Decline of the Iranian Rial and Its Macroeconomic Consequences

By:
Mohsen Bahmani-Oskooee[*]

Abstract

Since the advent of Islamic Revolution in ١٩٧٩ and due to foreign exchange controls by the Central Bank of Iran, the black market value of the Iranian rial had declined substantially as compared to its official value. In several articles published in professional journals I have first identified factors which has caused the rial to decline. I have then investigated the impact on Iranian economy of the depreciation of the rial. This paper collects and reviews those articles and provides a comprehensive review of issues involved with some policy implications.

I- Introduction

Every country has basically two major macroeconomic goals called internal and external balance. Internal balance is usually defined to be a situation under which rate of unemployment is at its natural level (full-employment) and rate of inflation is very low (price stability). External balance is defined to be a situation under which balance of payments is at equilibrium[†][(1)]. There are three group of policies available for a country to achieve both balances. First, central bank can manipulate the money supply or the interest rate. This is labeled as monetary policy. For example, by increasing the money supply which leads to a decline in interest rates, firms and consumers borrow more , thus spend more. In turn,

---

[*]- Wilmeth Professor of Economics, Department of Economics, The University of Wisconsin- Milwaukee. Milwaukee, WI ٥٣٢٠١. For a hard copy of any of my papers cited in this paper, please send an e-mail (bahmani@uwm.edu).

[1]- Balance of payments is a table in which all international transactions of one country with the rest of the world are recorded.

increased spending helps production to increase and thus, unemployment to decline. The second policy is the so called fiscal policy under which government changes its spending or its tax policy. For example, a tax cut which leaves more disposable income with the public is designed to stimulate their spending, therefore, the production. Finally, there is the exchange rate policy under which government tries to devalue or revalue its currency. For example, by devaluation or by cheapening domestic currency in terms of foreign currency, a country cheapens her exports, there by, she stimulates foreign demand for her goods. Increased exports boost domestic production helping to reduce unemployment.

During the Breton Woods system (١٩٤٦-١٩٧٣) under which exchange rates were fixed by an international agreement, devaluation was a common practice by many developing countries. However, since ١٩٧٣ the Breton Woods agreement has been broken and countries do have their own option of keeping their exchange rates fixed or allowing its value to be determined by the law of demand and supply (floating exchange rates). A country can keep her exchange rate fixed as long as she has enough international reserves to satisfy the demand. If exports do not generate enough international reserves to match the demand, that country loses reserves and when she runs out of reserves, she adheres to either foreign exchange controls or floating exchange rate under which due to excess demand for foreign currencies, domestic currency depreciates. Although, depreciation may stimulate exports, it has other macroeconomic consequences.

In this paper we consider the Iranian experience. Iran introduced her first foreign exchange controls on February ٢٥, ١٩٣٠ when the rial-dollar rate was ١١,٢٠ rials per dollar. On May ١٩٣٣, the official rate was increased from ١١,٢٠ rials to ١٦,٣٥ rials. The rial was devalued again on October ١, ١٩٤١ from ١٦,٣٥ to ٣٥,٢٥ rials per dollar and again to ٣٥,٥٠ on January ١, ١٩٤٢. On May ١٤, ١٩٤٢ the official rate was reduced to ٣٢,٥٠. Iran joined the International Monetary Fund on December ١٨, ١٩٤٦ when the rial dollar rate was ٣٢,٥٠ rials per dollar. Due to political turmoil and ousting of Premier Dr. Mossadegh in ١٩٥٣, a black market was developed and the exchange rate system went through several changes. Finally, in ١٩٥٥ Iran introduced different exchange rates with the basic rate for government transactions at ٣٢,٥٠ rials per dollar; student rate at ٤١,٥٠; commercial rate at close to ٧٥,٠٠; and a fluctuating selling rate for non-essentials at ٨٥,٠٠ rials per dollar. After introducing these rates, the black market rate stood at ٨١,٠٠ rials per dollar. On May ١٨, ١٩٥٧ finally the Bank Melli together with the finance minister decided to abolish the official rate of

۳۲٬۵۰ and computed the gold reserves at ۷۵٬۷۵ rials per dollar. The dollar buying rate was set at ۷۵٬۰۰ and the dollar selling rate at ۷۶٬۵۰. With the influx of oil dollars, these rates were reduced to ۷۰:۰۰ rials per dollar which prevailed till Islamic Revolution in ۱۹۷۹. Due to capital outflow after the revolution, the black market value of the dollar started to rise gradually. In May ۱۹۹۳ the black market rate that was ۱۶۵۰ rials per dollar, was adopted as the official rate and was allowed to float. At the same time Iran decided to liberalize the trade and capital flows which started to exert upward pressure on the dollar until it reached almost ۷۰۰۰ rials per dollar in early May ۱۹۹۵ when government decided to adhere, again, to foreign exchange and trade controls with the official rate fixed at ۳۰۰۰ rials per dollar. Raising the official value of the dollar to ۳۰۰۰ rial per dollar did not help the matter and the black market value of the dollar kept rising until settled around ۸۰۰۰ rials per dollar. Recently, once again, the Central Bank of Iran has adopted the black market rate as its official rate and has tried to unify the two rates so that it can stabilize the domestic economy and other economic conditions.

As the above review indicates, the Iranian rial has depreciated from a high of ۱۱٬۲۰ rials per dollar to as low as ۸۰۰۰ rials per dollar. It has continued to depreciate even after the revolution is settled (no more capital flight) and even after Iran-Iraq war is over. Why the rial has lost its value so much? What are the macroeconomic consequences of depreciation? Is it inflationary? Has it resulted in stagnation in the Iranian economy that we observe today? What could be done? These are typical questions raised in the literature against any country that allows its currency to depreciate and Iranian experience is no exception.

