

The J-Curve Hypothesis and Currency Devaluation: Cases of Egypt and Ghana

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Abstract

The paper reviews effects of devaluation on balance of trade by using Marshall Lerner condition, J-Curve hypothesis. It extends the hypothesis further to consider a case of continuous devaluations of exchange rates. After initially contributing to conventional theory of J-Curve hypothesis, and the paper then tests the theory for cases of Ghana and Egypt. In both cases it is found that theoretical arguments are consistent with empirical evidence. Paper consists of four sections including introduction.

Introduction

A question like, "what is the effect of an exchange rate devaluation on BOP?" is answered by the traditional international trade literature in terms of the elasticity approach. The basic thrust of the answer to this question implies that everything depends upon the values of the elasticities of demand for import and export of an economy. In fact the Marshall-Lerner condition created by Alfred Marshall and Abba Lerner in early fifties states specifically that if initially the balance of trade is zero and if supply elasticities are infinite, then the absolute values of export and import demand elasticities have to be at least large enough to add up to unity to have an exchange rate devaluation bring about the surplus in BOP.

It is easy to prove that since the elasticities values are quite dependent upon the time period, in the short run when the elasticities are small, the Marshall-Lerner condition is less likely to be satisfied, and the devaluation of a currency leads to a further Balance of Trade (BOT hereafter) deficit. (This is popularly called "the perverse reaction" of the BOT to the exchange rate change).

In the long run however, as the elasticities values are high, the Marshall-Lerner condition is satisfied and the devaluation leads to the surplus in BOT. When one plots the relationship between time period and the BOT behavior, one sees that it is shown by a tilted J shaped curve. Hence the J curve

hypothesis became popular tool of showing the effect of devaluation on balance of trade in early sixties.

Nonetheless the time period until 1973 was not a very appropriate time period to test the validity of J-curve phenomenon because in those days the exchange rates were fixed. In post-1973 era the relevance of J-curve is greater but the problem is that exchange rates are too volatile for the BOT to adjust to one exchange rate change.

One of the main theoretical aims of this paper is to recognize the dynamic events of devaluations of some currencies and as a consequence rationalize them by shifts of the J curve to the right. In fact when the J curve is shifting to the right after every devaluation, and when the correctly assigned points are observed in this case, then the persistent BOT deficit that exists for some economies can efficiently be explained. We use data of Ghana and Egypt to show the possibility of persistent deficit in BOT after several devaluations.

The paper is divided into three sections. Section one serves as an introduction and sets the tone of the problem to be solved. Section two surveys the literature for the J-curve studies and makes a review. It also mathematically shows the Marshall-Lerner condition and makes the theoretical contribution of the shifting J curve hypothesis. In section

three the data of Ghana and Egypt are analyzed and their experiences of devaluating currency are tested in the light of new theory. In Ghana the consistent devaluation of cedi has become an excellent case of shifting J curve. In case of Egypt the traditional J curve hypothesis is able to show the evidence quite satisfactorily since the devaluation of Egyptian pound was a one time phenomenon. The paper makes the mathematical derivation of the Marshall-Lerner condition in the simplest form possible, and shows that real world phenomenon of the devaluating currency in cases of Ghana and Egypt.

Theoretical Extension to J-Curve Phenomenon and Survey of Literature

When the exchange rate is defined as the number of domestic currency units per unit of foreign currency, (American way of defining exchange as against the European way, which is the inverse of American way, of defining it) then an increase in exchange rate defines the depreciation of the domestic currency.

