1^* - 1)\,TR. \tag{2.11}$$

It becomes clear from (2.11) that the current account will improve ($\Delta CA > 0$, so that the transfer is overeffected), remain unchanged ($\Delta CA = 0$, so that the transfer is effected) or deteriorate ($\Delta CA < 0$, so that the transfer is undereffected) depending on whether the sum of the marginal propensities to import at home and abroad, $IM_1 + IM_1^*$, is greater, equal or lower than 1:

$$IM_1 + IM_1^* \gtreqless 1 \Longleftrightarrow \Delta CA \gtreqless 0 \tag{2.12}$$

This is a condition directly reminiscent, but with some differences in the detail, of both the Marshall-Lerner condition (1.6) and the BoP adjustment - forex market stability condition (1.13).

In the case of CA (referred to in those times as BoP) *disequilibrium*, since there are no multiplier effects in the classical approach to the transfer problem, the only channel for adjustment to restore external equilibrium is a modification in the terms of trade, which itself can be brought about by either a change in the NER or a change in the absolute price levels (in a gold standard regime, as the implied by the classical theory). Such an adjustment, we should not forget, will in addition be possible only if the suitable elasticity conditions, guaranteeing forex market stability, are fulfilled.

The dominant opinion was that $IM_1 + IM_1^* < 1$ (similarly to the "pessimism" regarding *price* (or rather NER) elasticities in section 1, but now, in section 2, in the context of *income* elasticities). Therefore the transfer has to be undereffected and the ToT need to change in an unfavourable direction to the transferor to allow further adjustment to take place. Such was the opinion of Keynes (1929).

2.2.2. *Ohlin (1929) and the Multiplier Theory.*

Assumptions. With respect to the transfer problem, the multiplier theory[11] differs from the classical theory in three respects:

(1) the part of assumption 1. in the classical theory above saying that the expenditure at home and abroad change *exactly* by the amount of the transfer is not maintained under the multiplier theory; instead, *saving* is allowed for, so that the decrease in expenditure may not relate one-to-one with the amount of the transfer in the transferor country (H), if some expenditure is financed by (past) saving, and the increase in expenditure may not relate one-to-one with the amount of the transfer in the transferee country (F), if a portion of the transfer is not spent but saved (for future use);
(2) assumption 2. in the classical theory now becomes different: both countries are assumed in the (Keynesian) situation of *underemployment*;
(3) any change in aggregate expenditure due to the transfer (in both H and F) is to be considered as an exogenous change which gives rise to further, *multiplier effects* on *income*, so that *induced changes* in *imports* have also to be taken into account when calculating the overall effect on the current account (or the BoP, as it was implied then).

[11] Gandolfo (2001) duly notes, on p. 113, that the multiplier theory is also sometimes referred to as the Keynesian theory. But this might lead us into confusion: back in 1929, Keynes (still) reasoned on the basis of the clasical theory; which may seem surprising, as we know that in 1936 he (already) argued from the perspective of a (Keynesian) theory of the multiplier with sticky wages (hence prices) and underemployed resources, essentially the IS-LM model in Hicks' 1937 interpretation. Gandolfo also indicates that the multiplier theory was, in fact, developed notably by Metzler (1942), Machlup (1943: chapter 9) and Johnson (1956), who gave it its name.

Analysis. With view to the multiplier effects and the resulting induced changes, the chain of adjustments following a transfer under the multiplier theory, as maintained in Ohlin's (1929) response to Keynes (1929) on the transfer problem, becomes much more complicated than that envisaged by the classical theory (continuing here to consider a *fixed* exchange rate of $S = 1$, so that $TR = TR^*$):

(1) the initial deterioration in the transferor's CA by an amount equal to the transfer, $-TR$, is, of course, still the starting point of the analysis; but the new effects are as follows:
(2) changes, simultaneous with the transfer, in the *autonomous components* of expenditure in both countries, including the autonomous components of imports, $-\Delta IM_0 \neq -TR$ ($\Delta IM_0 < TR$) in H and $+IM_0^* \neq +TR$ ($\Delta IM_0^* < TR$) in F;
(3) *multiplier* effects of the above changes on both countries' *income*;
(4) *induced* changes in both countries' *imports*, $-IM_Y\Delta Y$ in H and $+IM_Y^*\Delta Y^*$ in F.

