Iranian Economic Review, Vol.8, No.8, Spring 2003

Long-Run Movements of the Parallel Market Premium in the Pre-Exchange Rate Unification Period in Iran

By:
Kazem Yavari*

Abstract

The purpose of this paper is to explain the causes of long-run movements in the parallel market premium in the pre-and-post revolution Iranian economy. The paper suggests that the premium is affected by both real and monetary shocks.

Non-spurious co-integration results indicate that negative oil revenue shocks and a revolution-induced exogenous capital outflow caused the parallel market parallel market premium to increase rapidly after the revolution. In addition, it has been shown that the excessive inflation tax created by post-revolution government decreased continuously the return to holding domestic currency and the premium increased as a result of continuous adjustments in private portfolio balances. The paper concludes that the premium cannot be controlled unless government controls money supply and reduces oil dependency of the economy.

I- Introduction

Parallel market for foreign currency is characteristic of almost all developing countries. While it is passive in some of them such as big oil exporters, it is very active in some others such as many Latin American and African countries. Iran has experienced both passive and active parallel markets for foreign currency. Immediately after the 1978 Islamic Revolution, the pre-

* - Assistant Professor of Economics, University of Tarbiat Modarres.

revolution passive parallel market turned into an active one. Simultaneously, parallel market premium increased continuously in the economy. The revolution-induced structural changes, the eight year war, outside political pressures and many other uncontrollable exogenous factors, without any doubt, contributed to the development of the parallel market for foreign currency.

In addition, there have been changes in post-revolution monetary and fiscal policies. High fiscal deficit was being financed by excessive money creation. The economy was also faced with several oil revenue shocks, exogenous capital outflow and long-run movements in domestic real income. The purpose of this paper is mainly to explain the causes of ever-increasing parallel market premiums. Instead of looking directly at changes in these exogenous variables, we try to find an equilibrium relationship between the parallel market premium and some relevant endogenous variables in which long-run movements reflect movements in nominal and real exogenous factors. We also attempt to separate the short-run dynamics from the long-run equilibrium relationship among the variables.

The paper consists of the following sections. Section II deals with the literature review. Section III introduces a brief history of Iran's currency in the official and parallel market. The data and methodology will be presented in section IV. Using the Maximum Likelihood procedure, an equilibrium co-integrating relationship and an analysis of short-run dynamics will be presented in section V. Finally in section VI the main conclusions are derived.

II- Parallel Market Premium: Theory

Parallel market premium is defined as:

$$\delta = \frac{(\pi - \varepsilon)}{\varepsilon}$$

Where π and ε are the parallel market and official normal exchange rates. Over the past few years, parallel markets for foreign exchange have been analyzed and modeled from a number of different perspectives. These models can generally be classified into two categories in terms of dealing with determinants of the parallel market premium. The first class of models are "real

trade" models of parallel markets(1). In real trade models of the determination of the parallel market premium, the parallel market for foreign exchange is modeled as reflecting the demand for foreign currency to purchase illegal imports and the supply of foreign currency derived from illegal sources. If τ denotes the tariff, ρ the probability of success in smuggling, a necessary condition for import smuggling to occur is $\tau\rho>\delta$. Similarly, under the same detection technology, an incentive to smuggle out exports will exist when $\eta<\rho\delta$ where η is the subsidy on exports.

In this framework, planned smuggled imports provide the flow demand for foreign currency in the parallel market while successfully smuggled exports provide the flow supply. The long-run parallel market premium is then determined by the equilibrium conditions for legal and illegal trade. In the long-run equilibrium, where legal exports, equal legal imports and successfully smuggled exports pay for planned smuggled imports, the premium can be expressed as a weighted average , and it is therefore determined by the structure of tariff barriers.

The basic limitation of the real trade models is that, dealing in the parallel or illegal markets for foreign currency, according to these models, is based only on smuggling motive. These models assume away the portfolio motive. This assumes away the portfolio motive that has been identified as a critical contributor to the demand for foreign currency.

