MODULE 8

Small Open Economy Equilibrium I:

The Balance of Payments and the Exchange Rate

This module draws on the basic concepts developed in the previous modules in the sequence. It explains the balance of payments accounts and their components, both as accounting identities and desired magnitudes. After explaining the concept of balance of payments equilibrium, the relationship between the desired levels of the balance of payments components and the equality of aggregate demand and supply is developed. The nature of the process by which the desired net capital flow and the desired current account balance (and hence, aggregate demand and supply) are brought into equality is then explored under conditions of full employment and flexible exchange rates and less than full employment with fixed prices and fixed exchange rates. Evidence as to the relationships between income, the exchange rate and the current account balance observed in the real world is presented and interpreted.

1. The Balance of Payments

The balance of payments is an accounting statement that summarizes the transactions between a country and the rest of the world. Figure 1.1 provides an illustration.

Figure 1.1:

BALANCE OF PAYMENTS (bill. $)

	Debits (Payments)	Credits (Receipts)	Balance
CURRENT ACCOUNT			
Goods (merchandise)	$200	$140	$-60
Services other than capital services (tourism, shipping, insurance, etc.)	30	50	20
Gifts and transfers	10	5	-5
Trade Account Balance			-45
Interest and Dividends	30	10	-20
Debt Service Balance			-20
Balance on Current Account			-65
CAPITAL ACCOUNT			
Purchases of assets from foreign residents	20		-20
Sales of assets to foreign residents		85	85
Balance on Capital Account			65
	$290	$290	$ 0

Transactions consisting of debits (payments) and credits (receipts) are classified into current and capital accounts. *Current* transactions represent the purchase and sale of current output while *capital* transactions represent the purchase and sale of assets, which are claims to future output. By the principles of double-entry bookkeeping, a positive (negative) balance on current account must be offset by a negative (positive) balance on capital account. The current account is further subdivided into the trade and the debt service accounts. The *balance of trade* consists of the balance of trade in goods (merchandise) and services other than the services of capital. The *debt service balance* is the balance of trade in capital services—net interest and dividend earnings abroad minus interest and dividend payments abroad. The *balance of indebtedness*, defined as the excess of the stock of foreign assets owned by domestic residents over the stock of domestic assets owned by foreign residents, is separate from the balance of payments. It involves the comparison of stocks of assets and liabilities at a point in time whereas the balance of payments involves the comparison of current-period flows.

2. Autonomous and Induced Transactions: Balance of Payments Equilibrium

We first distinguish between *desired* and *actual* transactions. Actual receipts and payments are always equal but desired receipts and payments are only equal when the foreign exchange market is in equilibrium. Purchases of goods and assets from abroad create a supply of the home currency and demand for foreign currency on the international market while sales of goods and assets create a demand for home currency and supply of foreign currency. Divergences between desired receipts and payments, and the associated excess demands and supplies of domestic currency on the foreign exchange market, will thus put pressure on the foreign exchange rate. The resulting change in the rate will bring desired receipts and payments into equality.

Figure 2.1:

BALANCE OF PAYMENTS (bill. $)

	Debits (Payments)	Credits (Receipts)	Balance
CURRENT ACCOUNT			
Goods (merchandise)	$200	$140	$-60
Services other than capital services (tourism, shipping, insurance, etc.)	30	50	20
Gifts and transfers	10	5	-5
Trade Account Balance			-45
Interest and Dividends	30	10	-20
Debt Service Balance			-20
Balance on Current Account			-65
CAPITAL ACCOUNT			
Purchases of assets from foreign residents	20		-20
Sales of assets to foreign residents		87	87
Change in official reserves (net sales)		-2	-2
Balance on Capital Account			65
	$290	$290	$ 0

Governments often interfere to prevent the exchange rate from moving in response to market forces. They maintain stocks of official *foreign exchange reserves* which they draw down or add to by purchasing and selling domestic currency, creating an "artificial" demand or supply, to influence its price in terms of foreign currency. They often fix the exchange rate at some official parity while preserving foreign exchange market equilibrium by adjusting their stocks of official reserves. We define *autonomous* foreign exchange transactions as those transactions that are *not* motivated by the government's desire to influence the exchange rate and *induced* transactions as those transactions that are so motivated.

When autonomous receipts exceed autonomous payments and the government is mopping up the excess, adding to the stock of official reserves by purchasing foreign currency with domestic currency there is a *balance of payments surplus.* The purchase of foreign exchange reserves represents an induced payment that offsets the excess of autonomous receipts over autonomous payments. Similarly, a situation where autonomous payments exceed autonomous receipts, which represents a *balance of payments deficit*, involves a balancing induced receipt—the sale of foreign currency for domestic currency by the government out of official reserves. Official sales of foreign exchange reserves (positive or negative) are entered on the credit side of the capital account in Figure 2.1. Throughout all this, the foreign exchange market will remain in equilibrium (i.e., there will be no pressure on the exchange rate) as long as desired receipts and payments, including those induced transactions desired by the authorities, are equal. *Balance of payments equilibrium* occurs when autonomous receipts equal autonomous payments.

Governments may also induce changes in private sector transactions by introducing *foreign exchange controls* whereby the authorities take control of all receipts of foreign exchange and parcel them out according to "social need" rather than market criteria to individuals wanting to purchase goods or assets abroad. When this happens, some of the transactions in Figure 2.1 other than changes in the stock of official reserves may have induced components.