We now need to introduce some more notation:

$$\Delta C_0 = -C_{TR}TR, \qquad \Delta C_0^* = C_{TR}^*TR,$$

$$\Delta I_0 = -I_{TR}TR, \qquad \Delta I_0^* = I_{TR}^*TR,$$

$$\Delta IM_0 = -IM_{TR}TR, \qquad \Delta IM_0^* = IM_{TR}^*TR,$$

where ΔC_0, ΔI_0, ΔIM_0 denote the changes, simultaneous to the transfer, in the respective autonomous components of expenditure in H, and ΔC_0^*, ΔI_0^*, ΔIM_0^* those in F. C_{TR}, I_{TR}, IM_{TR} and C_{TR}^*, I_{TR}^*, IM_{TR}^* stand for the coefficients that relate these exogenous changes to the amount of the transfer which caused them.[12]

Result(s). The total change (after accounting for the multiplier effects on income and the induced changes in imports) in the current account of the transferor country, H, will thus now be given by:

$$\Delta CA = -TR + (\Delta IM_0^* - \Delta IM_0) - (IM_{Y^*}^*\Delta Y^* - IM_Y\Delta Y) \tag{2.13}$$

with the three terms adding up in the LHS being the effects mentioned in points 1., 2. and 4. just above, respectively, whereas ΔY and ΔY^* come from 3. above.

The net result of all these effects can be determined only through a formal mathematical analysis (for instance, Gandolfo's Appendix D.4, pp. 452-454). Yet what is easy to see is that it will depend on the various propensities (to spend on domestic goods, C_1 and I_1, and on imports, IM_1, in H and, respectively, C_1^*, I_1^* and IM_1^* in F) as well as on the size of the transfer-induced changes in the autonomous components of expenditure (determined by the coefficients C_{TR}, I_{TR}, IM_{TR} in H and C_{TR}^*, I_{TR}^*, IM_{TR}^* in F). Thus all three cases – of an undereffected transfer (Keynes' position based on the classical theory), an effected transfer (Ohlin's position founded on the multiplier theory) and an overeffected one – are possible although the *most likely* case is, again, *undereffectuation.*

3. An Integrated Approach: The Laursen-Metzler (1950) Model

In section 1, we looked at BoP (or, rather, CA) adjustment through variations of the exchange rate under free float with constant income, the elasticity approach. In section 2, we continued with an alternative view, where the BoP (that is, CA) adjusts through income changes if the exchange rate is assumed fixed as are prices, the foreign trade multiplier approach. A natural next step is to integrate the two approaches, and have the two possible channels of adjustment in the same model. This has been done in the same year by three papers, Harberger (1950), Stolper (1950) and Laursen and Metzler (1950).

3.1. **Interaction between Exchange-Rate and Income Changes in the Adjustment Process.**

[12]Mind the difference with the marginal propensities to spend and the other related symbols introduced earlier, i.e. $IM_{TR} \neq IM_1 \neq IM_0 \neq IM_Y$ and $IM_{TR}^* \neq IM_1^* \neq IM_0^* \neq IM_{Y^*}^*$.

Model Set-Up under SOE. We shall consider a simplified version of the Laursen-Metzler (1950) model, the simplification being that a small open economy (SOE) will be examined.[13]

We denote by Y national *money* (i.e., *nominal*) income and assume constant domestic price level, normalised at 1. Then, variations in Y measure variations in *physical* output. Imports and exports depend on the ToT, as in section 1, and assuming that the price level abroad is also constant, on the exchange rate: exports vary in the same direction as the NER, and imports in the opposite direction. Imports also depend on national income, as in section 2.

In this setting, the NER, S, coincides with the relative price of imports, or ToT. A change in the NER will thus determine the split-up of expenditure between consumption and investment purchases of domestic goods (domestic absorption, DA) and foreign goods (imports, IM). If the domestic currency appreciates (a fall in the NER), imports become cheaper, so the real income corresponding to a given money income increases, but as some of this increase is saved, the amount spent on goods and services out of a given money income will fall, and vice versa under depreciation. This effect has been independently described by Harberger (1950) and Laursen-Metzler (1950), and is therefore called in the literature the Harberger-Laursen-Metzler effect; it has been the subject of much debate.

Model Summary under SOE. The Laursen-Metzler (1950) model, in its simplified version of a SOE, is indeterminate: there are two equations in three unknowns, (Y, CA, S):

$$Y = DA\,(Y, S) + CA,$$

$$CA = 1 \cdot EX(S) - SP^*_{IM} IM\,(Y, S)\,,$$

where the domestic price level has been normalised to 1.

Using the degree of freedom to impose BoP equilibrium, one can write the second equation as $CA = 0$, and then solve the resulting system for the remaining two unknowns, (Y, S), which determines the *equilibrium* point (Y_e, S_e).

