Lecture Notes 14

A Small Open Economy under Fixed Exchange Rates

International Economics: Finance

Professor: Alan G. Isaac

14 A Small Open Economy under Fixed Exchange Rates

14.1 The Small Open Economy

14.1.1 The Structure of the Economy

14.1.2 Alternative Closures

14.2 Equilibrium with Fixed Exchange Rates

14.2.1 Keynesian Approach

14.2.2 Classical Approach

14.2.3 Algebraic Analysis

14.3 Short Run Comparative Statics

14.3.1 Fiscal Policy:

14.3.2 Devaluation

14.3.3 An International Transfer of Income:
14.3.4 An Increase in Wealth ........................................... 22
Terms and Concepts .................................................. 23
Problems for Review .................................................. 25
14.1 The Small Open Economy

This chapter introduces the fixed exchange rate economy. Most countries fix the value of their currency in terms of another currency or basket of currencies. Our exploration of fixed exchange rate economies will focus on the effects of monetary policy, fiscal policy, and exchange rate policy on output, inflation, and the balance of trade. The central goal of this chapter is to determine the effects fiscal policy on small open economies with fixed exchange rates.

Recall that an economy is “open” to the extent that it trades with other countries; it is “small” when it cannot influence foreign income and prices. Foreign income and prices are determined in the rest of the world independently of the import behavior of the country we are modeling. We say foreign income and prices are *exogenous*: that is, they are not explained by the model.

So our analysis in this chapter focuses on an economy that has a negligible influence on foreign prices and incomes: a “small open economy”. A small open economy *may* be able to affect the relative price of its export good to its import good by changing the exchange rate, $S$, or the domestic price level, $P$, but it cannot affect the foreign currency price of its import good, $P^*$. For some countries this is a plausible simplification; for others it is not. Later in this book we will analyze the complications that arise when we drop the assumption of smallness and allow for repercussion effects between the domestic economy and the rest of the world. Our small country analysis will prove very helpful at that point: the basic determinants of income, prices, and the trade balance in a small open economy remain operative in a large open economy.
14.1. THE SMALL OPEN ECONOMY

14.1.1 The Structure of the Economy

We will characterize the structure of our basic fixed exchange rate economy with equations (14.1), (14.2), and (14.3). We therefore refer to these as our structural equations.

\[ A = A(G, Y_T, \Omega/P) \]  \hspace{1cm} (14.1)
\[ CA = TB(\frac{SP^*}{P}, Y_T) + FP + UTr \]  \hspace{1cm} (14.2)
\[ CA = Y_T - A \]  \hspace{1cm} (14.3)

New Notation:

\( A(\cdot, \cdot, \cdot) \) A function returning the value of real absorption given the values of real government expenditure, real total income, and real wealth.\(^1\)

\( \Omega \) Nominal wealth.

Equations (14.1) and (14.2) summarize the economically important behavior in this economy. We therefore call them behavioral equations. Behavioral equations provide functional descriptions of important economic behavior. They determine the basic structure of the model, and they embody many crucial economic assumptions. For example, we will assume that the key determinants of domestic spending are income and wealth. In our models of the open economy, this assumption about economic behavior is embodied in the behavioral equation (14.1).

In equation (14.1), domestic desired expenditure on final goods and services—which we call absorption—depends on real financial wealth and total income.\(^2\) Recall that absorption

---

\(^1\)Nominal means measured in domestic currency units (e.g., dollars in the U.S.). Real means measured in units of domestic GDP. You find the real value by dividing the nominal value by the GDP deflator, \(P\).

\(^2\)We generally expect that spending depends on income, wealth, and the real interest rate: \( A = A(G, Y, i - \pi, \Omega/P) \). Equilibrium in the money market can be written as \( H = L(i, Y) \). Our use of \( A = A(G, Y, \Omega/P) \) is motivated by the resulting algebraic simplicity, with the following rough justifications in the cases of perfect capital mobility and perfect capital immobility.

Suppose financial capital is “immobile” internationally, and ignore the foreign indebtedness of the private sector and government. Suppressing expected inflation and claims on physical capital, which we treat as exogenous constants, we can write \( A = A(G, Y, \Omega/P) \) where \( \Omega = H \). Real balances enter due to the Pigou...
comprises domestic consumption, investment, and government expenditure: $A = C + I + G$. You can think of absorption as responding to total income, $Y_T$, and real wealth, $\Omega/P$, because consumption does. Since we will wish to explore the effects of fiscal policy on the economy, we have explicitly included government expenditure as an influence on the level of absorption.$^3$

Equation (14.2) characterizes the determination of the current account ($CA$). Recall that the current account can be decomposed into the balance of trade on goods and non-factor services, net factor payments from abroad, and net unilateral transfers received from abroad. The key behavioral assumption in the determination of the current account is that the balance of trade on goods and services responds to the real exchange rate (i.e., the relative price of imports), $SP^*/P$, and total income, $Y_T$.

