EC933-G-AU – Lecture 2

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Macroeconomic Theories of Balance of Payments Adjustment: Flow Approaches

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Plan of talk

- **introduction**
1. BoP adjustment through exchange-rate variation: the (critical) elasticity approach
2. BoP adjustment through income variation: the (foreign trade) multiplier approach
3. an integrated approach to BoP adjustment: Laursen-Metzler (1950) model
4. Mundell (1960-1964) – Fleming (1962) model
- **wrap-up**

Aim and learning outcomes

- **aim:** understand and interpret the flow approaches to BoP adjustment
- **learning outcomes**
  - distinguish the elasticity vs the multiplier approach to BoP
  - derive and interpret
    - the Marshall-Lerner critical elasticity condition
    - the transfer problem (in diffirent model contexts)
    - the Laursen-Metzler (1950) model integrating the elasticity and multiplier approaches
  - derive and analyse the policy implications of the Mundell (1960-1964) – Fleming (1962) static model

Elasticity approach: assumptions

- **BoP ≡** NX ≈ **CA**

  (abstracting from NFI, current transfers; and capital movements)

- simple model
  - 2 countries, 2 goods with fixed prices in national currency ⇔ traditional producer's (seller's/exporter's) currency pricing, PCP
  - each good available only in one of the countries (endowment differences) => **relative price** b/n home and foreign good **coincides with ToT**

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

- trade in a **not perfectly homogeneous** good
  - *H* and *F* good similar, so that *substitution in consumption* possible
  - but *differentiated*, distinctive to consumers according to origin (*H* or *F*)

Elasticity approach: BoP adjustment

1. a **change in NER**, S
2. causes directly a **change in relative price** of goods, given in this simple model by **ToT**, q^{ToT}
3. which induces further a **change in the quantities demanded** for the two goods, q_{EX}^{D} and q_{IM}^{D}
4. and, under the assumption of **perfectly elastic** (geometrically, horizontal) **supply** (curve), implicit in the simpler model version, $q_{EX}^{D} \equiv q_{EX}^{S} \equiv q_{EX}$ and $q_{IM}^{D} \equiv q_{IM}^{S} \equiv q_{IM}$
5. BoP disequilibrium (goods and services) will **adjust**

Elasticity approach: policies, definitions

- BoP adjustment: automatic or **policies**, Johnson (1958)
  - expenditure **switching**: NER => ToT => *switch* expenditure
  - expenditure **reducing**: if trade deficit, fiscal and/or monetary restriction to *reduce* total expenditure, hence that on imports
- BoP measured in **value = price x quantity**
  - *export* quantities vary in *same* direction as NER (=> price)
  - *import* quantities vary in *opposite* direction to NER (=> price)
  - *overall* effect on BoP not clear from "directional" analysis
- **elasticities** of exports and imports w.r.t. NER

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

Elasticity approach: deriving the Marshall-Lerner condition

$$CA \equiv P_{EX} q_{EX} - S P_{IM}^{*} q_{IM}$$

$$CA + \Delta CA \equiv P_{EX}(q_{EX} + \Delta q_{EX}) - (S + \Delta S) P_{IM}^{*}(q_{IM} + \Delta q_{IM})$$

$$\Delta CA \equiv P_{EX} \Delta q_{EX} - S P_{IM}^{*} \Delta q_{IM} - \Delta S P_{IM}^{*} q_{IM} - \Delta S P_{IM}^{*} \Delta q_{IM}$$

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

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

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

$$= \Delta S P_{IM}^{*} q_{IM} \left(\eta_{EX} \frac{P_{EX} q_{EX}}{S P_{IM}^{*} q_{IM}} - 1 + \eta_{IM} \right) \qquad \eta_{EX} \frac{P_{EX} q_{EX}}{S P_{IM}^{*} q_{IM}} + \eta_{IM} > 1 \qquad \eta_{EX} + \eta_{IM} > 1$$

Elasticity approach: elasticity pessimism, elasticity optimism, forex market stability

- Marshall-Lerner condition if BoP is in *foreign* currency

$$CA^* \equiv \frac{1}{S}P_{EX}q_{EX} - P^*_{IM}q_{IM} = \frac{1}{S}CA \qquad \eta_{EX} + \eta_{IM}\frac{SP^*_{IM}q_{IM}}{P_{EX}q_{EX}} > 1 \qquad \eta_{EX} + \eta_{IM} > 1$$