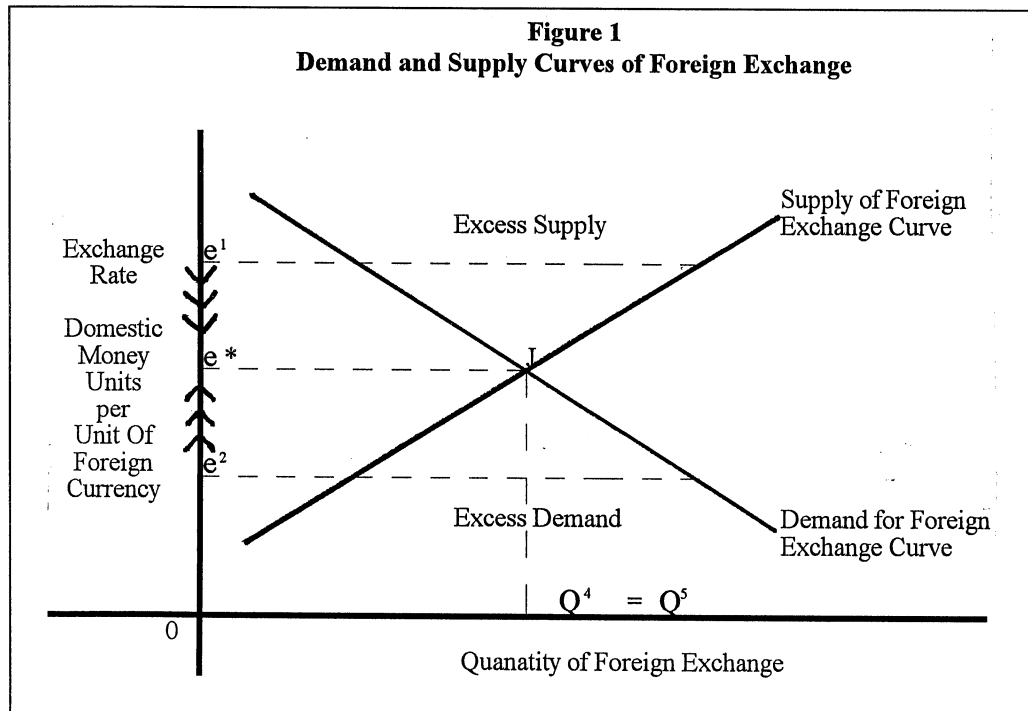
When this depreciation is carried out by a policy action we call it "devaluation". The devaluation of any currency has to be undertaken when the exchange rate is controlled by the government, as it is clearly obvious that a free exchange rate only depreciates or appreciates the currency. Thus a free exchange rate system exists when exchange rates are decided by demand for foreign exchange and the supply of foreign exchange. In order to conceptualize more clearly the

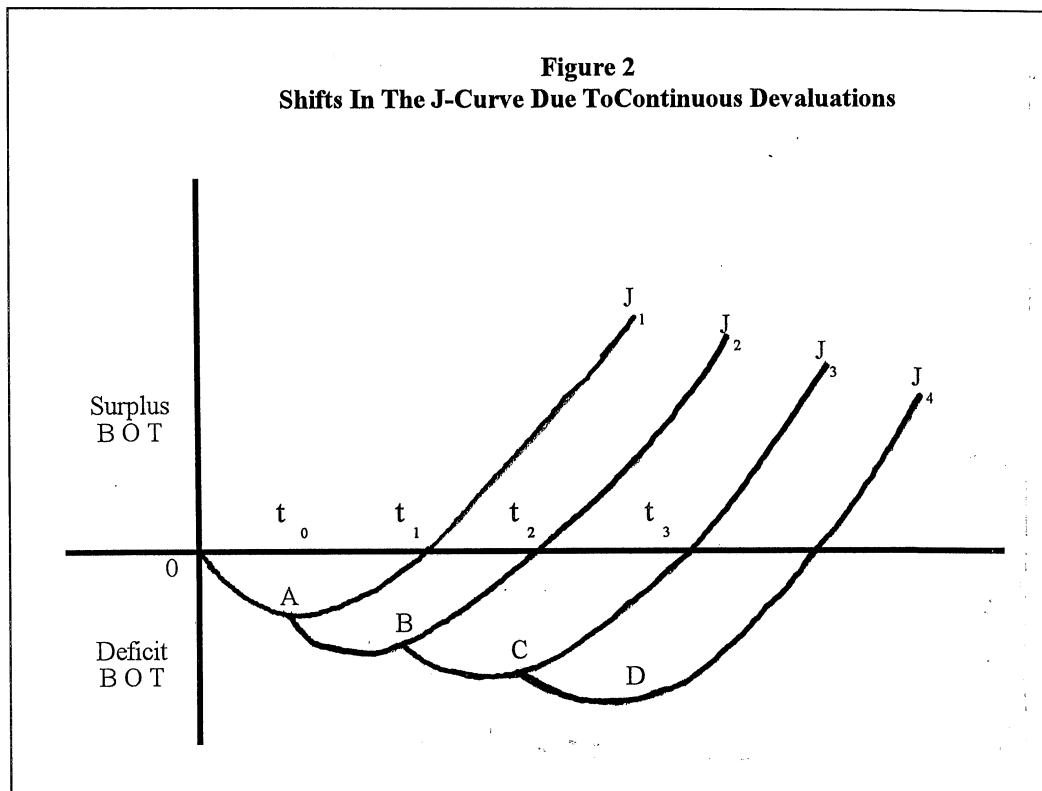
difference between fixed (controlled) and free exchange rate systems, it is useful to think in terms of Figure 1 that has the demand for foreign exchange curve and supply of foreign exchange curve intersecting at point J where the equilibrium exchange rate of e^* is determined.