We will refer to $Y_T - A$ as ‘hoarding’. It is the excess of real total income over real total expenditure. As we saw in the chapter on balance of payment accounting, you can also think of it as the excess of national saving (including the fiscal surplus) over investment. Hoarding is always zero in a closed economy, but in an open economy hoarding is the desired accumulation of claims on the rest of the world (i.e., desired net foreign investment). Equation (14.3) is our goods market equilibrium condition that the desired current account surplus must equal the economy’s desired hoarding.

The key equilibrium notion in this chapter is embodied in equation (14.3). We therefore refer to it as an equilibrium condition. Equilibrium conditions are algebraic relations that must hold in equilibrium. Equation (14.3) states that output equals the demand for output when the goods market is in equilibrium.

---

$^3$We often assume that increases in $G$ increase $A$ dollar for dollar, but equation (14.1) allows for other possibilities. For example, if government expenditure on public goods reduced desired consumption or investment expenditure, a dollar of new government expenditure could increase absorption by less than a dollar.

and Keynes effects, i.e., the direct wealth effects on spending and the indirect effects via the influence of real balances on $i$. In this case both $H$ and $\Omega$ are predetermined.

If capital is perfectly mobile, the money supply is endogenous but wealth, which is predetermined, still determines absorption. The interest rate is then determined by the interest parity condition.
Equation (14.3) may seem more familiar if we subtract $FP$ and $UTr$ from both sides and rearrange it to get (14.3’).

$$Y = A + TB$$  \hspace{1cm} (14.3')

On the left side we have GDP. On the right we have aggregate demand: the total desired expenditure on domestic final goods and services. Since equation (14.3’) simply says that domestic output must equal the demand for that output if the goods market is in equilibrium, so does equation (14.3).

### 14.1.2 Alternative Closures

Equations (14.1), (14.2), and (14.3) constitute the structure of the basic models that we are about to examine. It is important to remember, however, that these equations do not of themselves constitute a model. A model comprises not only a set of structural equations but also a specification of the exogenous and endogenous variables. Recall that endogenous variables are the variables whose behavior the model explains, while the exogenous variables are important economic influences that we do not try to explain. We are usually able to determine the values of as many endogenous variables as we have structural equations. So along with our structural equations we need to specify which three variables our model explains.

We begin with $\Omega$, $S$, $FP$, $UTr$, and $P^*$ exogenous. The two variables $A$ and $CA$ are endogenous. The structure of the model includes two more variables, $Y_T$ and $P$, but having only the three equations (14.1), (14.2), and (14.3) limits us to explaining only one more variable. This observation provides the basis for a number of alternative closures, i.e., completions of the model. In this book, we will concentrate on two closures, which we call the Keynesian model and the Classical model.\(^4\)

\(^4\)Other popular closures are achieved by adding additional structure. Two examples are the Phillips Curve model and the Hybrid model. The Phillips Curve Model adds a Phillips Curve that relates the rate of inflation to the GDP gap and expected inflation: $\dot{P}/P = f(Y/Y_f, \dot{P^e}/P)$. We can then let $\dot{P}$ and $Y$ be endogenous, where $P$ is predetermined. The Phillips curve model behaves like the Keynesian approach in
• The **Keynesian Approach** or Income-Expenditure Model:

\[ Y_T \text{ endogenous, } P \text{ exogenous.} \]

• The **Classical Approach** or Classical Model:

\[ P \text{ endogenous, } Y_T \text{ exogenous.} \]

The difference between the two models lies in the choice of one endogenous variable. The Keynesian approach models the determination of real income. The Classical approach models the determination of the price level. To reflect these emphases, let us collapse the three structural equations, through repeated substitution, into a single equation that includes only a single endogenous variable. Equation (14.4) is a summary of our original structure in equations (14.1), (14.2), and (14.3). We refer to it as a “reduced structure”. Note that the left side of this equation, the difference between total income and total desired domestic expenditure, is hoarding. The right hand side is the *ex ante* current account. Equation (14.4) therefore embodies our notion of goods market equilibrium, where hoarding equals the current account.

\[
Y_T - A(G, Y_T, \Omega/P) = TB(SP^*/P, Y_T) + FP + UTr \tag{14.4}
\]

In the Keynesian approach, \( Y_T \) is the only endogenous variable in (14.4); everything else—including \( P \)—is exogenous. In the Classical approach, \( P \) is the only endogenous variable in (14.4); everything else—including \( Y_T \)—is exogenous.

### 14.2 Equilibrium with Fixed Exchange Rates

In section 14.1.2, we summarized the structure of our Keynesian approach and Classical approach models by equation (14.4). This equation embodies both the economic behavior of the short-run and like the Classical approach in the long run. The Hybrid Model takes a different approach; it adds an aggregate supply curve that relates GDP to the real wage: \( Y = Y(W/P) \). If we treat \( W \) as exogenous, we can let both \( Y \) and \( P \) be endogenous. In this book we occasionally consider these alternative closures.
14.2. EQUILIBRIUM WITH FIXED EXCHANGE RATES

we have assumed and our characterization of goods market equilibrium. Our next goal is to use this reduced structure to develop a graphical representation of equilibrium in a small open economy. We will need one representation for each approach to modeling the small open economy. Remember, the Keynesian model has $Y_T$ endogenous and $P$ exogenous, while the Classical model has $P$ endogenous and $Y_T$ exogenous.