Attention has recently focused on the portfolio-balance approach, developed by de Macedon (1985-1987) and Dornbusch *et.al.* (1983). Which stresses the role of asset composition in the determination of the parallel market rate(2). Portfolio diversification has indeed identified as a critical component of the unofficial demand for foreign currency in many developing countries.

The general observation underlying this class of models is that foreign exchange is a financial asset. Loss of confidence in the domestic currency, fears about inflation and increasing taxation and low real domestic interest rates give rise to a demand for foreign currency, both as a hedge and refuge for funds and as a means of acquiring and hoarding imports.

1- Examples are: Bhagwati and Hanson (1973), Culberston (1975), Sheikh (1978), Pitt (1984), Martin and Panagariya (1984), de Macedo (1987), Branson and de Macedo (1989), and McDermott(1989).

2- Other Examples are: Dornbusch (1986), Edwards (1989), Edwards and Montiel (1989), Frenkel (1990), Kamin(1991), Kharas and Point(1989), Lizondo(1987, 1991), and Pinto (1986,1991).

In all these models, output is exogenous and the desired proportion between domestic and foreign currencies is given by a liquidity preference function that depends on the expected and, under perfect foresight, actual rate of depreciation of the parallel market exchange rate. Private capital transactions through the official market are usually ignored, so that the reported current account balance is equal to the change in central-bank reserves, which, together with an exogenously determined rate of growth of domestic credit, determine the change in the stock of foreign currency held in private agents' portfolios. The flow supply of foreign exchange in the parallel market usually derives from under-invoicing of exports. The propensity to under-invoice, when endogenous, is assumed to depend positively on the level of the premium. Portfolio balance implies that the domestic currency value of the stock of foreign assets is equal at each instant to a desired proportion of private wealth. In the short run, the parallel market rate moves so as to set the portfolio demand for foreign assets equal to the existing stock of foreign currency, implying that flow demand and supply may diverge at any given moment. In the long run, the parallel rate and private holdings of foreign currency are determined jointly by the requirements of both portfolio and current account equilibrium.

The conclusion from these models is that both real and normal factors will affect the parallel market premium. A positive shock to terms of trade, for example, will affect both supply of and demand for foreign currency in the parallel market and consequently the premium. The direction of the effect depends on the relative impact of the shock on supply and demand. Changes in the difference between domestic and foreign interest rate will change the return to holding domestic currency and as a result the premium will change as private agents adjust their portfolio balance. Evidence shows that low domestic interest rate with high domestic inflation in many developing countries have been in line with increasing parallel market premium. Fiscal, monetary and official exchange rate policies will also affect the premium.

Instead of modeling explicitly on the determinants, we try to find an equilibrium relationship between the parallel market premium and some relevant endogenous variables which can adequately capture the effect of movements in both real and nominal factors. Knowing the causes of long-run movements in these variables gives information about the causes of long-run movements in the premium. The effect of oil revenue shocks, fiscal and monetary policies on the premium will implicitly be identified. In addition, short-run departures from the long-run relationship will be analyzed.

III- A Brief History of Iran's Currency in the Official and Parallel[1] Market

The Iranian Rial (RI) is divided into 100 Dinars[2]. On May 22, 1957, the average "trade rate of Rls 75.75 per U.S. Dollar became the official rate, putting an end to the old Rls 32.50 per U.S. Dollar parity. On October 4, 1969, the buying and selling rates for the unit were set at Rls 76.25/76.50 per U.S. Dollar. Following the floating of the U.S. Dollar on August 15,1971, the Rial did not alter its exchange value vis-à-vis the American currency, thus effecting a de facto devaluation. On October 21st, the gold content of the Rial was reduced 7.89%, paralleling the U.S. Dollar devaluation and thereby retaining the Official Rate of Rls 75.75 per Greenback.