Clearly the demand for foreign exchange curve is sloping downward because as the exchange rate increases and the domestic currency loses value, the imports go down and domestic residents demand lower amounts of foreign exchange. Similarly with increase in exchange rate domestic exports increase, and foreign residents supply lower quantities of foreign exchange. Hence the supply of foreign exchange curve is sloping upwards from left to right.

Now in a freely floating exchange rate system, the exchange rate will always be at equilibrium rate e^* because of the "Paradox of Flexibility". The Paradox of Flexibility is summarized as saying that if a price (exchange rate in this case) is free to move up and down then it will stay at one level namely at the equilibrium. Economists have for a long time recognized that at any exchange rate above equilibrium, there is excess supply of foreign exchange that will drive down the exchange rate, and at any exchange rate below equilibrium the excess demand for foreign exchange will push it back up towards equilibrium.

But when governments try to control the value of exchange rate they forcefully keep the exchange rate either above or below the equilibrium, because as we just saw, no control is needed to keep it at the equilibrium.





In all of the underdeveloped countries the controlled exchange rate is necessarily below equilibrium. This is because these countries usually like to subsidize imports to help the "importers" which many times are the governments themselves. But as shown in Figure 1 at any exchange rate below e^* there is excess demand for foreign exchange by the private sector and to cure that excess demand governments put controls over private imports. To control imports the government also needs to control the free exchange of domestic currency to other currencies as well. Hence controls over imports necessitate controls over foreign exchange transactions. But this leads to illegal transactions of goods and currencies bringing in more administrative problems.

In any case, the arbitrarily controlled exchange rate below equilibrium, creates a deficit in the balance of trade of the economy. When pressures of the market become unbearable and when the trade deficit is outside the politically acceptable realm, the only option is to correct the exchange rate by accepting the devaluation of domestic currency.