### 14.2.1 Keynesian Approach

First consider the Keynesian approach. As total domestic income increases, so does absorption. But some income is saved, so spending increases more slowly than income. This implies that increases in income lead to increases in hoarding. In Figure 14.1, the hoarding curve therefore slopes upward with a slope less than unity. (Let us call this slope $s$, ‘the marginal propensity to save’.) The current account curve is downward sloping since increases in income increase domestic expenditure on foreign goods. This rise in imports reduces our trade balance and thus our current account. (That is, the slope is $-m$, minus the marginal propensity to import.)

The unique level of income at which hoarding equals the current account is our Keynesian equilibrium. In Figure 14.1, this is found where the hoarding locus crosses the current account.
locus. To the right of this point there is excess supply in the goods market; to the left, there is excess demand. The equilibrium level of income is labelled $Y_0$ on the horizontal axis. The equilibrium levels of hoarding and the current account is $CA_0$, which is found on the vertical axis.

We can exploit this graphical framework to anticipate a result from our discussion of the algebra of the Keynesian approach. Let $CA^{aut}$ be the level of the current account at $Y_T = 0$. Then the slope of the current account locus is $(CA_0 - CA^{aut})/Y_0 = -m$. Similarly, let $A^{aut}$ be the level of hoarding at $Y_T = 0$. Then the slope of the hoarding locus is $(A^{aut} + CA_0)/Y_0 = s$. Together these imply

$$Y_0 = \frac{A^{aut} + CA^{aut}}{s + m}$$

which is the solution determined by the algebra in section 14.2.3 below.

### 14.2.2 Classical Approach

Now consider the Classical approach as represented in Figure 14.2. Once again, the hoarding locus is upward sloping. The reason, however, is quite different. An increase in the price level reduces real wealth. This reduction in wealth leads to a reduction in spending, which
is the source of the increase in hoarding.

Prices affect the current account through a very different mechanism. An increase in the domestic price level—given the exchange rate and the foreign price level—increases the relative price of domestic goods. Since domestic goods now look more expensive relative to foreign goods, demand shifts away from domestic production and toward foreign production.\(^5\) That is, at any given level of \(SP^*\), domestic consumers will desire more imports and fewer domestically produced goods. So the price increase diminishes the trade balance and, thereby, the current account.

The hoarding locus and current account locus have been drawn for the Classical approach in Figure 14.2. The unique point of intersection determines the equilibrium price level. At a higher price level, there is excess supply in the goods market: higher prices reduce spending (by reducing real wealth) and shift spending away from domestic goods (by appreciating the real exchange rate). Similarly, at a lower price level, there is excess demand in the goods market. The equilibrium price level is labelled \(P_0\) on the horizontal axis. The equilibrium level of hoarding and the current account can be found on the vertical axis.

14.2.3 Algebraic Analysis

We have graphically characterized equilibrium for both approaches. Now we proceed to an algebraic characterization. For the algebraic analysis, we will work with simplified, linear representations of equation (14.4). Our representation of the Keynesian approach is equation (14.5); our representation of the Classical approach is equation (14.6). Both equations simply restate the equality of hoarding (on the left) and the current account (on the right) in equilibrium.

---

\(^5\)Our discussion here ignores the possible conflict between the effect of prices and the effect of quantities on the value of imports, which we dealt with in an earlier chapter.
10 LECTURE NOTES 14. A SMALL OPEN ECONOMY UNDER FIXED EXCHANGE RATES

**Keynesian Approach**

\[ sY_T - \left( \bar{A} + v\frac{\Omega}{P} \right) = CA - mY_T \]  \hfill (14.5)

**Classical Approach**

\[ \bar{S} - \frac{v}{P} = \frac{SP^*}{P} - \tau^* \]  \hfill (14.6)

**The Keynesian Approach**

In equation (14.5), hoarding appears as \( sY_T - [\bar{A} + v\Omega/P] \). Here \( s \) is the marginal propensity to save: it tells us how much each addition to income increases our hoarding. The term \( sY_T \) is therefore our total *induced* hoarding: the part of hoarding that is influenced by income. The term \( -[\bar{A} + v\Omega/P] \) is our *autonomous* hoarding: the part of hoarding that is not affected by income.

Where is the (negative) contribution to hoarding of government expenditure? Changes in government expenditure are represented by changes in \( \bar{A} \), as are other changes in autonomous expenditure. There is one exception: we separate out \( v\Omega/P \), the contribution of real wealth to autonomous consumption expenditure. This is unimportant at the moment, but it will prove useful later in this chapter when we think about real wealth a bit more carefully.