On January 14,1974, a two tier market was established with an Official Commercial Rate fixed at Rls 67.50/67.75 per Greenback applicable to import payments, travel allocations, export proceeds and current receipts by public sector agencies, and an Official Non-commercial Rate for all other transactions. Proceeds from most exports other than oil and natural gas could be negotiated at either exchange rate. On February 12, 1975, an Effective Rate was established, as the Rial's ties to the U.S. Dollar were served, and the unit linked to the SDR at an exchange value of Rls 82.2425 per SDR, thereby placing the unit on a controlled, floating basis with buying and selling rates adjusted whenever the SDR/U.S. Dollar rate changed by more than 2.5% and was maintained for more than five consecutive days. This procedure was abandoned on December 14, 1977.

On April 1,1978, the fluctuation range for the Rial was widened to 7.25% above and below the fixed rate. On July 22nd, the fluctuation range was abandoned in favor of a target zone above and below the fixed rate. On November 14th, the Official Free Non-commercial Rate was placed on a fluctuating basis. On January 10, 1979, the Effective Rate became theoretically inoperative, and the exchange rate system was revamped. An Official Rate of Rls 70.35/70.60 per U.S. Dollar buying and selling was made applicable to payments for imports and proceeds of exports by the pubic sector, while on May

---

1–The words "Parallel" and "Black" are usually used for legal and illegal markets respectively, In case of Iran, the market for dollar is "Quasi-Legal" and we used "Parallel" throughout the paper.

2- The statistics and most of the materials in this section were taken from various issues of world currency Yearbook.

8th, a Preferential Rate of Rls 78.00 per Greenback was applied to proceeds from exports to the private sector. An Unofficial Rate of Rls 105.00 per U.S. Dollar governed all other transactions. On July 8th, a Resident Travel Rate was created for conversion of travel allowances, half at the Official Rate and half at the Unofficial Rate. On May 22, 1980, the Rial's official link to the SDR was reinstated at Rls 92.30 per SDR, a devaluation of 11%, thus re- establishing the controlled, floating Effective Rate for practically all transactions. A Preferential Rate was granted for proceeds from non-oil exports, while other Posted Rates applied to certain invisible transactions. The latter was abolished in 1983 and the Preferential Rate on December 19, 1984.

On October 8, 1989, a so-called Competitive Rate was established at Rls 1,000 per U.S. Dollar and made applicable to public sector and State agency import payments. On October 25th, the rate was revalued to Rls 975.00 per Greenback and expended to include some private sector payments. On December 7th , the Competitive Rate was realigned to Rls 800.00 per U.S. Dollar. Also, a Preferential Rate was established at Rls 420.00 per Greenback for private sector imports of certain items and a Service Rate was created at Rls 845.00 per U.S. Dollar for the sale of foreign exchange to qualified individuals for certain service transactions.

Black markets in Rials, after declining and practically disappearing in 1959, reappeared on an enlarged scale in the Summer of 1960. when a political and economic crisis erupted. Unlicensed transactions of "Hand payments Tehran" were estimated at over Rls 3 Million a month during periods of stress in the following years. The skill of the Central Bank kept parallel market trading volume within limits, but not without difficulty and loss of foreign exchange. By early 1967, parallel market transactions had all but ceased and dealings in the officially tolerated free market centered among the money-changers in the bazaars. In early 1970, the Rial was again at Rls 80.00 per U.S. Dollar. The devaluations of the U.S. Dollar in the last semester of 1971 made no impact on the unofficial dealings of the Rial. Fluctuations remained narrow, and the unit listed at or near the Rls 77.00 level through 1972, weakening to Rls 79.00 in January 1973.