3. Aggregate Demand and Supply and the Balance of Payments

Now consider the relationship between the current and capital accounts and aggregate demand and supply. Purchases of domestic output (X) by domestic and foreign residents have three components—domestic consumption (C'), gross domestic investment (I'_g) and exports to foreign residents for consumption and investment abroad (E'):

$$X = C' + I'_g + E'. \tag{1}$$

We consolidate private and government transactions so that consumption, investment and exports represent combined public and private expenditures. Denoting foreign variables by the superscript *, domestic imports (foreign exports) can be expressed as the sum of imports of consumption goods, investment goods and goods for re-export,

$$E^* = E^*_C + E^*_I + E^*_E, \tag{2}$$

and added and subtracted to the right side of (1) to yield

$$X = C + I_g + E - E^*, \tag{3}$$

where $C = C' + E^*_C$, $I_g = I'_g + E^*_I$ and $E = E' + E^*_E$ are total purchases of consumption, investment and export goods from both domestic and foreign sources. When depreciation (D) is subtracted from both sides, (3) becomes

$$Y' = X - D = C + I + E - E^* \tag{4}$$

where $I = I_g - D$ is net investment and Y' is the net income generated in the domestic economy or Net Domestic Product. Net National Product is then obtained by adding the debt service balance (DSB) to both sides of (4).

$$Y = C + I + B_T + DSB \tag{5}$$

where $Y = Y' + DSB$ and the balance of trade, $E - E^*$, is denoted by B_T. Now subtract $C + I$ from both sides of (5) to obtain

$$Y - C - I = S - I = B_T + DSB \tag{6}$$

where $S = Y - C$ equals domestic saving. The excess of savings over investment represents the net purchase of assets by domestic residents from foreigners or the net capital outflow (NCO).

$$NCO = B_T + DSB \tag{7}$$

where $NCO = S - I$. The balance of payments is thus a component of the balance in the national accounts.

Equations (1), (5) and (7) are three alternative characterizations of the equality of domestic aggregate demand (output bought) and supply (output produced). They can be interpreted both as identities that result from the principles of double-entry bookkeeping and as equilibrium conditions. They are equilibrium conditions in the sense that if the variables entering the equations are viewed as desired levels something must have adjusted to preserve the equalities—actual balance will always occur as a result of accounting convention, but balance of desired magnitudes will occur only in equilibrium.

It should be noted that the desired magnitudes of the variables include both autonomous and induced transactions—an accumulation of publicly held foreign exchange reserves must be matched by production and exchange of goods in the same fashion as the accumulation of other assets.

4. The Equilibrating Mechanism

We now turn to the mechanism that brings about equality of the the desired net capital outflow with the desired current account balance or, what is the same thing, aggregate demand with aggregate supply. Treating savings (S), investment (I), the balance of trade (B_T) and the debt service balance (DSB) as desired magnitudes, we have

$$S - I = B_T + DSB. \tag{1}$$

The balance of trade can be expressed as

$$B_T = Z_{BT} - m\,Y + m^*\,Y^* - \sigma\,q \tag{2}$$

where m (> 0) and m^* (> 0) are the domestic and foreign marginal propensities to import, Y and Y^* are domestic and foreign incomes, Z_{BT} is a constant reflecting tastes and other factors that affect exports and imports at given incomes and relative prices, and q is the relative price of domestic goods in terms of foreign goods, otherwise known as the real exchange rate. The parameter σ (> 0) gives the response of the current account balance to changes in the real exchange rate. This response is negative as indicated by the minus sign in front of σ.

The real exchange rate is equal to

$$q = \frac{P}{\Pi P^*} \tag{3}$$

where P and P^* are the domestic and foreign price levels and Π is the nominal exchange rate defined as the domestic currency price of foreign currency. The denominator of (3) gives the foreign price level measured in domestic currency units. A rise in the real exchange rate can be associated with an increase in the domestic price level, a decline in the foreign price level, or an increase in the international value of the domestic currency.

Savings is the excess of income over consumption. Consumption is determined by

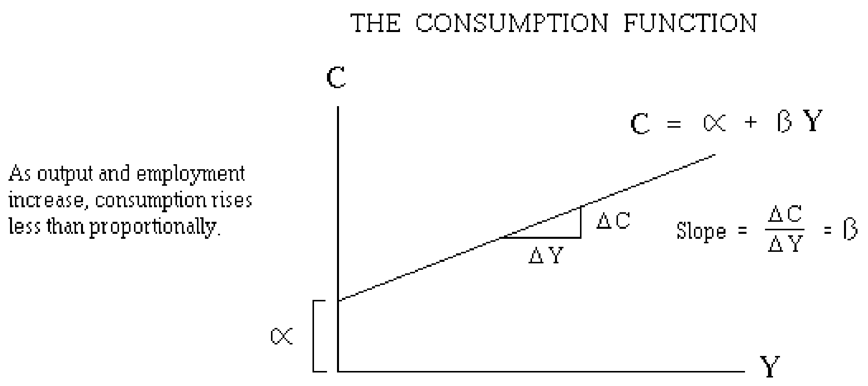
$$C = \alpha + \beta Y, \tag{4}$$

where C is the level of consumption, α is a constant reflecting tastes and other factors that affect consumption at given levels of income and β is the *marginal propensity to consume*. This *consumption function*, shown in Figure 4.1, implies that savings equals

$$S = Y - C = Y - \alpha - \beta Y = -\alpha + (1 - \beta) Y = -\alpha + s Y \tag{5}$$

where s $(= 1 - \beta)$ is the *marginal propensity to save*. Since $0 < \beta < 1$, s will also be positive and less than unity.