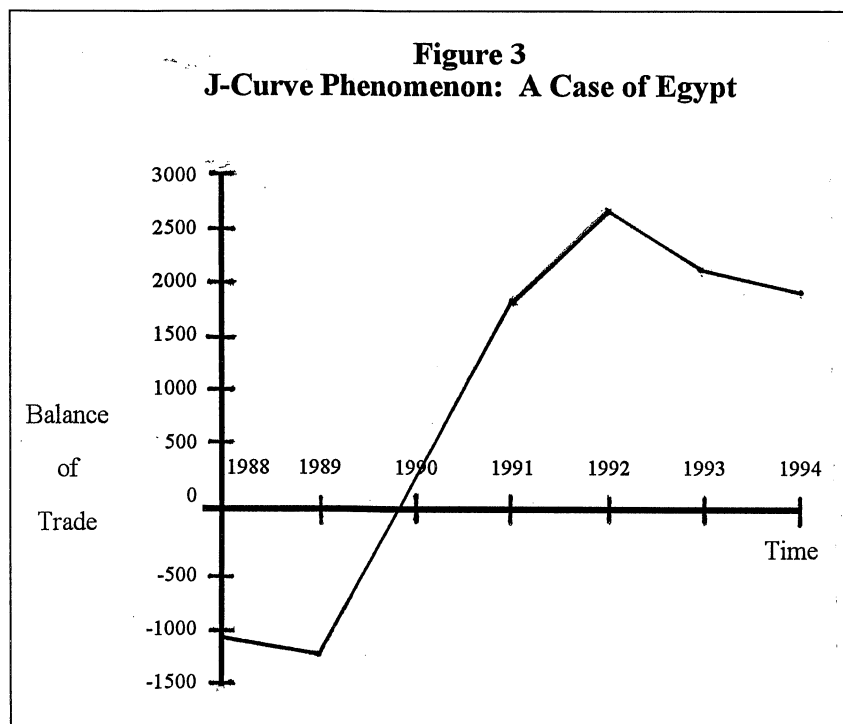
But as mentioned above any devaluation of the domestic currency does not guarantee a cure for balance of trade deficit. As in their independently carried out works, Alfred Marshall and Abba Lerner showed in early 1950s the sizes of elasticities of demand for export and import determine the final outcome. On the next two pages we mathematically

derive the Marshall Lerner condition to show the effect of exchange rate change on the balance of trade.

Now the J-curve hypothesis argues that in the short-run (meaning immediately after the devaluation of the domestic currency), the elasticities are small so that the Marshall-Lerner condition is not fulfilled and the balance of trade experiences further deficit. As shown in Figure 2 it is only after some time when the elasticity values become large enough to add up to unity, the balance of trade starts showing surplus. In practice however it is quite possible that one devaluation is followed by another devaluation in a short time.

Important point here to recognize is that while J-curve hypothesis is a comparative static analysis, in reality we have dynamic events of J curve occurring after every devaluation. In that case the shift of the J-curve as shown in Figure 2 is the only way to explain the dynamic effects of currency devaluations.

Observe that in these cases the devaluating currency is leading to further deficits in balance of trade as observed in many developing countries including in case of Ghana with the rapid devaluations of Cedi. As we shall see in Sections 3 the devaluation of Egyptian pound was a one time phenomenon hence the traditional explanation of one J-Curve (without shifts) applies to it. But when devaluations are



witnessed in a series of changes in domestic currency values, then the shifts of J-Curves become more relevant. Other important point to notice here is that when a country allows currency to devalue several times, then a persistent balance of trade deficit is a very likely outcome. In terms of Figure 2 on the next page, four devaluations take place at time periods to, t1, t2 and t3. This shifts the J curve further to right and there are four J-curves observed in terms of J1, J2, J3, and J4. It is possible that in reality one observes only the path traced by points A, B, C and D which shows a continuous BOT deficit.

In terms of survey of prior J-Curve studies, Artus (1975) uses the data of U.K. pound devaluation of 1967 to test the

validity of J-Curve hypothesis. Gylfason (1978) uses the data of ten industrial countries to test the effect of exchange rate change on balance of trade. However J-Curve hypothesis is also questioned on theoretical level. There is much suspicion in terms of the assumptions of the theory namely the high supply elasticities and the initial balance of payment being equal to zero. Rose (1991) questions the validity of Marshall-Lerner condition. Gylfason-Risager (1984) ask the basic question of change in balance of trade made by exchange rate change.