The current account in the Keynesian approach is also separated into an autonomous term, \( CA \), and an induced term, \(-mY_T\). Part of the current account is induced by domestic income because income is an important determinant of imports. The parameter \( m \) is the marginal propensity to import: it tells us how much imports change when income changes. Changes in the real exchange rate are represented by changes in \( CA \), as are changes in the other exogenous variables \( FP \) and \( UTr \).

With this background, we can attack the problem of algebraically determining the level of equilibrium income in the Keynesian approach. Solving equation (14.5) for the equilibrium
level of income yields equation (14.7), the reduced form equation for income.

\[ Y_T = \frac{\bar{A} + v\Omega/P + CA}{s + m} \]  \hspace{1cm} (14.7)

This solution may look very familiar from your earlier experiences with closed economy Keynesian macroeconomics. It says that the equilibrium level of income is a multiplier, \(1/(s+m)\), times the level of autonomous expenditure, \(\bar{A} + v\Omega/P + CA\). Opening up the economy leads to two modifications of the Keynesian solution for equilibrium income in a closed economy. First, international trade has an effect on autonomous expenditure, captured by \(CA\). This contribution may be positive, if the domestic economy has a current account surplus, or negative, if it is in deficit. Second, since our demand for imports is a leakage from the demand for domestic goods, the marginal propensity to import reduces the multiplier. Neither change alters the core of the Keynesian approach to income determination: the equilibrium level of income depends on the demand for domestic goods and services, and changes in autonomous expenditure have a multiplier effect on equilibrium income. However the leakage of expenditure into imports does suggest that openness has an important consequence for fiscal policy: increased international economic integration will be associated with higher propensities to import and therefore less effective fiscal policy.

We will look at the effects of such changes on hoarding and the current account in the next section. In the meantime, note that we can solve for the equilibrium current account by substituting our solution for income into our expression for the current account, \(CA - mY_T\). This yields equation (14.8).

\[ CA = \frac{s}{s + m} \bar{A} - \frac{m}{s + m} \left( \bar{A} + v\frac{\Omega}{P} \right) \]  \hspace{1cm} (14.8)
The Classical Approach

We can algebraically solve the Classical approach model for the equilibrium price level. Recall equation (14.6), our summary of the structure of the Classical approach.

\[
\bar{S} - \frac{v\Omega}{P} = \tau SP^*/P - \tau^*
\]

While behavior is induced by income in the Keynesian approach, in the Classical approach behavior is induced by prices. So in equation (14.6) we see hoarding is divided into an autonomous component, \(\bar{S}\), and an induced component, \(-v\Omega/P\). The parameter \(v\) is the propensity to spend out of real wealth. (Recall that real wealth is determined by the exogenous level of nominal wealth and the endogenous level of prices.) The autonomous component represents the influence of \(Y_T\), \(FP\), and \(UTr\) on the trade balance.

Similarly, the current account is decomposed into an autonomous component, \(-\tau^*\), and an induced component, \(\tau SP^*/P\). The induced component represents the response of the current account to changes in the real exchange rate. These changes can be induced by changes in the price level. The parameter \(\tau\) is the sensitivity of the trade balance to the real exchange rate: it tells us how quickly the trade balance improves as the real exchange rate depreciates. The autonomous component represents the influence of \(Y_T\), \(FP\), and \(UTr\) on the trade balance.

Solving equation (14.6) for the equilibrium price level yields equation (14.9), the reduced form equation for the price level. As we would expect, equation (14.9) tells us that the domestic price level depends positively on the demand for domestic goods. This suggests a parallel between the treatment of prices in the Classical approach and the treatment of income in the Keynesian approach. (We explore this in more detail in the next section.)

\[
P = \frac{v\Omega + \tau SP^*}{\bar{S} + \tau^*}
\]
Once again, we can solve for the equilibrium current account by substitution. Substitute our solution for the equilibrium price level into our expression for the current account, $\tau SP^*/P - \tau^*$. This yields equation (14.10).

$$CA = -\tau^* + \tau SP^* \frac{\bar{S} + \tau^*}{v\Omega + \tau SP^*} = -\frac{v\Omega\tau^*}{v\Omega + \tau SP^*} + \frac{\tau SP^*\bar{S}}{v\Omega + \tau SP^*}$$ (14.10)

14.3 Short Run Comparative Statics

Economists like to perform thought experiments about the effects of policy changes or other exogenous shocks on the economy. One way to do this is comparative statics. In this section, we examine the comparative statics of the Keynesian approach and Classical approach models.

The comparative statics algebra for income in the Keynesian approach and for the price level in the Classical approach follows directly from equations (14.7) and (14.9). The comparative statics of the current account similarly follow directly from equations (14.8) and (14.10). For ease of reference, these four equations are repeated below.