Diagrammatically, the system can be represented as two curves in the (S, Y) plane: all points whose coordinates satisfy the first equation determine the RR curve ensuring *real*-market equilibrium; and all points whose coordinates satisfy the second equation determine the BB curve ensuring BoP (that is, CA) equilibrium:

$$RR: \qquad Y = DA\,(Y, S) + CA, \tag{3.1}$$

$$BB: \qquad CA = 1 \cdot EX(S) - SP^*_{IM} IM\,(Y, S) = 0, \tag{3.2}$$

The *intersection* of the two curves yields the equilibrium (point) of the model.

[We'll discuss in class a graphic representation of the model and the dynamic stability of its equilibrium (point) as well as of the transfer problem in this model, as described in Gandolfo, sections 9.1.1, 9.1.2 and 9.1.3, pp. 119-126].

Back to the Transfer Problem. We could perform the comparative statics exercise of the transfer problem once again, now within the context of the Laursen-Metzler model allowing *interaction* between NER and income changes during the process of BoP (CA) adjustment. In addition to the previous assumptions of the multiplier theory, we here bring in the issue of stability: more precisely, we only consider the transfer problem within the context of a *stable* equilibrium (in the sense implied in our graphical examples above). Without treating the question in detail, we shall only stress the main result of such an analysis.[14] It is that once the restriction of *stability* of Equilibrium in the Laursen-Metzler model is imposed, the only answer to the transfer problem that remains is that the transfer will in any case be *effected*.

[13]The original two-country model is presented in Gandolfo's textbook, Appendix E.3, pp. 461-468.

[14]For more, you may refer to Gandolfo, section 9.1.3, pp. 124-126, and the related Appendix.

3.2. **The J-Curve and the S-Curve.** Both these curves describe regularities in the behaviour of the trade balance (or net exports) and conceptualise them in terms of the form of a particular letter in the Latin alphabet. Both have been found empirically, the first curve by NIESR (1968) and the second by Backus, P. Kehoe and Kydland (1994). A key difference is that the J-curve describes a dynamic relationship, the trade balance (or the current account) following a devaluation, where time is on the horizontal axis, while the S-curve is, indeed, a *horizontal* S resembling the cross-correlation structure of net exports with the terms of trade (ToT) at short, medium and long lag/lead horizons. Another difference is that the S curve seems to have been also robust in the data, for developed economies (11 OECD countries, in the original Backus et al. paper) as well as for developing economies (e.g., in Senhadji (1998), for 30 countries), while studies on the J-curve, initially documented for the UK in the late 1960s and early 1970s (following the 1967 devaluation of the British pound sterling), have produced rather mixed results in other economies.

The horizontal S curve summarises the "stylised facts" about the cross-correlations between the trade balance and the terms of trade at various time lags/leads: negatively correlated in the current period and in the more distant past/future but positively correlated over some medium run. The paper by Backus et al. (1994) rationalises the existence of the S-curve in the data by writing down an international real business cycle (IRBC) model – more on that topic will come later in the course – where the dynamics of *capital* formation is reflected in trade balance fluctuations.

As to the J-curve phenomenon, theoretically it has often been explained in terms of *adjustment lags*. An early influential study is Magee (1973), in which three periods following a devaluation were distinguished by the different behaviour of import and export prices and quantities. These periods have been referred to and defined as follows.

(1) *currency-contract* period: immediately following the increase of the exchange rate (i.e., domestic currency devaluation) during which the contracts that have been signed before the exchange rate variation are still binding, so *both* the prices and quantities stipulated in them *cannot be changed*: what happens to the BoP (i.e., the trade balance, in the present context) depends on the *currency composition* of exports and imports; this may vary from country to country, but in the *SOE* case it is likely that both exported and imported goods are priced in some foreign (world or international) currency; given such a SOE model and bearing in mind an initial trade *deficit* (imports bigger than exports), the devaluation will simply further deteriorate the deficit, i.e., will have a *perverse* effect on the BoP;
(2) *pass-through* period: the next period, during which prices can be changed (adjusted to the devaluation) but not the quantities, due to rigidities in the demand for imports by residents and the demand for the devaluing country's exports by the rest of the world (*both* being *inelastic* in the short run); the magnitude of this pass-through phenomenon varies form country to country, from period to period, and for exports and imports in the same country;[15]
(3) *quantity-adjustment* period: the last period following the devaluation when *both* prices and quantities are *free to adjust*; now if the suitable conditions on the elasticities are fulfilled, the BoP (that is, the trade balance) will improve.