Figure 4.1:



Investment is determined according to

$$I = \delta - \mu r^*. \tag{6}$$

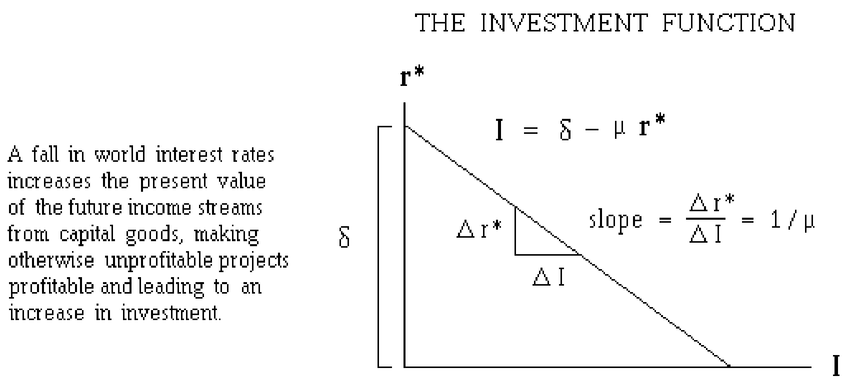
where r^* is the world real interest rate (assumed equal to the domestic real interest rate) and δ incorporates shifts in expectations, investment opportunities, and other factors that affect investment at given real interest rates. μ is positive and preceded by a negative sign indicating that rising world interest rates have a negative effect on domestic investment. A fall in the real interest rate increases the present value of all potential investment projects, making a larger number of projects profitable. Equation (6), the *investment function*, is graphed in Figure 4.2.

The savings and investment equations, (5) and (6), and the balance of trade equation (2) can now be substituted into the equilibrium equation (1) to yield

$$Z_{S-I} + s\,Y + \mu\, r^* = Z_{BT} - m\,Y + m^*\,Y^* - \sigma\, q + DSB \qquad (7)$$

where Z_{S-I} ($= -\alpha - \delta$) represents factors affecting the excess of savings over investment other than income and the world real interest rate, and Z_{BT} represents the factors affecting the balance of trade other than incomes and relative prices. Given world income and the world interest rate, the only non-predetermined variables that can adjust adjust to preserve the equality in (7) are the level of domestic income Y and the real exchange rate q.

Figure 4.2:



Suppose that there is full-employment in the domestic economy and that world investors come to believe that the domestic economy is a better place to invest than previously thought. This will appear as a decline in Z_{S-I} on the left side of (7) and, since Y is fixed at its full-employment level, q must increase to reduce the right side by the same amount. This rise in the relative price of domestic goods in terms of foreign goods can happen in one or both of two ways—the domestic price level can rise, or the domestic currency can appreciate in the international market. Under the pressure of increased aggregate demand, q must rise to reduce desired net exports sufficiently to "make room" for the resource demands of the additional investment.

Suppose alternatively that there is less than full employment in the domestic economy and that, following standard Keynesian tradition, the domestic price level is fixed. Assume also that the government happens to be maintaining the nominal exchange rate fixed. These assumptions imply that q is constant, so all of the adjustment must now fall on Y. A shift of world investment into the domestic economy must now increase domestic output and income to the point where savings have increased sufficiently on the left side of (7) and imports have increased sufficiently on the right side to keep the two sides equal. An upward shift of net exports, represented by an increase in Z_{BT} on the right side of (7), will lead to an increase in Y until the left side has increased and the right side has declined (from its initially higher level) to preserve the equality. In general, however, nothing requires that all the adjustment fall on Y under less than full employment conditions—if the exchange rate is allowed to float freely, adjustment can fall on q.

5. The Exchange Rate and the Current Account Under Full-employment Conditions

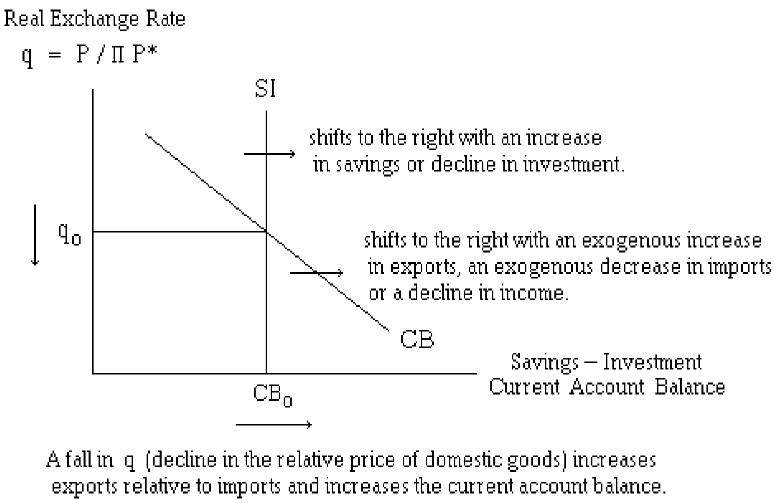
We continue the analysis using equation (7) of the previous topic,

$$Z_{S-I} + s\,Y + \mu\,r^* = Z_{BT} - m\,Y + m^*\,Y^* - \sigma\,q + DSB \tag{1}$$

here presented as equation (1). Recall that Z_{S-I} $(= -\alpha - \delta)$ represents factors affecting the excess of savings over investment other than income and the world real interest rate, and Z_{BT} represents the factors affecting the balance of trade other than incomes and relative prices. Given world income and the world interest rate, domestic income Y and the real exchange rate q are the only variables that can adjust to preserve the equality in (1).

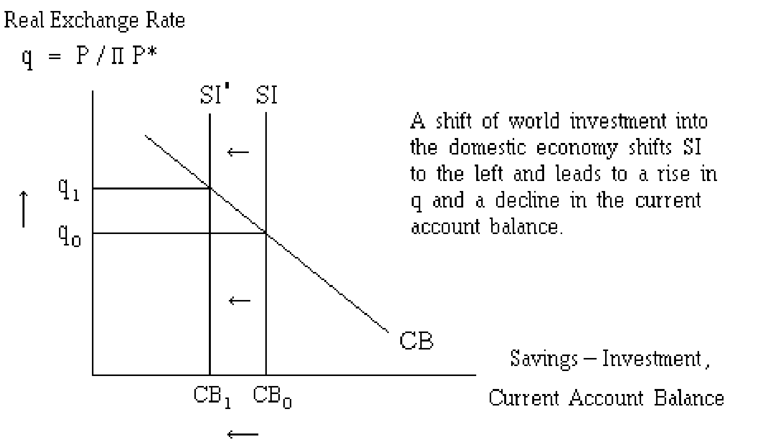
Under full-employment conditions, the real exchange rate is the sole avenue of adjustment. This adjustment process can be analyzed with reference to Figure 5.1. The vertical *SI* line represents the excess of real savings over real investment as indicated by the left side of equation (1), and the negatively sloped *CB* line represents the current account balance given by the right side of the equation.