The main purpose of this paper is to review and collect my previously published papers about Iran. It is hoped that the models will provide a good background to researchers, specially graduate students who can re-estimate them by extending the estimation period beyond ۱۹۹۰ so that some new lights could be shed on the predictions of the models. Thus, in section II, I review my work related to the causes of the decline of the rial. In section III, macroeconomic consequences of depreciation of the rial is discussed. Finally, a summary, conclusion, and policy implication of the findings are discussed in the last section.

II- Causes of the Decline of the Rial
A- The Purchasing Power Parity

In trying to understand causes of a change in any exchange rate, the common practice is to start with the simplest and the oldest theory of exchange rate determination, i.e., the Purchasing Power Parity theory. Consider the purchasing power of two currencies, say the rial and the dollar, in two countries Iran and the United States respectively. Assume in Iran the purchasing power of one rial is ١/٣٧٥٠٠ gram of fine gold and in the U.S., the purchasing power of one dollar is ١/١٢,٥ gram. Based on these purchasing powers, we are safe to say that in Iran ٣٧٥٠٠ rials = ١ gram of gold and in the U.S. ١٢,٥ dollars = ١ gram of gold. Since gold is a homogenous commodity across the nations, the two equalities mentioned above imply that ٣٧٥٠٠ rials must be equal to ١٢,٥ dollars or ٣٠٠٠ rials per dollar, an exchange rate which is based on the ratio of Iranian price level (٣٧٥٠٠ rials) over American price level (١٢,٥ dollars) of the same good. In ١٩١٨, Cassel (١٩١٨, p. ٤١٣) was the first to call this type of exchange rate, "the purchasing power parity" rate.

Generalizing the above notion to include national price levels rather than the price of an individual commodity, the purchasing power parity (PPP here after) theory of exchange rate determination asserts that the exchange rate between two currencies is nothing but the ratio of two price levels in two corresponding countries. If we denote the Iranian price level by P_i and that of the U.S. price level by $P_{u.s.}$, the PPP based exchange rate R, defined as number of rials per dollar could be formulated as:

$$R = P_i/P_{u.s.} \tag{١}$$

Equation (١) basically outlines what is known as "the absolute PPP". Equation (١) could also be written as:

$$P_i = R.P_{u.s.} \tag{٢}$$

which is known as the "law of one price" implying that movement in the exchange rate will tend to equalize national price levels over long-run.

Previous authors tested the empirical validity of equation (١) or (٢) by using standard econometric procedures and provided mixed support. The development of new techniques (such as co-integration) has shifted the emphasis to the analysis of the residuals of those models. Examples of studies that have used the co-integration technique include Taylor (١٩٨٨), McNown and Wallace (١٩٨٩), Karfakis and Moschos (١٩٨٩), Layton and Stark (١٩٩٠), Kim (١٩٩٠), Bahmani-Oskooee and Rhee (١٩٩٢), Bahmani-Oskooee (١٩٩٣a), and Bahmani-Oskooee

(۱۹۹٥a, ۱۹۹٥b, ۱۹۹٥c). By considering data from different countries, these studies have also provided mixed results. In general, PPP is rejected for countries that experience relatively low rate of inflation. For countries with high rates of inflation, it is argued that since monetary growth could overshadow real factors, PPP could receive empirical support.

All the above studies used official exchange rate data to test the PPP. In a recent study (Bahmani-Oskooee, ۱۹۹۳b) using quarterly data over ۱۹۷۳I-۱۹۸٦II period, I showed that in case of Iran, when official exchange rate is used, PPP fails to hold. However, when the black market exchange rate is employed, it receives some support. This was the conclusion when equation (۲) was tested between Iran and each of her major trading partners as well as between Iran and all of her trading partners together using the concept of average foreign price level. To update that study, at least between Iran and the U.S., I now employ annual data over ۱۹٥۹-۱۹۹۰ period and ask how closely the two variables in (۱) or (۲) track each other over time? Figures ۱ and ۲ show the plot of the two variables in equation (۱) using official and the black market exchange rates respectively.

Figure ۱: Plot of Official Exchange Rate and Relative Prices over ۱۹٥۹-۹۰ Period

Figure ٢: Plot of Black Market Exchange Rate and Relative Prices over ١٩٥٩-٩٠ Period

As can be seen from figure ١, when official exchange rate is used the two variables do not seem to be related. However, when black market exchange rate is used (as in figure ٢), the two variables track each other very closely, though at times they drift apart. The implication of these findings is that one reason for the depreciation of the nominal value of the rial against the dollar (or appreciation of the dollar against the rial) is continuously rising price level in Iran. But, what has caused prices to rise so rapidly in Iran in first place?

B- The Monetary Approach

In testing the PPP or establishing a relation between exchange rate and relative prices, the main assumption is that the price levels are given or exogenous. However, by identifying the main determinants of the price level in each country, we are actually endogen zing the price levels. Indeed, many economists, especially monetarists who see causes of all economic ills in excess supply of money, believe that price level in each country is endogenous and their movements over time are dominated mostly by money supply. Does monetarist view hold in Iran? A preliminary answer is provided by Figure ٣ where money supply and price level in Iran are plotted over ١٩٥٩-٩٠ period[1].

١- Note that it is the M١ monetary aggregate that is employed in Figures ٣ and ٤.