The processes operating during the described period ultimately may lead to a J-curve dynamics of the trade balance following a devaluation (or a depreciation induced by the authorities in a float regime).

3.3. **The Alleged Insulating Properties of Flexible Exchange Rates.** Earlier research has led to the impression that flexible exchange rates *completely* insulate the domestic economy from the rest of the world given that the suitable stability conditions are verified. The reason is that BoP disequilibria are the channel through which foreign economic shocks affect a national economy, and vice versa, and under a float regime the BoP (or rather the CA, in the present lecture context) is necessarily zero: $Y \equiv C + I + CA$ and since $CA \equiv 0$ under float, then

[15]For a recent empirical comparison of the exchange rate pass-through in three major economies, seee Mihailov (2003).

$Y \equiv C + I$, just like in the closed economy. Laursen and Metzler (1950) were among the first who criticised the idea, using analytical argumentation from their model, which was also one of the main objectives and contributions of their paper.

In summary, the conclusion about the insulating properties of flexible exchange rates appears incorrect for at least three reasons:

(1) the adjustment following variations in the exchange rate is *not instantaneous*, i.e., it takes some time, therefore the J-curve;
(2) exchange rate variations have an effect on the *composition* of aggregate demand, across the home and foreign good, inducing substitution in consumption, $Y \equiv C + I \equiv \underbrace{(C_H + I_H)}_{\equiv DA} + \underbrace{(C_F + I_F)}_{\equiv IM}$; but they also have an effect on the overall *level* of this aggregate demand, $Y \equiv C + I$, thus affecting income: here is the essence of the Laursen-Metzler (1950) effect, also called Harberger-Laursen-Metzler effect;
(3) the trade account (or the current account) needs not be balanced if *capital movements* are not abstracted away (which Laursen and Metzler did for the sake of simplicity).

4. The Mundell (1960-1964) - Fleming (1962) Model

The Mundell-Fleming model of the early 1960s is an extension to the open-economy case of the closed-economy sticky-price IS-LM model of Keynes (1936) and Hicks (1937). Mundell (1960, 1961a, 1961b, 1963, 1964) and Fleming (1962) worked independently in constructing different aspects of the model.

Gandolfo (2001) notes that the Mundell-Fleming model is really not a pure flow model, since adjustments in the money stock play a role, indirectly affecting the BoP through their effects on the interest rate and, hence, capital movements and real output. He adds that the view of capital movements in its set-up is, however, a pure flow view, which allows him, and us, to classify the Mundell-Fleming model as another representative (although somewhat mixed, or evolving) of the flow approach to balance of payments adjustment.

4.1. **The Original Static Model.**

4.1.1. *Assumptions.*

- the domestic economy, *Home*, is small (SOE), so that it takes foreign variables as given;
- *goods* prices are *fixed* (for the duration of the analysis);
- but *asset* markets are continuously in equilibrium, due to *full* capital mobility.

4.1.2. *Model.* The Mundell-Fleming model consists of *three equations*. All variables below (except interest rates) are in logarithms, i.e., $y \equiv \ln Y$ is income, $s \equiv \ln S$ is the NER, $g \equiv \ln G$ is government expenditure, and $p \equiv \ln P$ and $p^* \equiv \ln P^*$ are, respectively, *Home* and foreign price levels.

An *open-economy IS curve* describes equilibrium in the *goods* market:

$$y = \delta (s + p^* - p) + \gamma y - \sigma \iota + g. \tag{4.1}$$

All parameters are defined to be positive, with $0 < \gamma < 1$. Since the price level is fixed, *nominal* income/expenditure is also *real* income/expenditure in the model.

There are three determinants of the *demand/expenditure* for domestic goods:

- it depends *positively* on own(-country) *income*, y, through the (domestic) *absorption* channel: a rise in income leads to higher consumption, most of which is spent on domestic goods;
- it depends *negatively* on the *interest rate*, through the *investment-saving* channel: since the price level is fixed, the *nominal* interest rate is also the *real* interest rate in the model; thus, higher interest rates reduce investment spending (and, perhaps, also consumption spending) and increase saving;
- it depends *positively* on *RER fluctuations*, coinciding with NER fluctuations in the model (assuming constant price levels): an increase in the RER lowers the price of domestic

goods relative to foreign goods, thereby activating the *expenditure switching* channel (see earlier).