- elasticity empirical measurement and debate
  - elasticity *optimism*: sum is sufficiently high (>*1*) => Marshall-Lerner *holds*
  - elasticity *pessimism*: sum is too low (<*1*) => Marshall-Lerner *violated*
  - Hooper, Johnson and Marquez (2000): G-7, only for F and D found *too low*
- **equilibrium** in the *forex* market ≡ excess demand for *foreign exchange* (under PCP) is zero => *stability* analysis: Fig. 7.1, p. 90, in Gandolfo

$$ED_{fx}(S) \equiv D_{fx}(S) - S_{fx}(S) = P^*_{IM}IM(S) - \frac{1}{S}P_{EX}EX(S) = 0 \qquad ED_{fx}(S) \gtreqless 0 \Leftrightarrow CA \lesseqgtr 0$$

- main **peculiarity** of demand/supply schedules for *foreign exchange*
  - derived (indirect), i.e. induced by underlying demand schedules for *goods*: for domestic goods by *nonresidents* and for foreign goods by *residents*
  - **consequence:** even if underlying schedules for *goods* well-behaved, resulting schedules for *foreign exchange* may be abnormal => *multiple* equilibria

Multiplier approach: assumptions

- introduced by **Harrod (1933)**, before the Keynesian theory of the multiplier, to which it has many parallels
- another *flow* approach to BoP, whereby **NER** is assumed **fixed**, in addition to *prices* => 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 the model is by **changes in (national) income**
- **underemployed** resources
- all *exports* are made out of *current* output
- **absence of capital mobility**, so that the **BoP** is synonymous with the balance on goods and services or the current account (**CA**)

Multiplier approach: model set-up

- the *foreign trade multiplier model* is the *standard closed-economy Keynesian textbook model* with an **appended external sector** (the *linear* functions below are assumed for simplicity)

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

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

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

$$EX = EX_0$$

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

- **government expenditure** (often denoted by G in similar set-ups) is not explicit in the above equation, but is considered as *present in the autonomous components* of the expenditure functions

Multiplier approach: model solution

- **substituting** the four *expenditure functions* into *national income*:

$$Y = \frac{1}{1 - C_1 - I_1 + IM_1}(C_0 + I_0 - IM_0 + EX_0)$$

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

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

- 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 is *absent* in the respective closed-economy multiplier formula

Multiplier approach: BoP adjustment following an *exogenous* increase in **exports**

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

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

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

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

- *complete* adjustment: $MPSpend \equiv C_1 + I_1 = 1 \Rightarrow \Delta CA = 0$
- *under*adjustment: $MPSpend \equiv C_1 + I_1 < 1 \Rightarrow \Delta CA < \Delta EX_0$
- *over*adjustment: $MPSpend \equiv C_1 + I_1 > 1 \Rightarrow |\Delta CA| > \Delta EX_0$

Multiplier approach: BoP adjustment following an *exogenous* increase in **imports** (I)

a *complication* arises, so one has to consider at least **two extremes** (and the possibility of *intermediate* cases)

- assume that the $\uparrow$ 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* $\downarrow$ *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 $\Delta C_0 + \Delta I_0 = (\Delta C_{0F} + \Delta I_{0F}) + (\Delta C_{0H} + \Delta I_{0H}) \equiv \Delta IM_0 + \Delta DA_0 = 0$
- assume that the exogenous $\uparrow$ in imports is *not accompanied* by any $\downarrow$ or $\uparrow$ in exogenous expenditure on domestic output by residents, which remains *unchanged*, so that

  $$\Delta C_0 + \Delta I_0 \equiv (\Delta C_{0H} + \Delta I_{0H}) + (\Delta C_{0F} + \Delta I_{0F}) = 0 + (\Delta C_{0F} + \Delta I_{0F}) \equiv \Delta IM_0$$

  in the latter case, with $\Delta C_0 + \Delta I_0 = \Delta IM_0$ and $\Delta EX_0 = 0$

  it is seen from the multiplier formula that the numerator becomes 0, therefore *no adjustment is possible through induced changes in imports* and the *BoP deteriorates by the full amount of the exogenous* $\uparrow$ *in imports,* $\Delta CA = -\Delta IM_0$

Multiplier approach: BoP adjustment following an *exogenous* increase in **imports** (II)

in the former case, implying *perfect substitutability* of the home and foreign good (a very *restrictive* assumption), *under*adjustment, *exact* adjustment and *over*adjustment will occur whenever $C_1 + I_1 \lesseqgtr 1$, which becomes clear below

