

## The Swan diagram

**Definition 1 (informal).** The internal balance of an economy requires full employment of resources (sufficiently low unemployment rate) and price stability (low and stable inflation rate): not too much unemployment, not too much inflation.

**Definition 2.** External balance corresponds to a balanced current account (the supply and demand for the domestic currency are balanced). For simplicity, external balance is defined as zero trade balance.

Internal balance and external balance both are assumed to depend on two variables: domestic expenditures and the real exchange rate. Domestic expenditure is given by sum of the components C (consumption), I (investment), and G (government purchases) of aggregate demand. The remaining component, NX (net exports), depends on competitiveness, which is measured by the real exchange rate.

**Definition 3.** The IB function (drawn in Fig. 1) consists of those combinations of domestic demand and real exchange rate that lead the economy to the internal balance.

The IB function is assumed increasing for the following reason. Let the economy be initially at a point, like point *a* in Fig. 1, where the internal balance condition holds (the economy has the 'right' amount of unemployment and inflation). If a real appreciation occurs (the real exchange rate increases), then imports rise and exports fall. That is, there is a switch in demand from domestic to foreign goods. As a result, unemployment goes up and the economy moves from point *a* to *b*. To restore internal balance by reaching point *c*, unemployment must be eliminated. This requires an increase in domestic expenditure.

It follows from the previous analysis that points above the IB function (excessive expenditure abroad) imply the existence of unemployment. Below the IB function failure of internal balance is not due to unemployment but to inflation; see Fig. 2. For instance, at point *d* in Fig. 1, given the corresponding real exchange rate  $e'_r$ , domestic expenditure is excessive with respect to the level  $D_a$  required to reach internal balance. This excess of domestic expenditure manifests itself in the form of inflation.

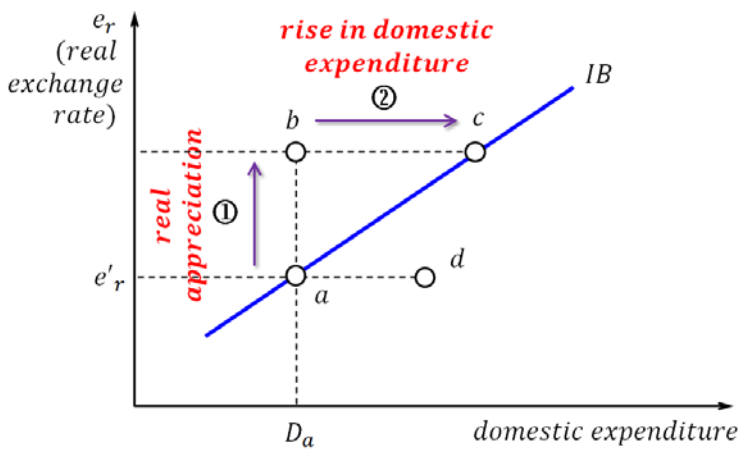


Fig. 1. The internal balance function IB

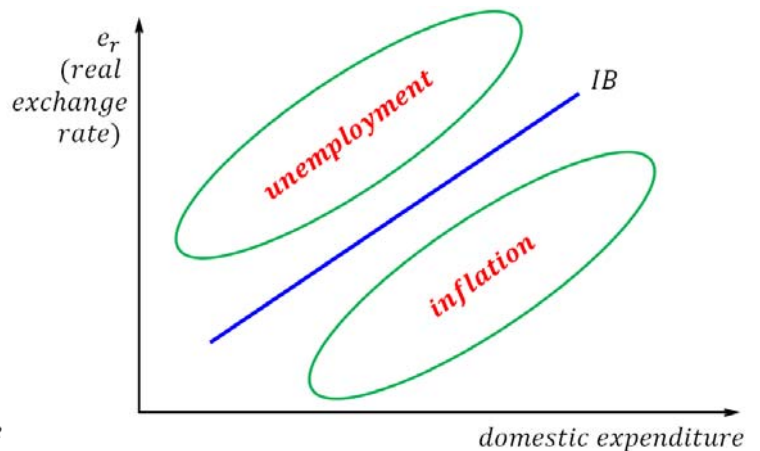


Fig. 2. What occurs outside the IB function

**Definition 4.** The EB function (drawn in Fig. 3) consists of those combinations of domestic demand and real exchange rate that lead the economy to the external balance.