The creation of a two tier exchange market finally legalized for all practical purposes the long-tolerated unofficial free market whose annual turnover in recent years had grown to Rls 23 billion. This move brought back a good deal of flight capital. By March 1975, the Rial stood at Rls 65.65 per U.S. Dollar, its best listing since January 1952. Though the removal of most exchange controls

made outbound capital transfers through the banking system easier, a good deal of capital still preferred the anonymity of unofficial Rial dealings. With the "paper prosperity" turning sour in 1975, repatriated money, fattened by the oil boom, again began to leave, seeking safer havens, such as foreign real estate and luxury dwellings, and by early 1978, over US$8 billion left the country. Weakness of the Greenback in early 1978 raised the Rial to Rls 71.05 per U.S. Dollar in February, and the Swiss Franc replaced the Greenback as the preferred vehicle for capital flight.

As the Shah's throne became shakier, the Rial began to fall sharply. By September, Capital flight was running at US$50 million weekly. During one two-week period US$ 700 million fled the country, as foreign exchange controls were tightened. By the beginning of 1979, an estimated total of US$ 10 billion had reportedly sought safety outside of Iran. With the economy in shambles, the Rial tumbled from one new low to another, hitting a record Rls 121.00 per U.S. Dollar in June. Following the replacement of the Shah in January by an Islamic regime, daily volume in the free or black market declined to US$ 4 million.

With the breakout of the war with Iraq in 1980, the Iranian currency was put under further pressure. Some improvement followed, especially in the spring of 1983 when some foreign exchange controls were eased. However, the Rial resumed its downward plunge in 1984, with monthly lows taking it to Rls 622.00 per U.S. Dollar at year end and Rls 650.00 per Greenback at the close of February 1985. After some minor improvement, the Rial took off on a downward spiral, reaching a new record low of Rls 1200.00 per U.S. Dollar at the end of March 1988. Following a sudden resurgence, which took the Rial to Rls 750.00 per Greenback by the start of 1989, Iran's unit then resumed its plunge to lows.

On March 21st , 1993 the Central Bank unified all the official nominal exchange rates and set the new rate closely to the parallel market rate. The pre-announced unification had immediate impact in the market free rate. The new unified official rate was moving closely to the market free rate for about six months. Following a negative oil price shock the market free rate started deviating again from the official rate. Accordingly, the Central Bank adjusted the official rate several times to keep the parallel market premium as low as possible. However, the recent information indicates that the difference between the two rates is increasing.

There is no accurate information on the sources of supply of and demand for dollars in the parallel market. Part of the supply is provided by export

smuggling and travelers. Government also injects part of oil revenue into the parallel market. Import smugglers and travelers demand for parallel dollars for the purpose of escaping from inflation tax.

IV – The Data and Methodology

Nominal exchange rate movements are more frequent than any other economic variable. Therefore, more information can be extracted by analyzing monthly data than by annual data. In addition, seasonal factors play an important role in markets for foreign exchange. We have obtained monthly data for parallel market nominal exchange rates from the various issues of world Currency Yearbook. Monthly data for the official nominal exchange rates were obtained from the IMF Statistical Yearbook. Then the parallel market premium was constructed by using these two series.

Immediately after the revolution the spread increased rapidly up to the end of the period. In addition to uncontrollable exogenous factors such as the war and the revolution, real shocks such as oil revenue shocks and monetary and fiscal policies contributed to the post-revolution high premium. Monthly data for the exogenous determinants of the PMP are not available. Accordingly, instead of looking closely at the exogenous determinant of the PMP, we tried to find an equilibrium relationship, if any, between the parallel market premium and some other relevant endogenous variables which can adequately reflect the movements in the real and monetary shocks to the economy. This will help us to extract more information from analyzing monthly data than from annual data. In addition, knowing the exogenous determinants of one endogenous variable give insights to the exogenous determinants of the others.