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

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

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

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

Multiplier approach: the transfer problem

- **origins:** war reparations on Germany after World War I
- **meaning:** understand effects, primary (immediate) and secondary (induced), of a (unilateral) **transfer of funds** from a *transferor* country to a *transferee* country on the BoP, that is, on the *current account* of the *transferor*
- **question:** will the BoP, understood as the CA (only), of transferor improve by a sufficient amount to "effect" the transfer
- **3 cases** possible:
  1. TB improves *less* than amount of transfer, CA *worsens*: *under*effected transfer
  2. TB improves *as much as* amount of transfer, CA is *same*: effected transfer
  3. TB improves *more* than amount of transfer, CA *improves*: *over*effected transfer
- **early literature** on transfer problem boils down to
  - **Keynes (1929):** transfer *under*effected, **vs Ohlin (1929):** transfer effected
  - conflicting outcome of findings results from the *different approaches* applied

Transfer problem: Keynes (1929) and the classical theory

- **assumptions**
  1. transferee, say *F*, disposes of transfer so as to reduce aggregate expenditure abroad, i.e. in transferor economy *H*, and increase aggregate expenditure domestically by *exact* amount of transfer
  2. continuous *full* employment
  3. external *equilibrium* before the transfer
  4. *entire* income spent on purchases of goods
- **analysis**, for *H* (elements correspond to 3 terms in result below)
  1. initial deterioration by an amount equal to the transfer
  2. improvement due to lower expenditure, hence, lower imports
  3. improvement due to higher expenditure abroad, hence higher exports
- **result:** $\Delta CA = -TR + IM_1 TR + IM_1^* TR = (IM_1 + IM_1^* - 1)TR$

  hence $IM_1 + IM_1^* \gtreqless 1 \Leftrightarrow \Delta CA \gtreqless 0$ but as "pessimism", $IM_1 + IM_1^* < 1$ dominated, *under*effectuation was the conclusion, e.g. Keynes

Transfer problem: Ohlin (1929) and the multiplier theory

- **assumptions:** differ from classical theory in 3 respects
  1. *saving* allowed, so that ↓ / ↑ in expenditure may not relate one-to-one with amount of transfer in transfer-or/-ee country
  2. (Keynesian) situation of *underemployment*
  3. any exogenous change gives rise to further, **multiplier effects** on *income*, so that **induced changes** in *imports* have also to be considered when calculating overall effect on CA
- **analysis:** 1. transfer, 2. simultaneous changes in autonomous components, 3. multiplier effects, 4. induced changes (1., 2. and 4. correspond to terms in result below, 3. comes from multiplier)

$$\Delta C_0 = -C_{TR}TR, \qquad \Delta C_0^* = C_{TR}^*TR$$
$$\Delta I_0 = -I_{TR}TR, \qquad \Delta I_0^* = I_{TR}^*TR$$
$$\Delta IM_0 = -IM_{TR}TR, \qquad \Delta IM_0^* = IM_{TR}^*TR$$

- **result:** $\Delta CA = -TR + (\Delta IM_0^* - \Delta IM_0) - (IM_Y^*\Delta Y^* - IM_Y\Delta Y)$
  - all three cases possible, and analysis much more complicated
  - most likely is, again, *under*effectuation
  - but Ohlin's opinion was of an effected transfer

An integrated approach to BoP adjustment: Laursen-Metzler (1950) model

- now **combine** the *elasticity* and *multiplier* approaches and consider a simpler, *SOE* version of original two-country model
  - denote by *Y* national *money* income and
    - assume *constant domestic* price level, *normalised* at *1*: then
    - variations in *Y* measure variations in *physical* output (too)
  - *IM* and *EX* depend on
    - *ToT*, as in *elasticity* approach,
    - and -- assuming that price level *abroad* is *also constant* -- on *NER*: *EX* vary in *same* direction as *S*, and *IM* in *opposite* direction
  - *IM* also depend on *income Y*, as in *multiplier* approach
- NER, *S*, thus *coincides* with the relative price of imports, i.e. ToT
  - hence, ΔS determines split-up of *C* and *I* b/n domestic and foreign goods
  - if appreciation (↓ in NER), imports become cheaper, so the *real* income corresponding to a *given money* income ↑, but as some of this ↑ is **saved**, amount spent on goods will ↓: **Harberger-Laursen-Metzler effect**