Once again, it is obvious that the link between money supply and the price level in Iran is very close. Therefore, since increase in money supply has caused prices to rise and price increases has caused the dollar to rise (or rial to fall), we are safe to conclude that a major reason for the decline of the rial is excess money supply in Iran. To make sure this conjecture is true, I plot the black market exchange rate and the money supply in Figure ٤.

Figure ٣: Plot of Money supply (M١) and Consumer Price Index (CPI) over ١٩٥٩-٩٠ Period

Figure٤: Plot of Money supply (M١ in Billions of Rials) and the Black Market Exchange Rate

As can be seen, both variables track each other very closely, indicating that actually, excess increase in money supply is the main cause of rising prices (figure ٣) and a depreciating rial (figure ٤). To establish the theoretical relation between

money and exchange rate, in high inflation countries like Iran it is recommended to employ the monetary approach to exchange rate determination. Monetarists employ the PPP based exchange rate outlined by equation (١) by assuming that price level in both countries are endogenous and are determined through a macroeconomic model that they favor, i.e., quantity theory of money according to which:

$$M_i.V_i = P_i.Y_i \qquad (٣)$$

in Iran and

$$M_{u.s.}.V_{u.s.} = P_{u.s.}.Y_{u.s.} \qquad (٤)$$

in the U.S. In (٣) and (٤) M_i ($M_{u.s.}$) is the money supply in Iran (the U.S.), V_i ($V_{u.s.}$) is the velocity of money in Iran (the U.S.), P_i($P_{u.s.}$) is the Iranian (the U.S.) price level, and Y_i($Y_{u.s.}$) is the Iranian (the U.S.) real income.

Solving equation (٣) for P_i and equation (٤) for $P_{u.s.}$ and making the appropriate substitution into equation (١) we obtain:

$$R = (\frac{M_i}{M_{US}})(\frac{V_i}{V_{US}})(\frac{Y_{US}}{Y_i}) \qquad (٥)$$

Equation (٥) indicates that the relative money supply, relative velocity, and relative income are the main determinants of the exchange rate. Equation (٥) shows that an increase in Iranian money supply (M_i) relative to that of the U.S. results in an increase in R, i.e., a depreciation of the rial. An increase in the Iranian income (Y_i) relative to that of the U.S., however, results in a decline in R or an appreciation of the rial. Finally, an increase in the velocity of money in Iran (V_i) relative to that of the U.S. also results in the depreciation of Iranian rial. While the effects of relative money supply is in line with the conventional wisdom or other theories, the effects of income is not. The monetarist explanation for the effects of income is that a faster growth of income in a country (Iran) relative to the growth of income in her trading partner (the U.S.) results in excess demand for money. If the excess demand for money is not satisfied by creating domestic credit, it will attract funds from abroad causing domestic currency to appreciate. In a recent article (Bahmani-Oskooee, ١٩٩٥d), I established the empirical validity of (٥) using co-integration analysis and showed that the relation between the rial-dollar rate, relative money supply, relative output, and relative interest rate (as a determinant of velocity) are in line with the monetarist prescription.

C- The Productivity Approach

Thus far, I have identified the causes of the decline in the nominal value of the rial either through the PPP (equation ١) or through the monetarist model (equation ٥). What has happened to the real value of the rial? In figure (٢) I showed that the black market exchange rate and the relative prices track each other very closely, though, at times they drift apart indicating that there could be some imperfections in the PPP in the case of rial-dollar rate.

In addition to other factors (such as trade restrictions, transportation cost, non-traded sector, ect.), productivity differential between countries has been cited as a real factor contributing to imperfections in PPP or its total failure. This phenomenon has resulted in its own literature under the heading of "productivity bias hypothesis in PPP". As it will be shown later, testing the productivity bias hypothesis amounts to testing and identifying the productivity differential between two countries as a determinant of **real exchange rate** between two countries.

By relying upon equation (١) and following the literature, we measure the deviation of PPP defined as $(P_i/P_{u.s.})$ from equilibrium exchange rate R by the following ratio:
which could also be written as :

$$\frac{P_i \big/ P_{US}}{R} \qquad (٧) \qquad\qquad \frac{P_i}{P_{US}R} \qquad (٦)$$

Quantity (٧) is the **real exchange rate** defined as number of units of the U.S. output per unit of the Iranian output. Therefore, an increase in (٧) will be an indication of real appreciation of the Iranian rial and a decrease in it, an indication of a real depreciation. The implication is that the measure of deviation of PPP from equilibrium nominal exchange rate (relation ٦) or the real exchange rate (relation ٧) could be used interchangeably. Indeed, Balassa (١٩٦٤, p. ٥٨٦) argued that if international productivity differences are greater in the production of traded goods than non-traded goods, the country with higher productivity will experience an overvalued currency in terms of purchasing power parity.

To determine whether productivity differential between Iran and the U.S. is a factor that contributes to the deviation of PPP from equilibrium exchange rate or is a determinant of real exchange rate we adopt the model from Bahmani-Oskooee (١٩٩٢) which with few changes in notation, it is outlined by equation (٨):

$$\frac{(P_i / P_{u.s.})_t}{R_t} = \alpha + \beta(PROD_i / PROD_{u.s.}) + \varepsilon_t \qquad (٨)$$

where P_i = price level in Iran; $P_{u.s.}$ = price level in the U.S.; R = nominal exchange rate (number of rials per U.S. dollar); $PROD_i$ = index of measure of productivity in Iran; $PROD_{u.s.}$ = index of measure of productivity in the U.S. and ε = an error term. If productivity bias hypothesis is to receive support, estimate of β should be positive and significant. As Balassa (۱۹٦٤, p. ٥٨٦) wrote[1].