**Keynesian Approach**

$$Y_T = \frac{1}{s + m}(\bar{A} + \frac{\Omega}{P} + \overline{CA})$$ (14.7)

$$CA = \frac{s}{s + m}\overline{CA} - \frac{m}{s + m}(\bar{A} + v\Omega/P)$$ (14.8)

**Classical Approach**

$$P = \frac{v\Omega + \tau SP^*}{\bar{S} + \tau^*}$$ (14.9)

$$CA = -\frac{v\Omega\tau^*}{v\Omega + \tau SP^*} + \frac{\tau SP^*\bar{S}}{v\Omega + \tau SP^*}$$ (14.10)
14.3.1 Fiscal Policy:

In this section we explore one sense in which a fiscal deficit causes a “twin” current account deficit. Specifically, we show that a fiscal expansion leads to a current account deficit in the Keynesian and Classical models.

Keynesian Approach:

In the Keynesian approach, we represent a change in fiscal policy by a change in autonomous absorption, \( d\bar{A} \). Consider an increase in government expenditure, \( dG > 0 \). We often think of autonomous absorption changing one for one with government expenditure, so that \( d\bar{A} = dG \).

This requires, for example, that private consumption decisions not be based directly on the level of government expenditure. In any case, the effect of a change in fiscal policy follows from the resulting change in autonomous aggregate demand.

This is natural. Equation (14.7) tells us that equilibrium income is a multiple of autonomous expenditure. Equation (14.8) tells us that the effect of this on the current account is determined by the marginal propensity to import. For example, a fiscal expansion increases domestic income; the resulting increase in imports deteriorates the current account. These effects are illustrated in the Figure 14.3.

Consider the downward shift in the hoarding curve. This reflects the higher level of absorption and therefore lower level of hoarding at each income level. At the old equilibrium level of income, the goods market is now in excess demand due to the fiscal expansion. Equilibrium is restored by a rise in output. The rise in output induces an increase in imports, which is the source of the deterioration in the current account.

Classical Approach:

The results for the Classical approach appear very similar to those for the Keynesian approach, but it is the price level rather than income changes. This is illustrated in Figure 14.3, where we now place \( P \) on the horizontal axis. This similarity in results illustrates
the parallels between the Keynesian and Classical approaches, but we must not allow the parallels to hide the differences in the mechanisms that lead to these results.

Consider the downward shift in the hoarding curve. This reflects the higher level of absorption and therefore lower level of hoarding at each price level. At the old equilibrium level of prices, the goods market is now in excess demand due to the fiscal expansion. Equilibrium is restored by a rise in the price level, which reduces absorption and deteriorates the trade balance. Absorption is reduced as the rise in prices reduces real wealth. The rise in prices also induces an increase in imports and a decrease in exports, since it creates an appreciation of the real exchange rate. The decline in the balance of trade is the source of the deterioration in the current account.

Note that in the new equilibrium autonomous absorption is higher than its old value, due to the fiscal expansion, but induced absorption is lower, due to the decline in real wealth. Looking at the graph we see the lower hoarding in the new equilibrium, so the end result is still an increase in absorption relative to the initial equilibrium.
The Algebra

**Keynesian Approach:** The comparative statics algebra for the Keynesian model follow directly from equations (14.7) and (14.8). These equations tell us that equilibrium income is a multiple of autonomous expenditure, and that the current account therefore depends on autonomous expenditure (since it depends on the level of income). The fiscal expansion can be represented as an increase in $\bar{A}$: $d\bar{A} > 0$. This increase in autonomous absorption produces the following changes in income and the current account.

\[
dY_T = \frac{1}{s + m} d\bar{A} \quad (14.7a)
\]
\[
dCA = -\frac{m}{s + m} d\bar{A} \quad (14.8a)
\]

**Classical Approach:** The comparative statics algebra for the Classical model follows directly from equations (14.9) and (14.10). The fiscal expansion can be represented as a decline in $\bar{S}$: $d\bar{S} < 0$.

\[
dP = -\frac{v\Omega + \tau SP^*}{(S + \tau)^2} d\bar{S} \quad (14.9a)
\]
\[
dCA = \frac{\tau SP^*}{v\Omega + \tau SP^*} d\bar{S} \quad (14.10a)
\]

### 14.3.2 Devaluation

In section 14.3.1 we saw that a fiscal expansion leads to a current account deficit in both the Keynesian and Classical model. Now we will explore a way to offset such current account deterioration.

When the foreign currency cost of imports is exogenous, the exchange rate—the domestic currency cost of foreign currency—determines the domestic currency price of imports. In this setting, changes in the exchange rate may be able to change the real exchange rate—the relative price of imports, or the rate at which our goods exchange for foreign goods. This

---

6Equivalently, changes in the exchange rate may be able to affect the *terms of trade*—the relative price
14.3. SHORT RUN COMPARATIVE STATICS

is the basic mechanism by which exchange rate policy may affect the economy. Once again we begin by reviewing equation (14.4).

\[ Y_T - A(G, Y_T, \Omega/P) = TB(SP^*/P, Y_T) + FP + UTr \] (14.4)

We see that ceteris paribus a nominal devaluation produces a real devaluation, thereby improving the trade balance, and this is the basis of our analyses, illustrated by figure 14.4.\(^7\)