Figure 5.1:



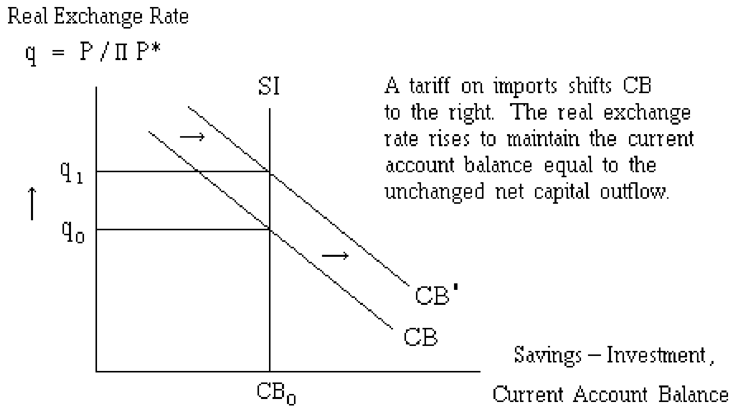
If the domestic economy becomes a better place to invest than it had been previously the vertical line *SI* will shift to the left in Figure 5.2, with the new equilibrium occurring at a higher real exchange rate and a smaller positive (bigger negative) current account balance.

Figure 5.2:



The effects of a domestic tariff that shifts domestic expenditure from imports to domestic goods are analyzed in Figure 5.3. The real exchange rate increases sufficiently in this case to return the current account balance to its previous level. No change in the current account balance can ultimately occur because nothing has happened to change the net capital outflow. The equilibrium balance on current account can change only if there is also a change in the equilibrium net capital flow.

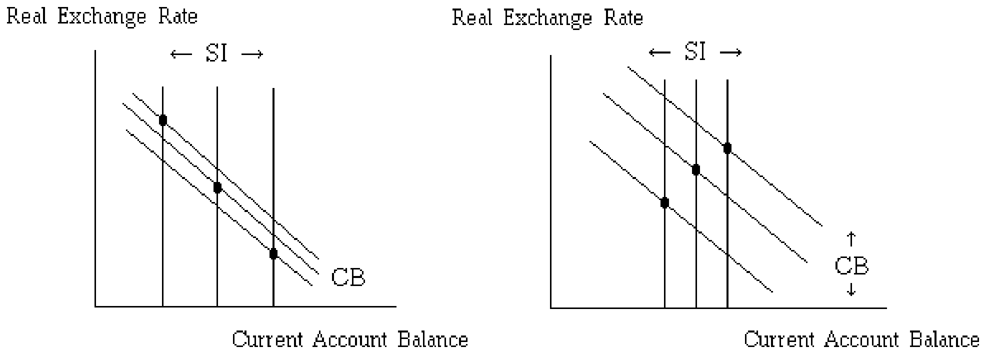
Figure 5.3:



The above real exchange rate adjustments can occur as a result of an increase in the domestic price level or an appreciation of the domestic currency in the international market, with the mix of nominal exchange rate and price level adjustments that actually occur depending on domestic monetary policy and other factors to be considered in subsequent modules.

Possible empirical relationships between observed changes in the current account balance and observed changes in the real exchange rate are shown in Figure 5.4. If there have been big shifts in the factors determining savings and investment but small shifts in the factors (other than the real exchange rate) determining exports and imports, the observed combinations the real exchange rate and current account balance will trace out a loose approximation to the *CB* curve as shown in the left panel. If, on the other hand, there have been big shifts in exports and imports unrelated to the real exchange rate the observed relationship between the real exchange rate and current account balances can be positively sloped as shown in the right panel.

Figure 5.4:



Big shifts in SI & small shifts in CB,
Data points (•) negatively related.

Big shifts in CB,
Data points (•) positively related.

Equation (1) above can be manipulated to yield an expression determining the real exchange rate by bringing q to the left side. The relative price of domestic output in the world market, according to the usual supply and demand analysis, will be determined by world demand for domestic relative to foreign goods and by technology and other factors that may shift the supply of domestically produced goods relative to the supply of goods produced abroad.

The above conditions determining the real exchange rate have nothing to say about balance of payments equilibrium, which depends not on the total net capital flow or current account balance, but on the portion of the net capital flow that represents induced transactions by the government. The analysis of balance of payments equilibrium involves money and monetary policy issues that are brought into consideration in subsequent modules.

6. Income Adjustments and the Current Account: Less-Than-Full-Employment Conditions

To highlight essential features of equilibrating income adjustments under less-than-full-employment conditions, we assume that price levels are rigid and that the government is maintaining the nominal exchange rate fixed. Real exchange rate adjustments are thus excluded as a mechanism for producing equilibrium. This is an extreme assumption—when the nominal exchange rate is flexible, real exchange rate adjustments will augment, and may even dominate or replace, income adjustments in bringing about equilibrium. These issues are explored in subsequent modules.