Test of J-Curve in Cases of Egypt and Ghana

Case of Egypt

The socialist revolution of 1952 was the starting point for the regulatory controls in Egypt that were further intensified by the governments of Gamal Abdel Nasser and Anwar Sadat. In the decolonization process and the Non-Alignment Movement (NAM) that was started by Nasser-Tito-Nehru trio, accepted "self sufficiency" as the main motto of their economic policies that basically involved keeping away the foreign influences by protecting the domestic production by heavy tariff policies. Other countries such as Sudan, Algeria, Nigeria and Kenya also followed their footsteps. In case of Egypt the foreign influence on domestic economy was not evident until the Camp David peace agreement signed in 1979. It was only in 1979 with the U.S. initiative the foreign companies were actively invited in the country. However, there were several reasons why Egypt should have been internationally active in trade in earlier years.

Table 1
Egypt's Exchange Rate and Balance of Payment: 1988-1994

Year	Exchange Rate S/E	Balance of Payments in millions of \$
1988	0.7	-1048
1989	1.1	-1309
1990	2.0	184
1991	3.33	1903
1992	3.3303	2812
1993	3.37	2203
1994	3.42	2102

Egypt was blessed with a wide stock of natural resources, Suez canal itself being responsible for six billion Egyptian pound revenue per year. Besides oil the country is also endowed with gold and copper mines. Nonetheless the heavy imports were consistently higher than the exports of Egyptian economy.

When the loan of 1986 was negotiated with the IMF Egypt was supposed to devalue her currency, reduce import tariff and intensify the liberalization process. It took two years but Egyptian government devalued the pound in a big margin in 1988. Further the currency was devalued by 200% between 1988 to 1991 and the balance of payment reached to surplus. Only when the devaluation process stopped after 1991

Table 2
Balance of Trade and Exchange Rate Changes: Ghana: 1983-1990

<u>Year</u>	<u>Exports</u>	<u>Imports</u>	<u>BOT</u>	<u>Market Exchange Rate</u>
1983	10.22	10.31	.09	30.00
1984	19.39	20.47	1.08	50.00
1985	33.49	44.11	10.62	59.99
1986	78.00	87.00	9.00	90.01
1987	143.00	163.00	20.00	176.06
1988	206.00	174.00	-12.00	229.89
1989	275.00	325.00	50.00	303.03
1990	298.00	375.00	77.00	344.83

Columns 2, 3, and 4 are measured in billions of Ghanaian Cedis. Calculations of column 4 figures are author's. Source: International Financial Statistics, International Monetary Fund Publications, Yearbook, 1994.

The Ghanaian economy registered growth for six consecutive years after 1984. Manufacturing output increased with the annual average rate of 9.2% while mining increased by 7.1% and the agriculture sector grew with 2.2%. Nonetheless in all these years the import bill kept on increasing even faster than export earnings as the purchasing power of consumers increased. The behavior of balance of trade followed an interesting path as shown in Figure 4.

As can be seen even if the devaluation of Cedi was an important step in this adjustment, the benefits were somewhat eroded by the worsening of balance of trade. Table 2 provides data of Ghanaian economy. As can be observed in it, with exception of 1988 in all years the balance of trade deficit was increasing despite the tremendous decline in value of Ghanaian Cedi.

the balance of payment showed a continuous surplus as evidenced in Table 1 of the next page. Figure 3 also shows the well-fitted J curve for the Egyptian case. This is clearly a result of an abrupt change in the value of the domestic currency rather than a continuous series of devaluations.

It is also worth noticing that the stock of foreign reserve went up from \$1.2 billion in 1988 to \$12.9 billion in 1993. This meant that Egypt could finance her imports of 10 months in 1993. With the devaluated currency the governmental authorities no longer needed to support the currency with strict foreign exchange controls, imports became quite expensive and the rest of the world found that importing from Egypt was much cheaper now. After further developments the foreign exchange controls are almost completely lifted now.

Case of Ghana

The Economic Recovery Program of early 1980s in Ghana revealed that the main aim of devaluation of Cedi was to turn the BOT movement around. Devaluation was therefore, a crucial component of the structural adjustment reforms required to influence production decisions in a new economic environment. In initial years the goal of boosting exports was successful as the main export of Ghana cocoa, which accounts for 60% of the total export bill, increased in production from 159,000 tons in 1983 to 300,000 tons in 1989. Production also increased in logging industry and in Timber that saw increase in production to 413,000 cubic meters in 1987. It seemed that the main objective of economic growth and reversal of economic stagnation of years were achieved.