**Keynesian Approach**

In the Keynesian approach, price levels are exogenous. A devaluation therefore directly affects the real exchange rate, and thereby it affects the trade balance. Let us represent the effects of the devaluation on the trade balance, for any given level of income, by \(dTB\). Then we have an exogenous improvement in the trade balance of \(dTB\), which is illustrated in figure 14.4 as an upward shift in the trade balance locus. This is not the end of the story, however, for in this Keynesian economy the increase in autonomous aggregate demand represented by

\(^7\)Of course this assumes the valuation effect of the devaluation does not outweigh the quantity effects. Further, we will ignore possible effects of a devaluation on absorption, including Harberger-Laursen-Metzler effects and wealth effects.
$dTB$ will raise income, and a rise in income will increase imports. Thus the improvement in the trade balance will ultimately be less than $dTB$.

**Classical Approach**

In the Classical approach, income is exogenous. The national price level is endogenous; it is determined by the model. Nevertheless, we can say that at any given price level, a devaluation affects the real exchange rate, and thereby it affects the trade balance. Let us represent the effects of the devaluation on the trade balance, for any given level price level, by $dTB$. Then at each price level we have an improvement in the trade balance of $dTB$ that can be illustrated in figure 14.4 as an upward shift in the trade balance locus. This is not the end of the story, however, for in this Classical economy the increase in aggregate demand represented by $dTB$ will raise prices, and a rise in prices will increase imports and reduce exports. Thus the improvement in the trade balance will ultimately be less than $dTB$.

**The Algebra**

**Keynesian Approach:** The comparative statics algebra for the Keynesian model follow directly from equations (14.7) and (14.8). These equations tell us that equilibrium income is a multiple of autonomous expenditure, and that the current account therefore depends on autonomous expenditure (since it depends on the level of income). The devaluation can be represented as an increase in $CA$: $CA = dTB > 0$. This increase in autonomous aggregate demand produces the following changes in income and the current account.

$$dY_T = \frac{1}{s + m} dTB \quad (14.7b)$$

$$dCA = \frac{s}{s + m} dTB \quad (14.8b)$$

**Classical Approach:** The comparative statics algebra for the Classical model follows directly from equations (14.9) and (14.10). The devaluation can be represented as a rise in
the nominal exchange rate $S$: $dS > 0$.

\[ dP = \frac{\tau P^*}{(\bar{S} + \tau^*)} dS \]  

(14.9b)

Thus the real exchange rate does change, but less than proportionally to the nominal devaluation. Further, since $dCA = \tau dQ$, we have

\[ dCA = \tau Q \frac{v\Omega}{v\Omega + \tau P^* \hat{S}} \hat{S} ^\prime \]  

(14.10b)

where $\hat{S} = dS/S$ is the percentage devaluation.

### 14.3.3 An International Transfer of Income:

The second experiment we will consider is an increase in the flow of aid to a country. Suppose we have an increase $dUTr > 0$ in the unilateral transfers received by a country. Recall equation (14.4), our description of equilibrium.

\[ Y_T - A(G, Y_T, \Omega/P) = TB(SP^*/P, Y_T) + FP + UTr \]  

(14.11)

Clearly the increase in unilateral transfers received directly increases the current account (i.e., the right hand side of equation (14.4)).\(^8\) We want to discover how the economy adjusts endogenously to restore equilibrium after this change. Equivalently, in the Keynesian approach we want to find out how $Y_T$ adjusts to restore the equality (14.4), and in the Classical approach we want to find out how $P$ adjusts to restore this equality.

\[^8\text{Note that the trade balance is determined behaviorally, so that a unilateral transfer of goods affects the trade balance only through its affect on total income. That is, the direct effect on the trade balance of the flow of transferred goods is offset by a reduction in imports.}\]


Keynesian Approach:

The increase in the flow of aid directly increases the current account for every level of $Y_T$. This is shown in Figure 14.5 as an upward shift in the $CA$ locus. However the change in the equilibrium current account is smaller than $dUTr$ for two reasons. First, some of the transfer is spent on imports, deteriorating the trade balance and thereby the current account. Second, consumption out of the transfer raises demand, increases equilibrium GDP, and thereby further increases imports. This also depresses the trade balance and the current account.

It is easy to be specific about the relationship between the change in equilibrium income, $dY_T$, and the change in the equilibrium current account, $dCA$. In the new equilibrium, hoarding must equal the current account, and the hoarding curve has not shifted. Since the slope of the hoarding curve is the marginal propensity to save, the change in the equilibrium current account must be this fraction of the change in equilibrium income: $dCA = sdY_T$.

Classical Approach:

We will consider a slightly different version of our experiment for the Classical approach, in order to obtain results that offer closer graphical parallels to the results from the Keynesian
14.3. SHORT RUN COMPARATIVE STATICS

approach. Suppose that a decline in GDP leads to an offsetting aid flow, so that $Y_T$ is unchanged but $UTr$ is higher. Since total income is unchanged, at any given $P$ demand is unchanged. But output has fallen, so at the old equilibrium there is now excess demand. The price level rises and the current account improves, just as income rose and the current account improved in the Keynesian approach. Once again, however, the mechanism behind these changes is quite different.