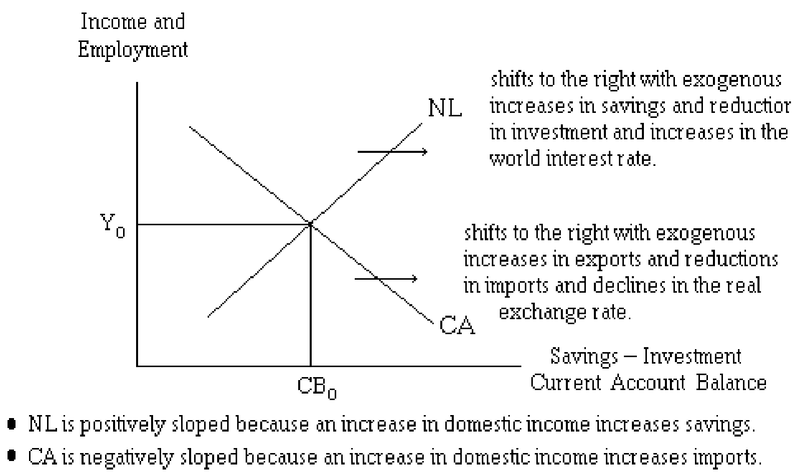
Again, the analysis is centered around equation equation (7) of the previous topic (which is the same as equation (7) of the topic before that),

$$Z_{S-I} + s\,Y + \mu\,r^* = Z_{BT} - m\,Y + m^*\,Y^* - \sigma\,q + DSB. \tag{1}$$

here presented again as equation (1).

Given world income, the world interest rate and the real exchange rate, the only variable that can adjust to produce equilibrium is domestic income Y.

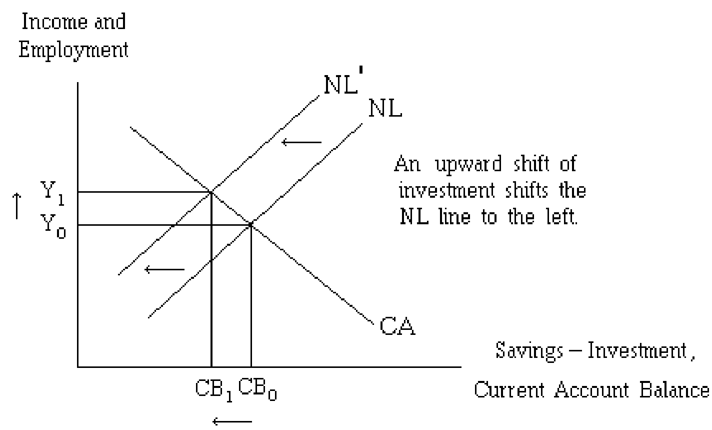
Figure 6.1:



The adjustment process can be analyzed on Figure 6.1. The positively sloped line *NL* gives the relationship between the level of income and the excess of real savings over real investment (net lending) as indicated by the left side of equation (1). It is like the *SI* line in the figures presented in the previous topic, except that Y is now on the vertical axis instead of q, and the line is positively sloped because a rise in domestic income increases savings. A positive shift of savings or negative shift of investment (increase in Z_{S-I}) will shift the *NL* line to the right. A rise in the world interest rate will reduce domestic investment, also shifting *NL* to the right. The negatively sloped *CA* line gives the relationship between income and current account balance on the right side of equation (1). The slope is negative because a rise in domestic income raises imports and reduces the current account balance. A rise in the level at which the government is fixing the nominal exchange rate (increase in Π) will reduce the relative price of domestic goods in world markets, causing the current account balance to increase and shifting the *CA* line to the right. An increase in income abroad will increase exports and also shift *CA* to the right. The equilibrium level of domestic income and employment is determined jointly with the equilibrium net capital outflow where the *NL* and *CA* curves cross.

The effects of a shift of world investment into the domestic economy is analyzed in Figure 6.2. Output, income, savings and imports all increase. The increase in imports reduces the current account balance while the increase in savings moderates the reduction in the net capital outflow.

Figure 6.2:



The effects of a tariff are analyzed in Figure 6.3. *CA* shifts to the right and output and the current account surplus both increase. This is contrary to the comparable full-employment result where a shift of world expenditure onto domestic goods results in a rise in the real exchange rate that drives the trade balance back into equality with an unchanged net capital inflow.

Figure 6.3:

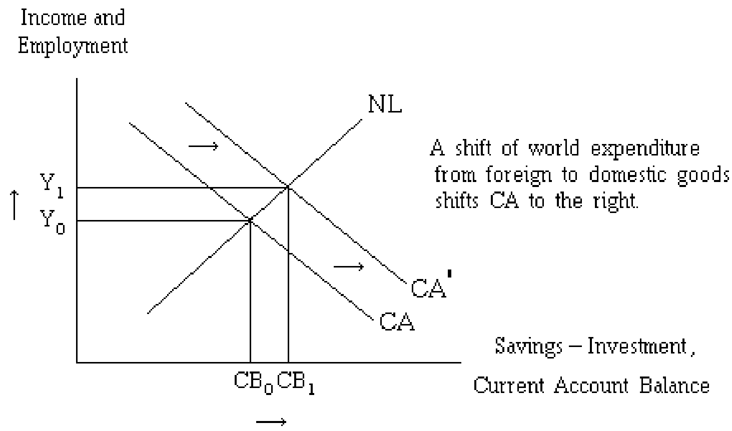
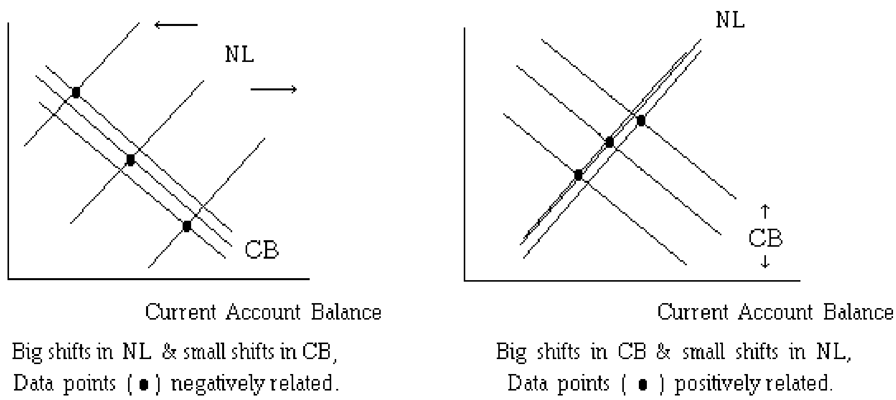


Figure 6.4:



As indicated in Figure 6.4, there is no reason to expect that observed increases in output and employment will be negatively associated with observed changes in the current account balance—the direction of the observed relationship will depend upon whether exogenous shifts of the savings and investment or exports and imports predominated during the period in which the data were generated.