Hence, the IS-curve for the model is, more precisely, defined by

$$IS: \qquad \iota = \frac{\gamma - 1}{\sigma} y + \frac{1}{\sigma} g + \frac{\delta}{\sigma} \left(s + p^* - p \right),$$

from where the *negative* slope in the plain (y, ι), $\frac{\gamma-1}{\sigma} < 0$, is evident.

Money market equilibrium is represented by an LM *curve*:

$$m - p = \phi y - \lambda \iota. \tag{4.2}$$

Hence, the LM-curve for the model is defined by

$$LM: \qquad \iota = \frac{\phi}{\lambda} y - \frac{1}{\lambda} \left(m - p \right),$$

from where the *positive* slope in the plain (y, ι), $\frac{\phi}{\lambda} > 0$, is evident.

UIP, with *static* (no-change) expectations (i.e., with $E_t\left(S_{t+1}\right) \equiv S_t$ so that $\frac{E_t(S_{t+1})}{S_t} = 1$ and $\ln \frac{E_t(S_{t+1})}{S_t} = \ln 1 = 0$), gives international *capital* market equilibrium and is represented by an FF *curve*:

$$FF: \qquad \iota = \iota^*. \tag{4.3}$$

It is evident from the above static-expectations version of UIP that the third schedule of the Mundell-Fleming model, the FF-curve, is *horizontal* in the plain (y, ι).

One first substitutes (4.3) into (4.1) and (4.2). Then the resulting two equations are totally differentiated. Taking first (4.1), one gets:

$$y = \delta \left(s + \underbrace{p^*}_{\text{constant}} - \underbrace{p}_{\text{constant}} \right) + \gamma y - \sigma \iota^* + g,$$

$$y - \gamma y = \delta s - \sigma \iota^* + g,$$

$$\left(1 - \gamma\right) y = \delta s - \sigma \iota^* + g,$$

$$\frac{d\left(1-\gamma\right) y}{dy} dy = \frac{d\left(\delta s\right)}{ds} ds - \frac{d\left(\sigma \iota^*\right)}{d\iota^*} d\iota^* + dg,$$

$$\left(1 - \gamma\right) dy = \delta ds - \sigma d\iota^* + dg,$$

$$dy = \frac{\delta}{1-\gamma} ds - \frac{\sigma}{1-\gamma} d\iota^* + \frac{1}{1-\gamma} dg,$$

Now totally differentiating (4.2), one obtains:

$$m - \underbrace{p}_{\text{constant}} = \phi y - \lambda \iota^*,$$

$$dm = \phi dy - \lambda d\iota^*.$$

Substituting for dy above from the IS equation and rearranging:

$$dm = \underbrace{\phi \left(\frac{\delta}{1-\gamma} ds - \frac{\sigma}{1-\gamma} d\iota^* + \frac{1}{1-\gamma} dg \right)}_{=dy} - \lambda d\iota^*$$

$$dm = \frac{\phi \delta}{1-\gamma} ds - \left(\lambda + \frac{\phi \sigma}{1-\gamma} \right) d\iota^* + \frac{\phi}{1-\gamma} dg$$

Hence, the following two-equation system constitutes the original, static Mundell-Fleming model:

$$dy = \frac{\delta}{1-\gamma} ds - \frac{\sigma}{1-\gamma} d\iota^* + \frac{1}{1-\gamma} dg, \tag{4.4}$$

$$dm = \frac{\phi\delta}{1-\gamma} ds - \left(\lambda + \frac{\phi\sigma}{1-\gamma}\right) d\iota^* + \frac{\phi}{1-\gamma} dg. \tag{4.5}$$

All comparative statics results on the use of this model for macroeconomic policy analysis come from these two equations.

4.2. **Policy Analysis.** The Mundell-Fleming model has important policy implications.

4.2.1. *Fixed Exchange Rate Regime.*
Domestic Credit Expansion. Figure 8.1, p. 181 in Mark's (2001) textbook.
Domestic Currency Devaluation. Figure 8.2, p. 182 in Mark's textbook.
Domestic Fiscal Policy Expansion. Works in the same way as devaluation – see Mark (2001), p. 182.
Foreign Interest Rate Increase. Figure 8.3, p. 183 in Mark (2001).
Implied International Transmission. See Mark (2001), pp. 182-183.

4.2.2. *Flexible Exchange Rate Regime.*
Domestic Credit Expansion. Figure 8.4, p. 181 in Mark's (2001) textbook.
Domestic Fiscal Policy Expansion. Figure 8.5, p. 182 in Mark's textbook.
Foreign Interest Rate Increase. Figure 8.6, p. 183 in Mark (2001).
Implied International Transmission. See Mark (2001), p. 185.

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