The Classical approach is illustrated in Figure 14.6. Once again, the shift up of the $CA$ locus equals the increase in annual aid flow. The increase in the equilibrium current account is smaller than this shift, however. Part of the transfer is spent on domestic goods, but in the Classical approach GDP is exogenously fixed. The increased demand simply leads to higher prices, without any increase in output. The rise in the domestic price level appreciates the real exchange rate, which causes a deterioration in the trade balance and thereby depresses the current account.

The Algebra:

In the simplified algebra for the Keynesian approach, we set $dUTr = dCA > 0$. The comparative statics algebra the follows immediately from equation (14.7) and (14.8).
\[ dY_T = \frac{1}{s + m} d\overline{CA} \]  
\[ dCA = d\overline{CA} - \frac{m}{s + m} d\overline{CA} \]
\[ = \frac{s}{s + m} d\overline{CA} \]

So the increased flow of foreign aid has a multiplier effect on income and improves the current account.

In the Classical approach, we will represent the same change by \( d\tau^* < 0 \). The comparative statics algebra follows directly from equation (14.9) and (14.10).

\[ dP = \frac{-(v\Omega + \tau SP^*)}{(\overline{S} + \tau^*)^2} d\tau^* \]  
\[ dCA = -d\tau^* + \frac{\tau SP^*}{v\Omega + \tau SP^*} d\tau^* \]
\[ = -\frac{v\Omega}{v\Omega + \tau SP^*} d\tau^* \]

So in the Classical approach, the increased flow of foreign aid increases the price level and improves the current account. (Don’t forget that \( d\tau^* < 0 \).)

### 14.3.4 An Increase in Wealth

We now consider the effects of an increase in \( \Omega \). Once again we begin by reviewing equation (14.4).

\[ Y_T - A(G, Y_T, \Omega/P) = TB(SP^*/P, Y_T + FP + UTr) \]  

---

9 This representation has been picked for algebraic simplicity. When the country in question is a recipient of foreign transfers, a more reasonable representation may be \( d\tau > 0 \), since this allows real exchange rate changes to affect the value of the foreign transfer measured in domestic goods. The qualitative conclusions of this section are unaffected by this change. It is also important to remember that the offsetting GDP and \( UTr \) changes preclude a change in autonomous hoarding.

10 To derive (14.9b) from (14.9), use the quotient rule.
An increase in wealth directly increases absorption, since consumers increase their spending in response to the increase in their net worth. The graphical analysis is therefore identical to our analysis of an increase government expenditure. The algebraic results are also very similar.

The Algebra

\[ dY_T = \frac{1}{s + mP} \frac{v}{P} d\Omega \quad (14.7c) \]

\[ dCA = -\frac{m}{s + mP} \frac{v}{P} d\Omega \quad (14.8c) \]

\[ dP = \frac{v}{S + \tau^*} d\Omega \quad (14.9c) \]

\[ dCA = -\frac{v\tau SP^*(S + \tau^*)}{(v\Omega + \tau SP^*)^2} d\Omega \quad (14.10c) \]
Terms and Concepts

behavioral equations, 12-2

deficit
twin, 12-8
devaluation, 12-9
economy
open, 12-1
small, 12-1
equilibrium condition, 12-3
exchange rate
fixed, 12-1
exogeneity, 12-1

tax policy
with fixed exchange rates, 12-8
foreign aid, 12-11

hoarding, 12-2

model
constituents, 12-3

structural equations, 12-2

transfer problem, 12-11
Problems for Review

1. For both the Keynesian and Classical approaches, explain the slopes of the hoarding locus and the current account locus.

2. Show that equation (14.4) can be derived from equations (14.1), (14.2), and (14.3) by substitution.

3. What is a structural form? What is a reduced form equation?

4. Explain why excess supply obtains to the right of the equilibrium point in both the Keynesian model as represented in Figure 14.1 and the Classical model as represented in Figure 14.2.

5. In the Keynesian Approach analysis of an increased flow of aid, the hoarding curve did not shift. Yet absorption depends on total income, a component of which is $UTr$. How can this be?

6. Suppose there is a “shock” to the trade balance: foreign demand for the domestic good exogenously increases. What is the affect on a Keynesian economy? What is the effect on a Classical economy? [Hint: Use figure 14.4.]

7. In our graphical analysis of an increase in the flow of foreign transfers, we determined the changes in GDP and the trade balance (in addition to the changes in total income and the current account). Determine these algebraically. [Hint: $CA = TB + FP + UTr$.] [Comment: please assume, realistically, that $s + m < 1$. (What would be the economic interpretation of $s + m = 1$?)]