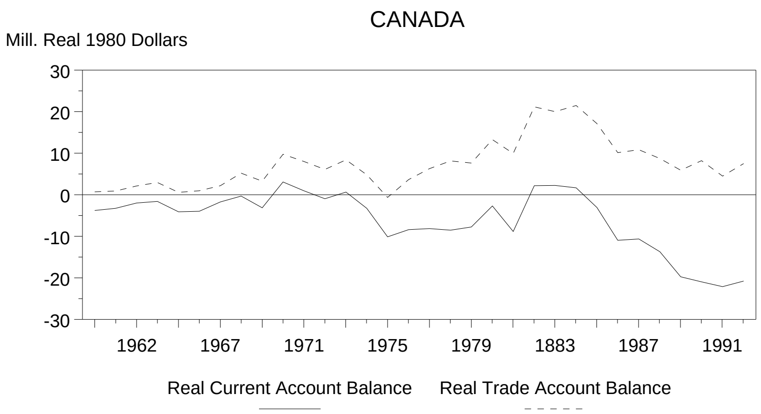
Again the analysis says nothing about balance of payments equilibrium, which depends not on the total net capital flow or current account balance but on the portion of the net capital flow that represents induced transactions by the government aimed at manipulating the nominal exchange rate.

When equation (1) is manipulated to bring the income variable Y to the left side it becomes the standard income-expenditure equation of elementary macroeconomics. This equation is developed from a more traditional aggregate demand and supply perspective in subsequent modules.

7. Some Empirical Evidence

We now look at some of the evidence on the balance of payments and real exchange rate. Figure 7.1 plots the real current account balance and real balance of trade in goods and services, excluding the services of capital, for Canada for the years 1960 to 1992.

Figure 7.1:

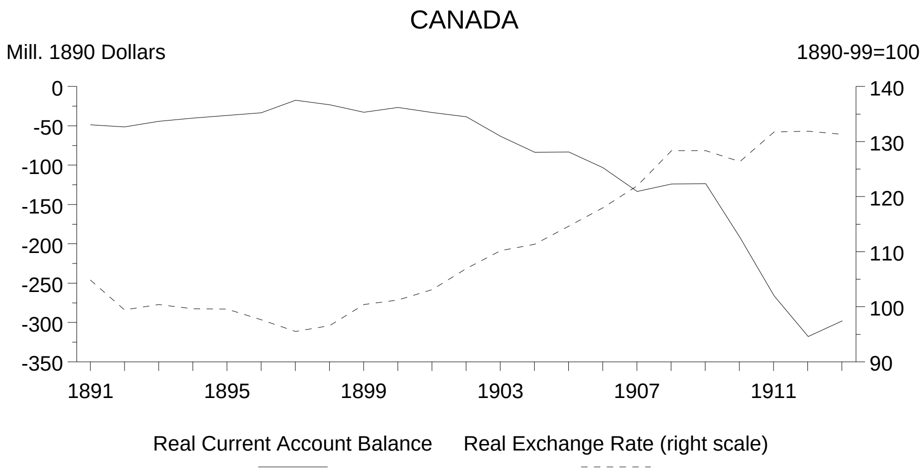


Except for 1969 and 1982-84, the country ran current account deficits throughout the period. This implies that investment in Canada has exceeded the savings of Canadian residents almost continually—capital was flowing into the country. The trade account showed a surplus, in real terms, every year. From the balance of payments accounting identities,

$$DSB = CAB - TAB \tag{1}$$

where *CAB* is the current account balance, *TAB* is the trade balance and *DSB* is the debt service balance. The positive values for *TAB* in Figure 7.1 together with negative or smaller positive values for *CAB* imply that Canada's debt service balance was negative throughout the period. Canadians were paying net interest and dividends to foreigners for the services of foreign capital that had been invested in Canada over the years.

Figure 7.2:



Since the real trade account balance has always been positive, it follows that the current account deficit has been smaller than the negative debt service balance. This means that foreign residents were, on average, plowing back some but not all of their earnings from Canadian employed capital into re-investment in Canada. The large negative debt service balance reflects the rather extensive foreign investment in Canada over the years.

Capital inflows were especially important is the two decades before World War I during which the western prairies were settled. The real current account balance and real exchange rate during these years (taken with respect to the remaining gold-standard countries) are plotted in Figure 7.2. The current account balance was negative throughout implying positive net capital inflow. Notice also the positive relationship between the net capital inflow and the real exchange rate (negative relationship between the real net capital outflow and real exchange rate) after 1896. Evidently, the capital movements were such a predominant influence that the movements in the real exchange rate necessary to bring the current account balance into line with them overwhelmed any real exchange rate movements that were necessary to accommodate shifts in desired exports and imports. Such a strong relationship is unusual. No such relationship appears during the period after 1960, as shown in Figure 7.3. (Here the real exchange rate is calculated with respect to the major industrial countries.) This is what we would expect from the fact that shocks to both the desired net capital flow and the desired current account balance were driving the equilibrium. For the same reason, as indicated in Figure 7.4, there was also no relationship between Canada's level of unemployment and her real current account balance since the mid-1960s.