The **EB function** is assumed **decreasing** for the following reason. Suppose the economy is initially at a point, like point *a* in Fig. 3, where the external balance condition (the trade balance is zero) is satisfied. If domestic expenditure increases, GDP and, consequently, income also increase. Part of this additional income is spent buying foreign goods and a trade deficit ensues. To restore external balance by reaching point *c*, the trade deficit must be neutralized. This requires a reduction of the real exchange rate: a real depreciation (an improvement of competitiveness)

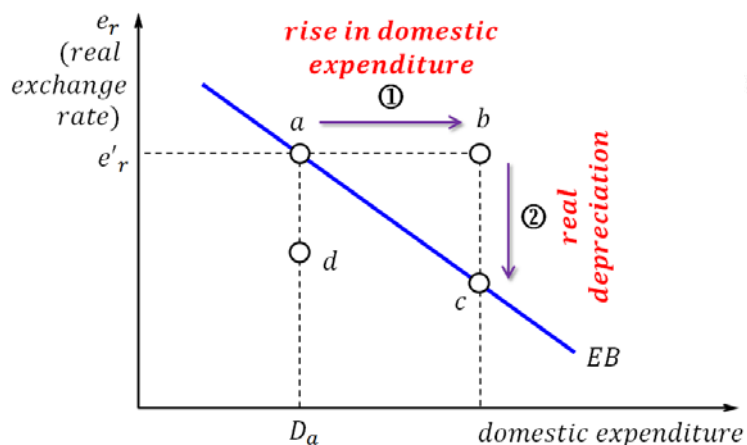


Fig. 3. The external balance function EB

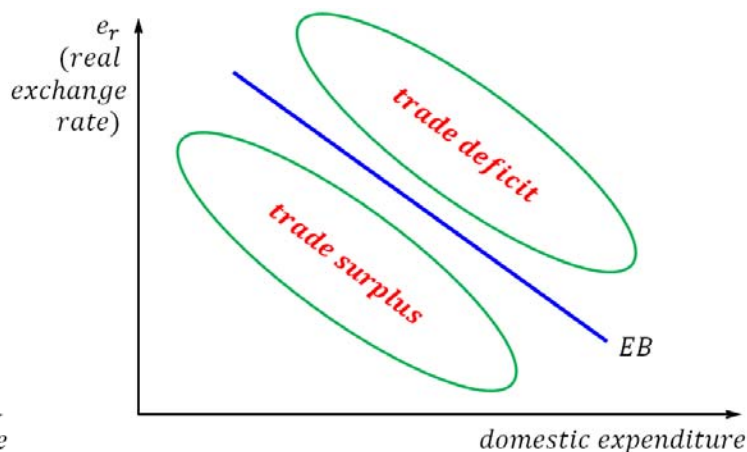
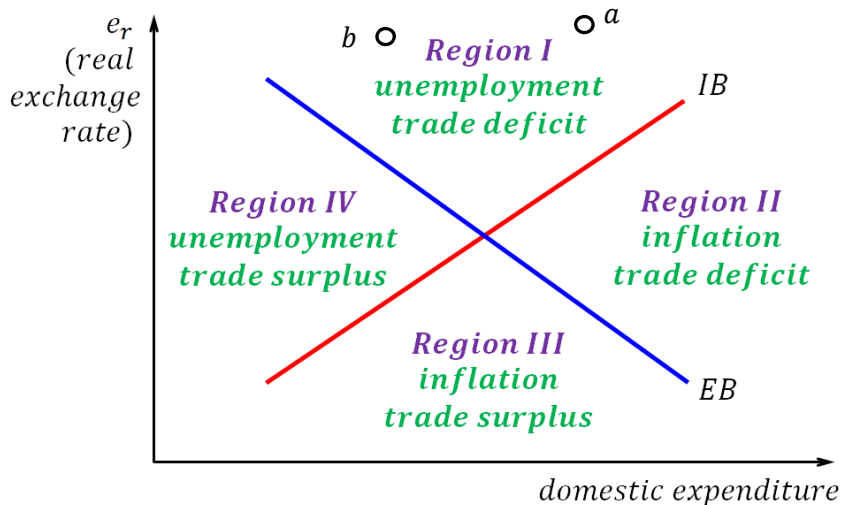