The Two other variables which we deal with in this paper are the real exchange rate (RER) and price level (P). We have used parallel market free nominal exchange rate instead of the official nominal rate in constructing the RER. Due to the lack of monthly data for GDP deflator, consumer price index was used, although the former is more appropriate than the latter in reflecting the effect of oil revenue shock on the RER. It has also been shown that the bilateral and effective RER's have more or less the same long-run movements. In addition, the PMP was constructed by using the bilateral nominal exchange rate (with US). Therefore, we have used the bilateral RER, defined as the relative price of home goods in terms of US goods, instead of the effective rate in the rest of the paper.

V- Co- integration Analysis

According to the literature review in section II, the parallel market premium can be affected by both real and monetary shocks. In the case of Iran, shocks to oil revenue constitute the main real shocks to the economy. It has already been shown by the author that the long-run movements in the RER, are mainly caused by oil revenue shocks. In addition, the RER reflects the movements in the underlying fundamentals such as capital outflow and domestic real income. Therefore, it seems that real shocks can adequately be represented by long-run movements in the RER.

Monetary shocks can also be represented by movements in nominal price level even though the price can be affected by real variables such as oil revenue shocks. The eight year war absorbed a great proportion of oil revenue income and as a result of expansionary monetary policy oil was excessively used by government to finance its rising deficit. Excessive inflation tax was imposed on private agents which led to continuous adjustments in private portfolio balance. This, as will be seen later, caused a rapid increase in the parallel market premium. Consumer price index was chosen as the best representative of monetary shocks.

Taking the above facts into consideration, it seems that all three variables- PMP, RER, and CPI – have had huge shifts within the period. There is a possibility that these shifts are correlated with each other, implying that there is a long-term relationship between them. Any exogenous shock to the ERE or CPI will have immediate impact on the PMP in such a way that the long term relationship will be maintained . By using the co-integration technique, we will investigate an equilibrium relationship among these three endogenous variables. Knowing the exogenous determinants of the RER, if there is a co-integrating relationship among the three variables then we can implicitly determine the exogenous determinants of the parallel market premium. In the following section, Johansen (1988) maximum likelihood procedure will be used for testing and estimating this long run or co-integrating relationship.

Testing for unit root in time series precedes the co-integration test. Augmented Dickey- Fuller (ADF) tests were used for this purpose. We assume that the level and the first differences of all three series can adequately be

represented by the following process:

$$Y_t = \alpha + \beta t + \rho Y_{t-i} \sum_{i=1}^{m} \gamma_i (Y_{t-i} - Y_{t-i-1}) + \varepsilon_t$$

Where ε_t is a random variable with $(0,\sigma^2)$. Testing for unit root is just testing for H_0: $\rho=1$ against H_1: $\rho\neq1$.

Table 1: Unit Root Test Results for the Levels and First Differences of the Series

Variable	ADF	No. of lags
Log (PMP)	-0.81	2
Log(RER)	-1.35	0
Log (CPI)	-1.91	1
ΔLog(PMP)	-15.00	1
ΔLog(RER)	-6.41	5
ΔLog(CPI)	-12.69	0

Note: Critical values for %.5% and 10% significance levels are-3.98, -3.42 and -3.13 respectively. They were obtained from fuller (1973:373)

Table 1 shows the ADF test results for the level and the first differences of the series. The null hypothesis of one unit root in the levels cannot be rejected for any series. However, it is strongly rejected for the first differences. Therefore, it seems that all three variables are I(1) series, implying that there is a possibility of co-integration.

Johansen maximum likelihood procedure is the popular test for co-integration. Consider the following k-dimensional co-integrating system:

$$X_t = \sum_{i=1}^{\rho-1} D_i \Delta X_{t-i} + \pi X_{t-\rho} + U_i \;;\; U_t - IN(0,\Omega)$$

where U_t is Gaussian white noise with non-singular covariance matrix Ω. Matrix π and D_i capture the long-run and the short-run dynamics of the model respectively. The co-integration test is just a test for the rank deficiency of π.