"If per capita incomes are taken as representative of levels of productivity, the ratio of purchasing power parity to the exchange rate will thus be an increasing function of income levels".

To gain some insight into the relation between real exchange rate and productivity differential (as dependent and independent variables in equation ۸) between Iran and the U.S. I plot both variables of equation (۸) over ۱۹٥۹-۱۹۹۰ period in Figure ٥. Thus, in figure ٥, the real exchange rate is the left hand side variable in equation (۸) and productivity ratio is the right hand side variable.

Figure ٥: Plot of Real Exchange Rate and Productivity Ratio: The case of Iran vs. The U.S.

---

[1]- Authors have tried to test different variants of equation (۸) by using either cross-sectional data or time-series data. Among the cross-sectional studies that do not support the productivity bias hypothesis one could cite De Vries (۱۹٦۸), Clague and Tanzi (۱۹۷۲), Officer (۱۹۷٤, ۱۹۷٦) and Bahmani-Oskooee and Niroomand (۱۹۹٦). However, cross-sectional studies such as Balassa (۱۹٦٤), Kravis and Lipsey (۱۹۷۸) and Clague (۱۹۸٦, ۱۹۸۸) have supported the hypothesis. Among the time-series studies there is general support for the hypothesis. Hsieh (۱۹۸۲), Bahmani-Oskooee (۱۹۹۲), and Bahmani-Oskooee and Rhee (۱۹۹٦) are examples in this later group.

Once again, it is obvious from figure ٥ that the two variables follow each other closely. It is interesting to note that both variables are rising before ١٩٧٨ and falling thereafter. The explanation lies behind political events led by the fall of the Shah, the Islamic revolution, and rhetorical war between Iran and Iraq. Specifically, in the post-revolutionary period, there is an indication that as Iranian productivity relative to that of the U.S. declines, so does the value of real rial. The empirical validity of the relation between real exchange rate and productivity differential not only between Iran and the U.S., but also between Iran and six other major trading partners is already established in Bahmani-Oskooee (١٩٩٦a), again using co-integration technique. The main conclusion is that there is a long-run relation between real value of the rial and relative productivity between Iran and her trading partners, implying that a decline in the Iranian productivity relative to that of its major trading partners is associated with a depreciation of the rial in real term. This relation is specially pronounced during post-revolutionary period. Therefore, if policy makers are to reverse the decline of the rial, they must aim at macroeconomic policies that are designed to increase Iranian productivity over time. Increase in productivity not only will help rial to gain its real value, but it will also increase living standard. Such policies will be outlined in the last section of this chapter.

III. Macroeconomic Consequences of Depreciation of the Rial

Depreciation of any currency is said to have an impact on almost all macroeconomic variables of a country. The list includes, interest rates, wages, income distribution, inflation, domestic production, imports, exports, demand for money, etc. In what follows, I review the impact of the depreciation of the rial on Iranian inflation, domestic production, and the demand for money. The remaining areas are recommended as topics for future research.

A- Depreciation and Inflation

Many researchers have investigated sources of inflation in developing nations. Some have relied upon the structuralist approach in which many macroeconomic variables, including the inflation rate, are linked through a system of relationships. For high inflation countries, many have relied upon the monetarist model of inflation in which the inflation rate is related to the rate of change of the money supply in excess of the rate of increase of domestic output. The monetary model introduced originally by Harberger (١٩٦٣) has been applied to Asian countries by

Bomberger and Makinen (۱۹۷۹) and to Latin American countries by Nugent and Glezakos (۱۹۷۹). Others like Rana and Dowling (۱۹۸۰) and Bahmani-Oskooee and Malixi (۱۹۹۲) have applied the monetarist model augmented with imported inflation and exchange rate depreciation to some LDCs. This augmented model usually takes the following form:

$$\dot{CPI}_t = a + b(\dot{M} - \dot{Y})_t + cP\dot{X}W_t + dB\dot{E}X_t + \varepsilon_t \qquad (۹)$$

where a dot above each variable indicates the rate of change of that variable. In (۹), CPI is the Consumer Price Index, M is the money supply, Y is the real output, PXW is the world export price as a proxy for imported inflation, and BEX is the black market exchange rate.

In a recent article (Bahmani-Oskooee ۱۹۹۰e) I modified equation (۹) so that the co-integration technique could be applied. The modified version of (۹) in log-linear form is as follows:

$$\text{Log CPI}_t = a + b\text{Log}M_t + c\text{Log } Y_t + d \text{ Log PXW}_t + e \text{ Log BEX}_t + \varepsilon_t \qquad (۱۰)$$

In (۱۰) it is expected that the estimate of $b > ۰$, indicating that an increase in money supply could result in an increase in CPI. An increase in domestic output Y should cause a decline in domestic price levels, yielding a negative estimate of c. If imported inflation is to contribute to domestic inflation, the estimate of d should be positive. Finally, defined as the number of rials per U.S. dollar, if an increase in the BEX variable or a depreciation of the Iranian rial is to be inflationary, the estimate of e should also be positive. Figure ۳ already showed the positive association between money supply and the CPI. To determine whether exchange rate depreciation has caused the Iranian CPI to rise, I plot the two variables in Figure ۶.