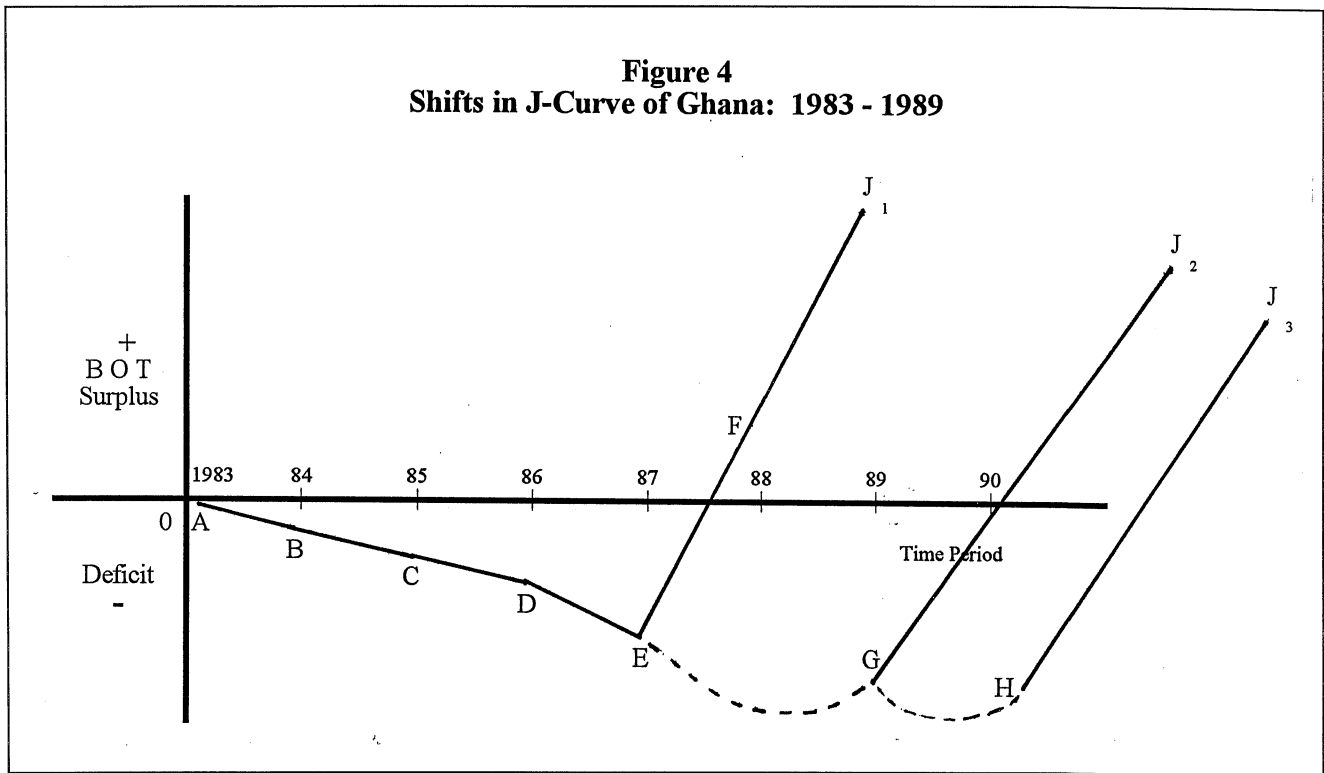
As mentioned before, one of the reasons for continuous deficits in balance of trade is the series of devaluations in case of Ghana. As a consequence Ghanaian experience suggests that changing real prices must go hand in hand with other policies that make structural adjustment. The structural adjustment that is needed is in the form of changing the export composition. As the export structure is very concentrated in only some goods, cocoa being the main one, the changes in its volume are dependent upon only one market.