Let R_{0t} and R_{1t} be the residuals of the regression of Δx_t and $x_{t-\rho}$ on $q=(1, \Delta x_{t-1}, \ldots, \Delta x_{t-\rho})$. We compute the second-moment matrices of all these residuals and their cross-products , S_{00} , S_{01}, S_{10}, S_{11} where:

$$S_{ij} = T^{-1} \sum_{t=1}^{T} R_{it} R'_{ij} \ , \ i, j = 0, 1$$

The test depends on the values of rth largest eigenvalues $\lambda_1 \geq \lambda_2 \geq \ldots \geq \lambda_r \geq \lambda_n \geq 0$ which are given by the following equation:

$$| \lambda S_{11} - S_{10} S_{00} S_{01} | = 0$$

The null hypothesis that there are r_0 co-integration vectors is tested against the alternative hypotheses of r_0+1 or more than r_0 co-integration vectors. That is:

$H_0 : r = r_0$ against $H_1: r_0 < r \leq k$

or

$H_0 : r = r_0$ against $H_1: r = r_0 + 1$

The trace (η_r) and maximal-eigenvalue (ζ_r) statistics are the relevant likelihood ratio statistics in two cases respectively. They are calculated as follows:

$$\eta_r \sum_{i=r+1}^{n \log} (1 - \lambda_i), \quad r = 0, 1, 2, \ldots, n-2, n-1$$

$$\zeta_r = -T \log (1 - \lambda_{r+1}), \quad r = 0, 1, 2, \ldots, n-2, n-1$$

The distribution of the η_r and ζ_r are derived under the hypothesis that there are r co-integrating vectors and tests H_r within H_n and H_{r+1} respectively. The number of co-integrating vectors selected is r+1 where the last significant statistic is η_r and ζ_r .

In our 3-dimensional case, an error correcting co-integrating system consisting of the three variables and non-zero intercepts in the following form

was estimated for testing and estimating the co-integration rank and the co-integrating vector. The model[1] Is as follows:

$$\Delta x_{1,t} = \mu_1 + d_{11}\Delta x_{1,t-1} + d_{12}\Delta x_{2,t-1} + d_{13}\Delta x_{3,t-1} + \pi_{11}x_{1,t-2} + \pi_{12}x_{2,t-2} + \pi_{13}\Delta x_{3,t-2} + e_{1t}$$
$$\Delta x_{2,t} = \mu_2 + d_{21}\Delta x_{1,t-1} + d_{22}\Delta x_{2,t-1} + d_{23}\Delta x_{3,t-1} + \pi_{21}x_{1,t-2} + \pi_{22}x_{2,t-2} + \pi_{23}\Delta x_{3,t-2} + e_{2t}$$
$$\Delta x_{3,t} = \mu_3 + d_{31}\Delta x_{1,t-1} + d_{32}\Delta x_{2,t-1} + d_{33}\Delta x_{3,t-1} + \pi_{31}x_{1,t-2} + \pi_{32}x_{2,t-2} + \pi_{33}\Delta x_{3,t-2} + e_{3t}$$

Where $x_{1,t}$ = log (PMP), $x_{2,t}$ = log (PER), $x_{3,t}$ = log (CPI). The three corresponding eigenvalues were calculated. They are:

$$\lambda_1 \approx 0.10 \ , \ \lambda_2 \approx 0.01 \ , \lambda_3 \approx 0.002$$

The co-integration rest test are summarized in Table 1. Both the trace and maximal-eigenvalue statistics reject the null hypothesis of zero co-integration vector in favour of the alternative of one or more co-integration vectors. At the same time, the null hypothesis of one co-integration vector can not be rejected against the alternative hypotheses of two or more co-integration vectors. Therefore, there is strong support for the existence of one co-integration vector, implying that there is a stationary relationship among the three non-stationary variables.