Laursen-Metzler (1950): stability analysis

- in its simplified *SOE* version, model *reduces to* **two equations**

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

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

  where the *domestic* price level has been normalised to *1*
- model is **indeterminate**: 2 equations in 3 unknowns, *(Y,CA,S)*
- imposing **BoP equilibrium**, write 2nd equation as $CA = 0$ and
  - *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 *(Y,S)* plane: **stability analysis**, Fig. 9.3, p. 123, in Gandolfo
  - all points whose coordinates satisfy 1st equation determine the curve ensuring *real-market* equilibrium: RR curve
  - all points whose coordinates satisfy 2nd equation determine the curve ensuring *BoP (that is, CA)* equilibrium: BB curve
  - the intersection of the two curves yields the *equilibrium (point) of model*

The J-curve and the S-curve

- **transfer problem** in Laursen-Metzler model: if *stability* is to obtain (by suitable conditions on elasticities => slopes) transfer will always be *effected*
- **J-curve**: describes the *dynamics* of net exports (i.e. CA), with *time* on the horizontal axis, following a depreciation
- **S-curve**: indeed, a *horizontal* S resembling the *cross-correlation* structure (function) of net exports with ToT at short, medium and long lag/lead *horizon* (on the horizontal axis)
- Magee (1973): J-curve results from **adjustment lags**
  - *currency-contract* period: p and q fixed
  - *pass-through* period: p can be modified but not q, due to rigidities in demands for imports and exports
  - *quantity-adjustment* period: both p and q free to move

Does a float really insulate the economy?

- 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: $Y=C+I+CA$ and since $CA=0$ under float, $Y=C+I$
- conclusion about the insulating properties of flexible exchange rates seems incorrect for (at least) 3 reasons
  1. adjustment following variations in NER is **not instantaneous**, i.e. it takes some time, therefore the *J-curve*
  2. NER variations have an effect
     – on *composition* of AD (b/n home and foreign good) inducing substitution
     – but also on the overall *level* of AD, affecting income: the essence of the Laursen-Metzler-Haberger effect
  3. the trade account (or the current account) needs not be balanced if *capital movements* are not abstracted away, which Laursen and Metzler (1950) did for the sake of simplicity

Mundell-Fleming (early 1960s) static model

- an extension to the *open* economy of Keynes (1936) – Hicks (1937) **IS-LM** model
- **assumptions**
  - the *domestic* economy, *H(ome)*, is small, so that it takes foreign variables as given: **SOE**
  - *goods* prices are **fixed** (for the duration of the analysis)
  - but asset markets are continuously in equilibrium, due to **full capital mobility**

Mundell-Fleming model: derivation

- *open*-economy **IS** curve ⇔ *goods* market equilibrium

$$y = \delta(s + p^* - p) + \gamma y - \sigma\imath + g$$

- **LM** curve ⇔ *money* market equilibrium

$$m - p = \phi y - \lambda\imath$$

- **FF** curve ⇔ *international capital* market equilibrium, given by *UIP* with *static* expectations $\imath = \imath^*$
- substituting the domestic interest rate using UIP in IS and LM and then totally differentiating them (as shown in detail in the lecture notes), one obtains the following system of 2 equations

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

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

Mundell-Fleming model: policy analysis

- all **comparative statics** results on the use of this model for *macroeconomic policy* analysis come from the above system
- *policy analysis* under **peg =>** graphical interpretation
  - domestic credit expansion: Fig. 8.1 in Mark (2001)
  - domestic currency devaluation: Fig. 8.2 in Mark (2001)
  - expansionary fiscal policy: works in the same way as devaluation
  - foreign interest rate rise: Fig. 8.3 in Mark (2001)
  - implied international transmission
- *policy analysis* under **float =>** graphical interpretation
  - domestic credit expansion: Fig. 8.4 in Mark (2001)
  - expansionary fiscal policy: Fig. 8.5 in Mark (2001)
  - foreign interest rate rise: Fig. 8.6 in Mark (2001)
  - implied international transmission

Concluding wrap-up

- **What have we learnt?**
  - distinguish b/n the elasticity and the multiplier approach to BoP adjustment (both **flow** approaches)
  - derive and interpret the Marshall-Lerner condition
  - describe and analyse the transfer problem
  - summarise the Laursen-Metzler (1950) model, which **integrates** the elasticity approach with the multiplier approach, and discuss its stability
  - derive and interpret the policy implications of the original, static Mundell-Fleming model, which is largely a flow approach, again, but already with some first elements of a stock approach to BoP
- **Where we go next**: to the richer, **stock and stock-flow** approaches to BoP adjustment