Figure ۶: Plot of Black Market Exchange Rate and Consumer Price Index (CPI)

As can be seen from figure ٦, indeed an increase in the value of the dollar or a decrease in the value of the rial is associated with rising CPI. To show that these relations are not spurious, in Bahmani-Oskooee (۱۹۹۰e) I established the empirical validity of the above model, again using unit root tests and co-integration analysis. In summary, it is shown that inflation in Iran is not only a monetary phenomenon, it is also a result of depreciation of the Iranian rial and of imported inflation. The first major policy implication of our finding is that, if the Iranian government is to fight inflation, it should not finance budget deficits by printing money. Rather, the government should rely upon fiscal policy such as removing subsidies, raising taxes, increasing the effectiveness of government-owned industries, and making the Iranian central bank independent of the central government, etc[1].

B- Depreciation and Domestic Production

What are the effects of depreciation on domestic production? There are numerous theoretical and empirical studies in the literature that have focused on the effects of depreciation or devaluation on domestic production. Generally, it is concluded that in developed countries (DCs) depreciations expand domestic production, whereas, in less developed or developing countries (LDCs) they actually contract it. This contradictory outcome could easily be understood by a reference to the aggregate demand and aggregate supply model. Usually, depreciation increases aggregate demand by stimulating its net export component. On the other hand, it decreases aggregate supply by raising the cost of imported intermediate goods. Thus, the net effect on output will depend upon extend of the shift in the aggregate demand and the aggregate supply. Lizondo and Montiel (۱۹۸۹: ۱۸۲) concluded that "the direction of the impact effects of devaluation on real output is ambiguous on analytical grounds".

Diaz-Alejandro (۱۹٦۳), Krugman and Taylor (۱۹۷۸), and Hansen (۱۹۸۳), Gylfason and Risager (۱۹۸٤), Solimano (۱۹۸٦), Edwards (۱۹۸٦), and Gylfason and Radetzki (۱۹۹۱) are example of studies who have provided theoretical and

---

1- More about these policies in the last section.

empirical evidence that depreciations are contractionary in LDCs, at least in the short to medium-run[1].

In a recent article (Bahmani-Oskooee ١٩٩٦b) I investigated the Iranian experience by estimating a reduced form output model that took the following form:

$$GDP_t = F[\ t,\ G_t,\ M_t,\ (P^*R/P)_t] + \omega_t \tag{١١}$$

where GDP = Gross Domestic Product; t is the trend term; G = government spending as a measure of fiscal policy; M = money supply as a measure of monetary policy; P^* = the U.S. price level; R = nominal exchange rate defined as number of rials per U.S. dollar; and P = Iranian price level. Note that P^*R/P is then the real exchange rate defined as number of units of Iranian output per unit of the U.S. output. By dropping P^* and P from equation (١١), the effects of nominal exchange rate was also investigated. It is expected that an increase in G or M (an expansionary fiscal or monetary policy) will expand GDP. If real or nominal depreciation reflected by an increase in R or (P^*R/P) is to be expansionary, it should carry a positive coefficient[2]. Using co-integration analysis and data over ١٩٥٩-٩٠ period, it was shown that in most instances real and nominal exchange rate carried a highly significant negative coefficient, indicating that depreciation of the rial is contractionary in Iran. This is perhaps expected in an oil economy. Devaluation of the rial cannot have much of an impact on the aggregate demand because the net exports are priced in terms of the dollar. However, because of dependency on imported inputs, devaluation of the rial would decrease the aggregate supply and thus domestic production. For devaluation to be expansionary, aggregate demand should expand by more than the decline in aggregate supply. In Iran this will be a possibility when non-oil exports become a major component of total exports[3]. One major policy implication of my finding is

---

1- For the most recent review of the literature on this topic see Bahmani-Oskooee and Miteza (٢٠٠٣).

2- The model was borrowed from Edwards (١٩٨٦). However, unlike Edwards who estimated equation (١١) by pooling annual data from ١٢ LDCs, I estimated it for Iran using co-integration technique.

3- My study period was restricted to ١٩٥٩-١٩٩٠. The recent data and evidence shows that during ١٩٩٠s indeed Iran has increased her share of non-oil exports. Thus,

that Iranian Central Bank must make attempts at revaluing the rial. On this matter one has to commend the Central Bank of Iran for taking initial steps in eliminating multiple exchange rates. Such policy opens the way to intervention in the foreign exchange market effectively where there is only one single rate. While market intervention could only be a short-run policy, in the long run and over time economic policies must be aimed at improving economic fundamentals as outlined in the last section.

C- Depreciation and the Demand for Money

What determines how much money public wants to hold? For a closed economy, income as a measure of economic activity and interest rate as a measure of opportunity cost of holding money are said to be two main determinants. In a growing economy reflected by an increase in the level of income, more money will be demanded. An increase in the opportunity cost of holding money results in a decrease in the demand for money. However, recently several studies, e.g., Arango and Nadiri (۱۹۸۱), Bahmani-Oskooee and Pourheydarian (۱۹۹۰), McNown and Wallace (۱۹۹۲), and Bahmani-Oskooee and Rhee (۱۹۹٤) included the exchange rate in their formulation of money demand. The rationale behind including the exchange rate is that when domestic currency depreciates (or foreign currency appreciates), the value of foreign assets held by domestic residents increases in terms of domestic currency. This, in turn results in an increase in wealth, thus, an increase in the demand for money.