Fig. 4. What occurs outside the EB function

It follows from the previous analysis that points above the EB function (excessive domestic expenditure) generate a trade deficit. Below the EB function failure of external balance is not due to a trade deficit but to trade surplus; see Fig. 4. For instance, at point *d* in Fig. 3, given the corresponding level  $D_a$  of domestic expenditure, the real exchange rate is smaller than the value  $e'_r$  required to reach external balance with  $D_a$ . That is, the economy is 'too competitive' and therefore runs a trade surplus.

**Definition 5.** The Swan diagram (due to Trevor W. Swan) combines the IB and EB functions (see Fig. 5) to identify the real exchange rate level and the amount of domestic expenditure that allows the economy to simultaneously reach its internal and external balances.



The Swan diagram separates the plane into four regions. In region I, there is unemployment and trade deficit (Spain, Egypt, Poland). In region II, inflation coexists with a trade deficit (Brazil, Turkey, Colombia, Morocco). In region III, there is inflation and a trade surplus (China, Russia, Korea). In region IV, there is unemployment and a trade surplus (Hungary, Slovakia).

Fig. 5. The Swan diagram

Though the Swan diagram may lack precision (how is internal balance unambiguously defined?), it is useful to illustrate some points. Firstly, it shows that a way to solve a problem may worsen another problem, so policies must take into account their full effects not just the desired or intended ones.

**Example 6.** Suppose the economy is in point *a* of Region I in Fig. 5. At *a*, the economy suffers from excessive unemployment. It may appear that more expenditure is needed to reduce unemployment. Yet, the diagram suggests that the unemployment problem is not solved by changing expenditure (increasing it) but by shifting expenditure. To reach the intersection of lines IB and EB, domestic expenditure must fall and net exports rise (through depreciation). If only the unemployment problem is attacked by boosting domestic expenditure, internal balance could be reached at a price: the trade deficit worsens.

Indeed, in an economy that lies in Region I in Fig. 5 moves horizontally towards the IB function (by increasing domestic expenditure) to solve the unemployment problem, the consequence is that the economy moves away from the EB function (the trade deficit worsens, as more expenditure lead to more income and more income boosts imports).

Secondly, the Swan diagram alerts against the orthodox principle 'one size fits all', according to which solutions to macroeconomic problems need not take into account particular features of the economy suffering from those problems. That is, the principle maintains that if it works once, it works always.

**Example 7.** Suppose two economies are in Region I in Fig. 5, one situated on point *a* and the other on point *b*. If both economies want to meet the conditions of internal and external balance, it is plain that both should reduce the real exchange rate (become more competitive to reduce the trade deficit). But, to reach internal balance, the economy on *b* should expand domestic expenditure, whereas the economy on *a* should contract domestic expenditure. Consequently, there is not a single recommendation for both economies to attain internal and external balance.

**Remark 7.** The Swan diagram would also illustrate how to assign policies (fiscal policy and the exchange rate policy, for instance) to reach each of the two policy goals, internal and external balance.

**Definition 8.** Robert Mundell's principle of effective market classification: "Policies should be paired with the objectives on which they have the most influence".

"In countries where employment and balance-of-payments policies are restricted to monetary and fiscal instruments, monetary policy should be reserved for attaining the desired level of the balance of payments and fiscal policy for preserving internal stability. The opposite system would lead to a progressively worsening unemployment and balance-of-payments situation."

<http://robertmundell.net/major-works/the-appropriate-use-of-monetary-and-fiscal-policy-for-internal-and-external-stability>