Summary and Conclusions

This paper had the aims of revising the J-Curve hypothesis to determine the effect of exchange rate change on the balance of trade. A theoretical explanation in terms of the shifts of J-curves is also put forward to solve the dynamic but realistic situation of continuous series of devaluations. In this case it is concluded that the existence of dynamic, persistent balance of trade deficit is a possibility. Cases of Egypt for one time devaluation of 1984 and of Ghana for series of devaluations between 1983 and 1989 are studied.

Suggestions for Future Research

Clearly this paper has added a new dimension to the theory of J-Curve in terms of shifts in the J-Curve that occur as there are several episodes of currency devaluation. It also leads to unprecedented conclusion that a continuously devaluating currency may lead to further deficits in balance of trade. Hence devaluation is not an answer to the deficit in balance of trade of any country. It is obvious that more research is needed to



justify this argument in terms of more studies of countries that are experiencing this phenomenon. The author is willing to entertain any correspondence about studies dealing with this evidence.

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Appendix 1

Derivation of the Marshall-Lerner Condition

Consider the following definitions:

$$1) \text{ Real Exchange Rate (j)} = \frac{e \cdot p^*}{p}$$

Where

e = Nominal exchange rate defined as # of foreign currency.

p^* = Foreign general price level.

p = Domestic general price level.

$$2) \text{ Elasticity of demand for imports with respect to real exchange rate (N}_m\text{)}$$

$$N_m = \frac{\Delta M}{\Delta j} \times \frac{j}{M}$$

Where M = amount of real imports.

$$3) \text{ Elasticity of demand for exports with respect to real exchange rate (N}_x\text{)}$$

$$N_x = \frac{\Delta x}{\Delta j} \times \frac{j}{x}$$

Where x = amount of real exports

To derive the Marshall-Lerner Condition, assume:

- A) The supply elasticities of exports and imports are infinite. This implies that there are no bottlenecks in supplying the higher quantities of exports or imports so that all changes in balance of trade (BOT) are prompted by changes in demand conditions.
- B) The balance of payment is defined by balance of trade alone. This assumption implies that capital account is always balanced so that for any given time the capital inflows and outflows are exactly alike.
- C) At the time of the devaluation, the balance of trade is balanced. This assumption necessitates that initially the value of export = value of import or,

$$\text{BOT} = x - jM = 0, \text{ which also implies that } x = jM \text{ or } M = \frac{x}{j}$$

now, consider again the definition of BOT,

$$\text{BOT} = x - jM \quad (1)$$

taking the differentiation of equation (1) with respect to changes in j,

$$\frac{\Delta \text{BOT}}{\Delta j} = \frac{\Delta x}{\Delta j} - \frac{\Delta j \cdot M}{\Delta j} - \frac{\Delta M \cdot j}{\Delta j} \quad (2)$$

To convert first term on the right hand side of equation (2) into the N_x (from above) we can convert equation (2) into equation (3) as follows:

$$\frac{\Delta \text{BOT}}{\Delta j} = \frac{\Delta x}{\Delta j} \cdot \frac{j}{x} \cdot \frac{x}{j} - \frac{x}{j} - \frac{\Delta M}{\Delta j} \cdot \frac{j}{M} \cdot M \quad (3)$$

$$\Delta \text{BOT} = M (N_x - 1 - N_m) \quad (4)$$

Now to have a surplus in BOT after a devaluation meaning to have $\frac{\Delta \text{BOT}}{\Delta j} > 0$, we need to have the term in parenthesis on the right hand side of equation (4) to be positive. (This is because both x and j are positive by definition).

$$\therefore N_x - 1 - N_m > 0 \text{ for } \frac{\Delta \text{BOT}}{\Delta j} > 0$$

Keeping in mind that the value of N_m is always negative, this implies the Marshall-Lerner condition that:

$$N_x + N_m > 1 \text{ for } \frac{\Delta \text{BOT}}{\Delta j} > 0$$