In a recent article of mine (Bahmani-Oskooee ۱۹۹٦c) I estimated the demand for money in Iran by incorporating some features of Iranian economy. In Iran rather than using the interest rate as the opportunity cost of holding money, for several reasons, I included the rate of inflation as an appropriate measure of opportunity cost. First, financial markets are not well developed. Second, the interest rate has usually been set by the Iranian Central Bank and remained fixed for long periods. Third, no interest rate data are available for the post revolutionary period. Finally, in Iran real assets are considered more attractive than financial assets. This is because historically real asset prices have often increased at a much more rapid rate

---

extending the study period to include more recent observations and re-estimating the model could be another research project that is highly recommended.

than the rate of return on financial assets. Due to lack of well developed stock market, most Iranians speculate in land or housing markets. During the post-١٩٧٩ period when inflation has been very high, Iranians even speculate in the market for durable commodities such as new or used cars. Therefore, the money demand function that I estimated took the following form:

$$\text{Log } M_t = a + b \text{ Log } Y_t + c \, \Delta \text{Log } P_t + d \text{ Log } R_t + \varepsilon_t$$
(١٢)

where M is the demand for real cash balances; Y is the real GDP; P is the price level; and R is the exchange rate defined as the number of Iranian rials per U.S. dollar. Note that the inflation rate is measured by $\Delta \text{Log } P_t = \text{Log } P_t - \text{Log } P_{t-١}$. Depending on whether the monetary aggregate is defined as M١ or M٢, and the exchange rate as official (OEX) or black market rate (BEX), variants of equation (١٢) were estimated using co-integration analysis and it was shown that all coefficients carried their expected signs.

was concluded that the more stable long-run demand for money in Iran will include real M٢, real GDP, the inflation rate, and the black market exchange rate as its arguments. Furthermore, the exchange rate variable carried a positive coefficient indicating that as the Iranian rial depreciates (R) increases, demand for money increases, supporting the wealth effect argument in the literature.

IV- Summary and Conclusion

Since the advent of revolution in Iran, the rial has lost its nominal and real values. In this paper we were concerned with two major question. First, what has caused the rial to depreciate and second, what are the macroeconomic consequences of depreciation of the rial? Iranian high rate of inflation, excess money supply, and declining productivity provided answer to the first question. In investigating the second question, I found that depreciation of the rial has contributed to high inflation, to declining domestic production (and thus high unemployment rate) and to an increased demand for money. The following policies that come from Bahmani-Oskooee (١٩٩٦b), are recommended to cope not only with declining rial, but also with other macroeconomic ills such as inflation, and stagnation.

a. Given the current inflationary environment in Iran, Iran may adhere to monetarist prescription for fighting inflation. Many monetarist economists argue that countries that are committed to fight inflation and provide price stability, will

end up having a market system which functions better and provides a better environment to promote productivity growth. Stable prices allocate economic resources more efficiently. To achieve price stability, monetary policy should be implemented without political pressure implying that central bank should be independent. Independent central bank will adhere to price stability and use monetary policy to fight inflation and not to finance government spending.

b. Fiscal policy should be aimed at balancing the budget and not running any deficit. Rather than using the private saving to finance government spending, it could be used to finance private or public investment that contributes to economic growth and productivity increase. To raise revenue, Iran must rely on tax policies. They must simplify the tax system and reorganize or create tax administration so that tax policies could be effective in generating revenue.

c. One of the fundamental economic decisions that any government must make is the proper allocation of its resources between consumption and investment. Should Iran allocate its oil income to present consumption or future long-term investment? All economists would agree that investment should be given a high priority than present consumption. Oil dollars should not be allowed to spent on foreign luxury goods, through trade liberalization. Rather, they should be channeled toward more productive equipment investment or direct investment. Government should have policies that give incentive for private parties to invest.

d. Government must also pay attention to incentive structure for financial capital. It must provide an economic environment that provides incentive for people to invest in financial assets. It is through such investments that firms can raise revenue to be engaged in direct investment.

e. Investing in human capital is also essential for long-run growth. Specially, a developing country such as Iran must take steps in increasing its skilled labor force. Many Iranian students who came abroad for higher education did not return. Even many educated Iranians fled the country after revolution making Iran to suffer from the so called "Brain Drain" problem. By relying upon some policies to attract this group back, Iran can increase its pool of skilled labor force. The TOKTEN program of the United Nation is an step in positive direction.

f. Iran needs rapid and effective progress in the privatization of state companies; the elimination of any control on prices and wages and the elimination of a complex network of subsidies.

g. There must be an industrial policy that supports Research and Development in public and private institutions. Research and development in all fields is

something that many developing countries are lacking. Government policies should be aimed at creating an environment that is conducive for research and development.

h. Usually, productivity is measured by per capita real Gross Domestic Product. An increase in population could be one reason for the decline in Iran's productivity. Thus, a major secret to growth and increased productivity is to keep population growth down by appropriate policies.

References

۱- Arango, Sebastian, and M. Ishag Nadiri, "Demand for Money in Open Economies," *Journal of Monetary Economics*, Vol. ۷ (January ۱۹۸۱): ٦۹-۸۳.

۲- Bahmani-Oskooee, Mohsen, ''A Time-Series Approach to Test the Productivity Bias Hypothesis in Purchasing Power Parity," *Kyklos*, Vol. ٤٥ (Fasc.۲, ۱۹۹۲), pp. ۲۲۷-۲۳٦.

۳- Bahmani-Oskooee, Mohsen, "Purchasing Power Parity Based on Effective Exchange Rate and Cointegration: ۲٥ LDCs' Experience with its Absolute Formulation," *World Development*, Vol. ۲۱ (۱۹۹۳a), pp. ۱۰۲۳-۱۰۳۱.