8. Note that we lose some information in our simple algebraic representation of the Classical model. If we want to investigate the effects of $dY$, $dFP$, or $dUTr$, we need to know how these affect $S + \tau^*$. Turning back to equation (14.4), what is the effect of $dFP$ on these two autonomous components?
9. Suppose a country has net foreign indebtedness of $FI$ and is making interest payments on that debt at the ROW real interest rate $r^*$. What happens to income, output, the current account, and the balance of trade when $r^*$ rises? [Hint: let $FP = -r^*FI$ and consider the parallels to our treatment of $dUTr$.] [Comment: please ignore any direct interest rate effects on absorption.]

10. What is the effect of an exogenous increase in $P$ in the Keynesian model? What is the effect of an exogenous increase in $GDP$ in the Classical model?

11. In the IMF’s financial programming model during the 1980s, as laid out by ?, the domestic price level was a weighted average of the price of domestic and foreign goods.

\[ P = wP^d + (1 - w)SP^* \]

where we now let $P^d$ represent the domestic currency cost of the domestic good. How does this affect our model of the small open economy?


Appendix

In this appendix, we take another look at the comparative statics algebra. In the chapter, we introduce a simple linear form to present the comparative statics algebra. In this appendix, we simply redo that algebra using the general functional forms found in equation (14.4).

\[ Y_T - A(G, Y_T, \Omega/P) = TB(SP^*/P, Y_T) + FP + UTr \]

The total differential is

\[ dY_T - A_Y dY_T - A_G dG - A_\omega \left( \frac{1}{P} d\Omega - \frac{\Omega}{P^2} dP \right) = TB_Q \left( \frac{P^*}{P} dS + \frac{S}{P} dP^* - \frac{SP^*}{P^2} dP \right) + TB_Y dY_T + dFP + dUTr \]

(14.12)

Defining \( s = 1 - A_Y, m = TB_Y \), this implies the following results.

**Keynesian Approach:** For the Keynesian approach we will let \( dP = 0 \). Also, we let \( dP^* = 0 \), leaving consideration of external price shocks as an exercise. So (14.12) becomes

\[ dY_T - A_Y dY_T - A_G dG - A_\omega \frac{1}{P} d\Omega = TB_Q \frac{P^*}{P} dS + TB_Y dY_T + dFP + dUTr \]

(14.13)

This implies

**Fiscal Policy** \( dY_T = \frac{1}{s+m} A_G dG \)

**Devaluation** \( dY_T = \frac{1}{s+m} TB_Q \frac{P^*}{P} dS \)

**Income Transfer** \( dY_T = \frac{1}{s+m} dUTr \)

**Increase in Wealth** \( dY_T = \frac{1}{s+m} A_\omega \frac{1}{P} d\Omega \)

**Classical Approach:** For the Keynesian approach we will let \( dY_T = 0 \). Also, we let \( dP^* = 0 \), again leaving consideration of external price shocks as an exercise. So (14.12)
becomes

\[-A_G dG - A_\omega \left( \frac{1}{P} d\Omega - \frac{\Omega}{P^2} dP \right) = TB_Q \left( \frac{P^*}{P} dS - \frac{SP^*}{P^2} dP \right) + dFP + dUTr \]  \hspace{1cm} (14.14)

This implies

**Appendix: Common Model Changes**

\((2') TB = TB(SP^*/P, A)\) e.g., Dornbusch p.133

\(2'') P = SP^*\)

with a single good which is traded, \(TB\rho \rightarrow \infty\) to indicate perfect substitutability between the domestic and the foreign good, and

2” Now becomes the goods market equilibrium condition. Condition 3) is now an identity.

\[A = v\Omega/P\]

where \(v\) is the “expenditure velocity” of money (see, e.g., Dornbusch p.120.)

\((1'') Y - A = H[L(Y) - (M/P)]\) Saving depends on gap between derived and actual wealth. HW: a) How do each of these affect our graphical analysis? Show.

b) use 4) and 2”) to write

\[\dot{H} = SP^*Y - vH\]

Solve using 3 step method. Is it stable?

c) Tell the adjustment story.
For an increase in G:

$$CA = Y_T - A(G, Y_T, \frac{\Omega}{P})$$

$$CA = TB\left(\frac{SP^*}{P}, Y_T\right) - FP - UTr$$

totally diffing:

$$dCA = (1 - A_Y) - A_G dY_T$$

$$dCA = T_Y dY$$

now,

$$s = (1 - A_Y)$$

$$m = -T_Y$$

$$dCA - sdY_T = -A_G dG$$

$$dCA + mdY = 0$$

$$\begin{bmatrix}
1 & -s \\
1 & m
\end{bmatrix}
\begin{bmatrix}
 dCA \\
 dY_T
\end{bmatrix}
= \begin{bmatrix}
-A_G dG \\
 0
\end{bmatrix}$$
\[
\begin{bmatrix}
\frac{dCA}{dY_T}
\end{bmatrix} = \frac{1}{m+s} \begin{bmatrix}
m & s \\ -1 & 1
\end{bmatrix} \begin{bmatrix}
-dG \\ 0
\end{bmatrix}
\]

\[dCA = -\frac{m}{s+m}dG\]

\[dY_T = \frac{1}{s+m}dG\]