Figure 7.3:

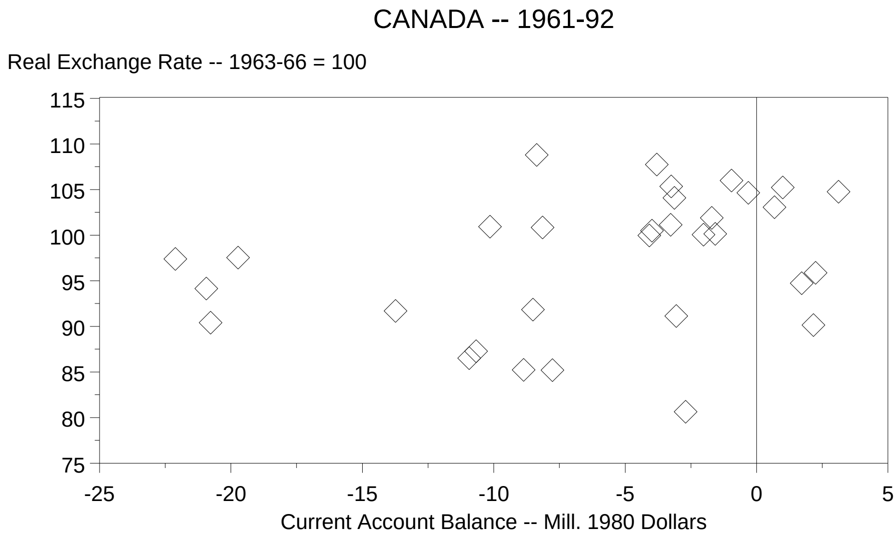


Figure 7.5 presents the evidence for the United States. The balance on current account averaged close to zero between 1970 and 1981 and then became negative after 1981. The deficit increased sharply to 1987 and then reversed itself, all but disappearing by 1991. This reflected an increasing and then diminishing net capital inflow into the United States. The real exchange rate, measured with respect to the other major industrial countries, appreciated in the early stages of the capital inflow during 1981-84 as would be required to bring the desired current account balance into equality with it. It also depreciated during the 1985-87 period of capital inflow, however, suggesting that shocks to desired exports and imports were also driving the equilibrium.

Figure 7.4:

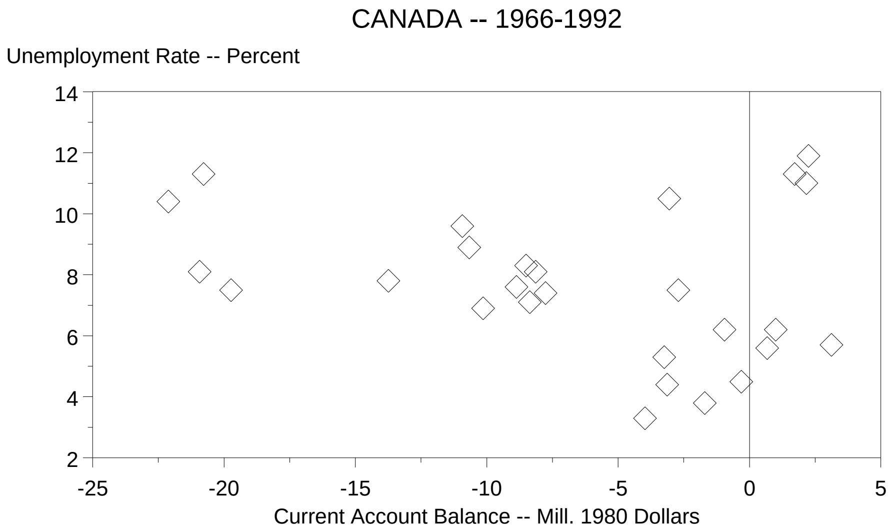


Figure 7.5:

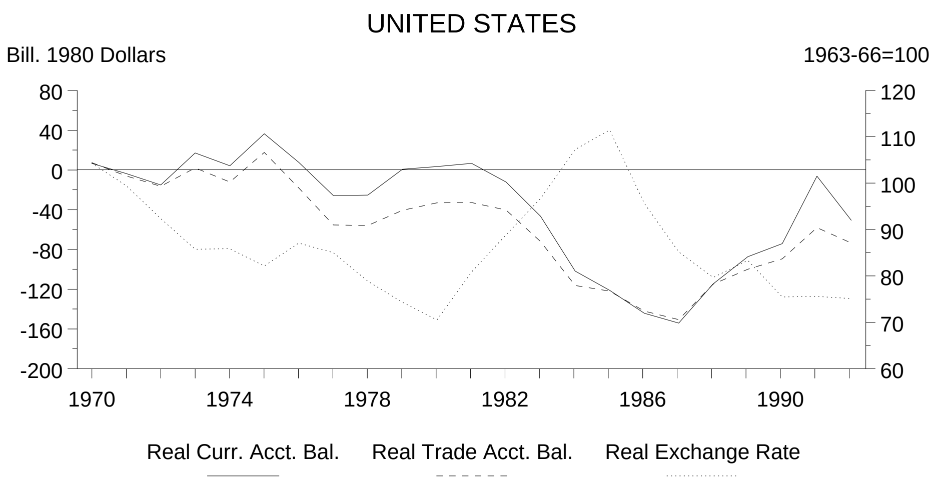
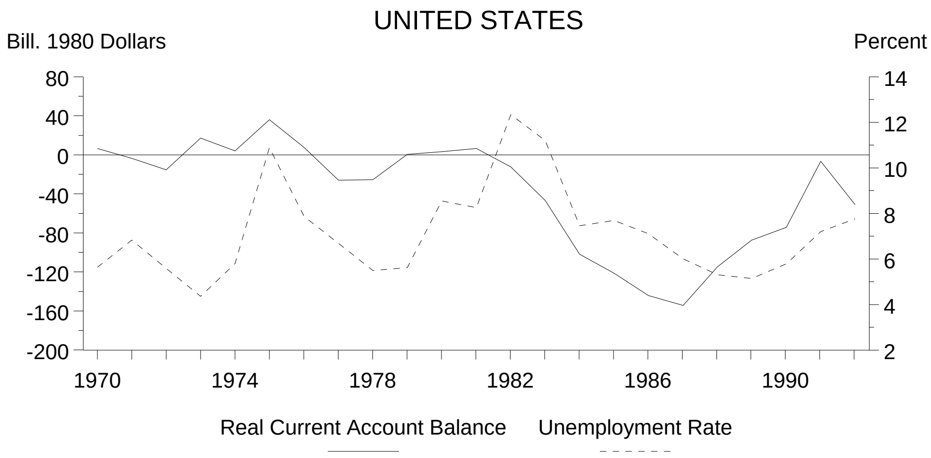