٤- Bahmani-Oskooee, Mohsen, "Black Market Exchange Rates versus Official Exchange Rates in Testing Purchasing Power Parity: An Examination of the Iranian Rial," *Applied Economics*, Vol. ۲٥ (۱۹۹۳b), pp. ٤٦٥-٤۷۲.

٥- Bahmani-Oskooee, Mohsen, "Real and Nominal Effective Exchange Rates for ۲۲ LDCs: ۱۹۷۱:۱-۱۹۹۰:٤," *Applied Economics*, Vol. ۲۷ (۱۹۹٥a), pp. ٥۹۱-٦۰٤.

٦- Bahmani-Oskooee, Mohsen, "Testing for Long-Run Purchasing Power: A Reexamination of Greek Drachma," *Journal of Economic Development*, Vol. ۲۰ June ۱۹۹٥b), pp. ۷-۱٤.

۷- Bahmani-Oskooee, Mohsen, "Real Effective Exchange Rates and the Purchasing Power Parity:Experiences of ۱۹ Industrial Countries," Economic Notes, Vol. ۲٤ (۱۹۹٥c), pp. ۲۳۹-۲٥۰.

۸- Bahmani-Oskooee, Mohsen, "The Decline of Iranian Rial During Post-Revolutionary Period: The Monetary Approach and Johansen's Cointegration Analysis," *Canadian Journal of Development Studies*, Vol. ۱٦ (۱۹۹٥d), pp. ۲۷۷-.

۹- Bahmani-Oskooee, Mohsen, "Source of Inflation in Post-Revolutionary Iran," *International Economic Journal*, Vol. ۹ (Summer ۱۹۹٥e), pp. ٦۱-۷۲.

١٠- Bahmani-Oskooee, Mohsen, "Decline of the Iranian Rial During Post-Revolutionary Period: Productivity Approach," *Journal of Developing Areas,* Vol. ٣٠ (July ١٩٩٦a), pp. ٤٧٧-٤٩٢.

١١- Bahmani-Oskooee, Mohsen, "Source of Stagflation in an Oil Producing Country: Evidence from Iran," J*ournal of Post Keynesian Economics*, Vol. ١٨ (Summer ١٩٩٦b), pp. ٦٠٩-٦٢٠.

١٢- Bahmani-Oskooee, Mohsen, "The Black Market Exchange Rate and Demand for Money in Iran," *Journal of Macroeconomics*, Vol. ١٨ (Winter ١٩٩٦c), pp. ١٧١-١٧٦.

١٣- Bahmani-Oskooee, Mohsen and Mohammad Pourheydarian, "Exchange Rate Sensitivity of the Demand for Money and Effectiveness of Fiscal and Monetary Policies," *Applied Economics*, Vol. ٢٢ (July ١٩٩٠), pp. ١٣٧٧-١٣٨٤.

١٤- Bahmani-Oskooee, Mohsen and Hyun-Jae Rhee, "Testing for Long-Run Purchasing Power Parity: An Examination of Korean Won, "*International Economic Journal*, Vol. ٦ (Autumn ١٩٩٢), pp. ٩٣-١٠٣.

١٥- Bahmani-Oskooee, M. and M. Malixi, "Inflationary Effects of Changes in Effective Exchange Rates: LDCs Experience," *Applied Economics*, Vol. ٢٤ (April ١٩٩٢), pp. ٤٦٥-٤٧١.

١٦- Bahmani-Oskooee, Mohsen, and Hyun-Jae Rhee "Long-Run Elasticities of the Demand for Money in Korea: Evidence from Cointegration Analysis," *International Economic Journal*, Vol. ٨ (Summer ١٩٩٤), pp. ١-١١.

١٧- Bahmani-Oskooee, Mohsen, and Hyun-Jae Rhee "More Time Series Support for Balassa's Productivity Bias Hypothesis: Evidence from Korea," *Review of International Economics*, Vol. ٤ (October ١٩٩٦), pp. ٣٦٤-٣٧٠.

١٨- Bahmani-Oskooee, Mohsen and Farhang Niroomand, "A Reexamination of Balassa's Productivity Bias Hypothesis," *Economic Development and Cultural Change*, Vol. ٤٥ (October١٩٩٦), ١٩٥-٢٠٤.

١٩- Balassa, Bela, "The Purchasing-Power Parity Doctrine: A Reappraisal," *Journal of Political Economy*, Vol. ٧٢ (December ١٩٦٤), pp. ٥٨٤-٥٩٦.

٢٠- Bomberger, W. A., and G. E. Makinen, "Some Further Tests of the Harberger Inflation Model Using Quarterly Data*," Economic Development and Cultural Change*, July ١٩٧٩, ٦٢٩-٦٤٤.

٢١- Cassel, Gustav, "The Present Situation of the Foreign Exchanges," *Economic Journal*, Vol. ٢٦ (١٩١٦), pp. ٦٢-٦٥.

۲۲- Clague, Christopher, "Determinants of the National Price Level: Some Empirical Results," *Review of Economics and Statistics*, Vol. ٦٨ (١٩٨٦): ٣٢٠-٢٣.

۲۳- Clague, Christopher, "Purchasing Power Parities and Exchange Rates in Latin America," *Economic Development and Cultural Change*, Vol. ٣٦ (١٩٨٨): ٥٢٩-٤١.

۲٤-Clague, Christopher, and Vito Tanzi, "Human Capital, Natural Resources and the Purchasing-Power Parity Doctrine: Some Empirical Results," *Economia Internazionale*, Vol. ٢٥ (February ١٩٧٢), pp. ٣-١٨.

۲٥- Diaz-Alejandro, Carlos F. , "A Note on the Impact of Devaluation and the Redistributive Effect," *Journal of Political Economy*, Vol. ٧١ (August ١٩٦٣), pp. ٥٧٧-٥٨٠.

۲٦- De Varies, Margaret G., "Exchange Depreciation in Developing Countries," *IMF Staff Papers*, Vol. ١٥ (November ١٩٦٨), pp. ٥٦٠-٥٧٨.

۲٧- Edwards, Sebastian, "Are Devaluations Contractionary?" *The Review of Economics and Statistics*, Vol. ٦٨ (August ١٩٨٦), pp. ٥٠١-٥٠٨.

۲٨- Gylfason, Thorvaldur and Ole Risager, "Does Devaluation Improve the Current Account?" *European Economic Review*, Vol. ٢٥ (June ١٩٨٤), pp. ٣٧-٦٤.

۲٩- Gylfason, Thorvaldur and Marian Radetzki, "Does Devaluation Make Sense in the Least Developed Countries?" *Economic Development and Cultural Change*, Vol. ٤٠ (October ١٩٩١), pp.١-٢٥.

۳۰- Hanson, James A., "Contractionary Devaluation, Substitution in Production and Consumption, and the Role of the Labor Market," *Journal of International Economics*, Vol. ١٤ (February ١٩٨٣), pp. ١٧٩-١٨٩.

۳۱- Harberger, A., "The Dynamics of Inflation in Chile", in Measurement in Economics (Ed.) C. F. Christ, Stanford University Press, Stanford, ١٩٦٣.

۳۲- Hsieh, David A., "The Determination of the Real Exchange Rate: The Productivity Approach,"*Journal of International Economics*, Vol. ١٢ (May ١٩٨٢), pp. ٣٥٥-٣٦٢.

۳۳- Karfakis, Costas, and Demertrios Moschos, "Testing for Long Run Purchasing Power Parity: A Time Series Analysis for the Greek Drachmas," *Economic Letters*, Vol. ٣٠ (December ١٩٨٩), pp. ٢٤٥-٢٤٨.

۳٤- Kim, Yoonbai, "Purchasing Power Parity in the Long Run: A Cointegration Approach," *Journal of Money, Credit and Banking*, Vol. ٢٢ (November ١٩٩٠), pp. ٤٩١-٤٠٣.

۳۵- Kravis, Irving B. and Robert E. Lipsey, "Price Behavior in the Light of Balance of Payments Theories," *Journal of International Economics*,۸ (۱۹۷۸): ۱۹۳-۲٤٦.

۳٦- Krugman, Paul and Lance Taylor, "Contractionary Effects of Devaluation," *Journal of International   Economics*, Vol. ۸ (August ۱۹۷۸), pp. ٤٤٥-٤٥٦.

۳۷- Layton, Allan P. and Jonathan P. Stark, "Co-integration as an   empirical   Test of Purchasing Power Parity*," Journal of Macroeconomics*, Vol. ۱۲ (Winter ۱۹۹۰), pp. ۱۲٥-۱۳٦.

۳۸- Lizondo, J. Saul and Peter J. Montiel, "Contractionary Devaluation in Developing Countries: An   Analytical Overview," *IMF Staff Papers*, Vol. ۳٦ (March ۱۹۸۹), pp. ۱۸۲-۲۲۷.

۳۹- McNown, Robert and Myles S. Wallace, "National Price Levels, Purchasing Power Parity, and Co- integration: A Test of Four   High   Inflation Economies," *Journal of International Money and Finance*, Vol. ۸ (December ۱۹۸۹), pp. ٥۳۳-٥٤٥.

٤۰- McNown, Robert, and Myles S. Wallace, "Co-integration Tests of a Long-Run Relationship Between Money Demand and the Effective Exchange Rate," *Journal of International Money and Finance*, ۱۱ (February ۱۹۹۲): ۱۰۷-۱۱٤.

٤۱- Nugent, Jeffrey B., and Constantine Glezakos, "A Model of Inflation and Expectations in Latin America," *Journal of Development Economics*, September ۱۹۷۹, ٤۳۱-٤٤٦.

٤۲- Officer, Lawrence H., "Purchasing Power Parity and Factor Price Equalization," *Kyklos*, Vol. ۲۷ (Fasc. ٤, ۱۹۷٤), pp. ۸٦۸-۸۷۸.

٤۳- Officer, Lawrence H., "The Productivity Bias in Purchasing Power Parity: An Econometric Investigation," *IMF Staff Papers*, Vol.   ۲۳ (November ۱۹۷٦), pp. ٥٤٥-٥۷۹.

٤٤- Rana, Pradumma B., and J. Malcolm Dowling, Jr., "Inflationary Effects of Small but Continuous Changes in Effective Exchange Rates: Nine Asian LDCs," *The Review of Economics and Statistics,* August ۱۹۸٥, ٤۹٦-٥۰۰.

٤٥- Solimano, Andres, "Contractionary Devaluation in the Southern Cone: The case of Chile," *Journal of Development Economics*, Vol. ۲۳ (September ۱۹۸٦), pp. ۱۳٥-۱٥۱.

٤٦- Taylor, Mark P., "An Empirical Examination of Long-Run Purchasing Power Parity Using Cointegration Technique," *Applied Economics*, Vol. ۲۰ (October ۱۹۸۸), pp. ۱۳٦۹-۱۳۸۱.