Figure 7.6 shows the relationship between the current account balance and the unemployment rate. Overall, no systematic relationship between the current account balance and either the real exchange rate or the unemployment rate is evident in the raw data. The current account balance

was nearly always greater than the balance of trade in goods and services, excluding the services of capital. Thus, except for the years 1986-88, the U.S. was a net international creditor, having a positive debt service balance. The large inflow of capital between 1981 and 1984 temporarily eliminated the country's creditor position, which became positive again as the capital inflow abated.

Figure 7.6:



Finally, we look at the evidence for Japan. Figure 7.7 plots the real current and trade account balances for the years 1963-92. The trade balance is uniformly above the current account balance, indicating that the country was a net international debtor with a negative debt service balance. On the other hand, the real current account was in surplus most years, indicating that Japan engaged in net lending abroad during the period. Continuation of this lending will gradually reduce the net debtor position that was accumulated during the period of reconstruction immediately after World War II.

Figure 7.8 plots the real current account balance on the left scale and the real exchange rate index vs. the other major industrial countries (1963-66 = 100) on the right scale. Japan's real exchange rate has shown an overall upward trend since the early 1960s. Since the real current account balance has also shown an upward trend, the trend in the real exchange rate cannot represent a response to upward trends in desired domestic investment relative to savings. Rather, it appears that the most important forces driving the real exchange rate were technological ones affecting desired exports relative to imports.

Figure 7.7:

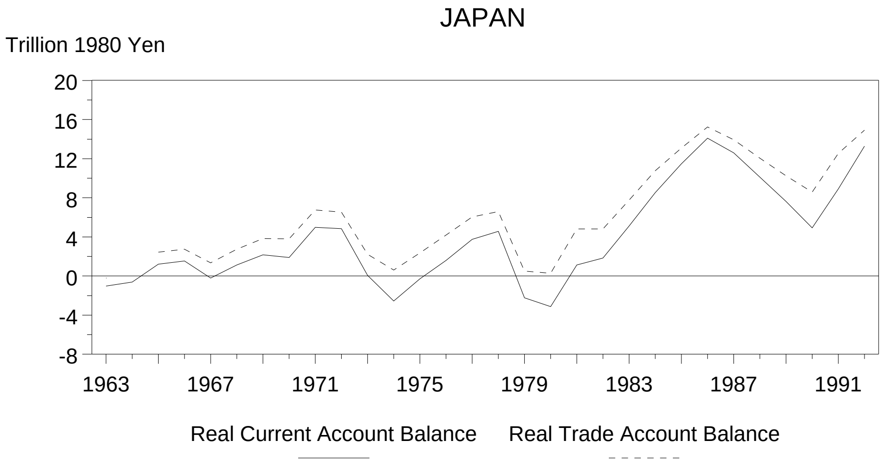
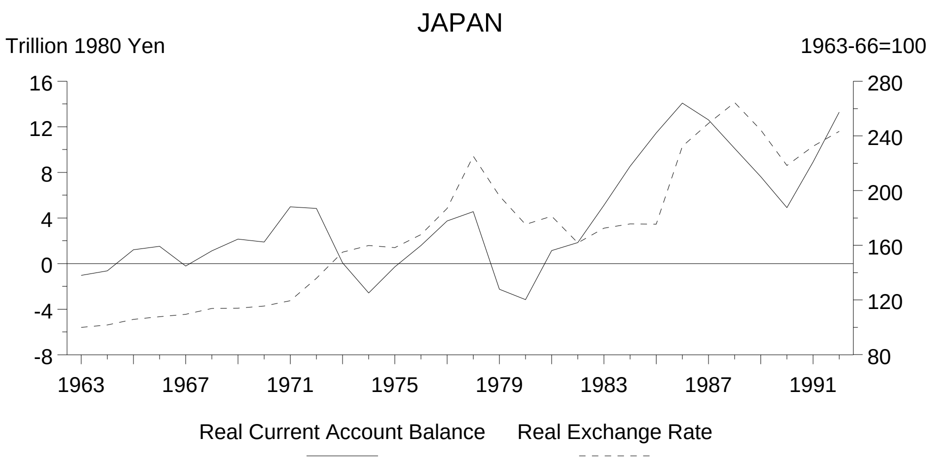


Figure 7.8:



Study Question

One frequently hears the argument in Canada that the country's nearly continuous current account deficit is bad for the health of the economy. Some argue that the country is "spending beyond its means". In other countries whose current accounts are in deficit one frequently hears the argument that the deficit is "unsustainable" and will eventually require painful adjustments to eliminate. Frequently the remedy is a tariff or other policy designed to improve the current account by reducing imports or increasing exports. Comment on these arguments. Will the imposition of a tariff "improve" the current account? Is it appropriate that a country's current account balance be zero? Is the long-run equilibrium current account balance zero?

References

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