Table 2: Co-integration Test: Maximum Likelihood Procedure

H_0:	H_1:	Likelihood Ratio Statistics		Critical Values		
		η_r(trace)	ζ_r(λ-max)	1%	5%	10%
r = 0	0 < r ≤ 3	35.47		32.65	29.68	26.79
r = 1	1 < r ≤ 3	3.41		20.04	15.41	13.33
r = 2	r = 3	0.53		6.65	3.76	2.69
r = 0	r = 1		32.01	25.52	20.97	18.60
r = 1	r = 2		2.88	18.63	14.07	12.07

Note: Critical values for %.5% and 10% significance levels are-3.98, -3.42 and -3.13 respectively. They were obtained from Fuller (1973:373)

1- The order of the system (ρ=2) was selected according to Hannan-Quinn (HQ) and Schwarz (S) criteria which are said to perform better than Akaike's Information (AIC) for unstable processes.

Given that the co-integration rank is one, the matrix can now be decomposed in the following way:

$$\pi_{3x3} = \gamma_{1x3}\,\alpha_{1x3}$$

where α is the co-integration vector and γ is the so-called loading vector. α and γ can now be estimated consistently. They are:

α : (4.76, 2.44, -3.99)
γ : (-0.01 , 0.01 , -0.003)

The two vectors can now be given a valid economic interpretation. Based on the estimate, consider the following combination of the parallel market spread, the real exchange rate and consumer price index:

$$\omega_t = 4.76\log(PMS) = 2.44\log(RER) - 3.99\log(CPI)$$

ω_t is combination of the three I(1) series. If α is a co-integrating vector then for any real number such as μ , $\mu\alpha$ is also the co-integrating vector. Hence, we can normalize the co-integrating vector in terms of its first element and obtain the following long-run relationship:

between log(PMP), log(RER) and log (CPI):

$$\log(PMS)_t = -0.51\log(RER)_t + 0.84\log(CPI)_t$$

Equation 5 shows that there is a strong negative correlation between the PMP and the RER. The required real depreciation at the beginning of revolution as a result of capital flight and reduction in oil revenue put huge pressure on domestic currency at the parallel market and as result, the parallel market premium increased. The co-integrating relationship on one hand, and a negative correlation between the RER and capital outflow in the other hand, and a negative correlation between the RER and capital outflow implies a positive correlation between the capital outflow and the PMP.

The positive correlation between the RER and oil revenue shocks also implies a negative relationship between the PMP and oil revenue shocks. Since part of supply of dollars at parallel market is provided by government, a positive oil revenue shock enables government to put more dollars at the parallel market. This will lower the premium to restore the portfolio balance equilibrium.

Monetary shocks will affect the PMP. An expansionary monetary policy will increase price level. People try to escape inflation tax by buying dollars on the parallel market. This will cause the PMP to rise to restore portfolio balance equilibrium. Figure 4 shows the trend of money supply in Iran. The upward trend of money supply and price level is very consistent with the post-revolution ever-increasing parallel market premium. Excessive inflation tax created by the expansionary monetary policy continuously deceased the return to holding domestic currency. As a result the required adjustment in private portfolio balance led to an increasing parallel market premium. This positive correlation between the price level and the premium is significantly shown in equation 4. Movements in price level can also reflect severe trade restrictions in forms of quantitative controls and import rationing. Shortage of foreign exchange forced government to limit private access to the official exchange rate and as a result the private sector resorted to the parallel market to finance its import. The market price and parallel market premium consequently rose.

Vector is interpreted as the vector of adjustment coefficients. It shows how the system adjusts to the equilibrium if it ever departs from it that. To explain the precise economic meaning, consider the coefficients of the vector (-0.01, 0.01, -0.003). Each coefficient shows how error term or the disequilibrium of the system feeds back to the corresponding variable. The first coefficient is negative and shows that if at any time the parallel market spread increases and moves away from its equilibrium relationship with the RER and price level, then the system corrects itself through decreasing the PMP. This correction can also be done through increasing or decreasing the real exchange rate or price level respectively.

The implication of the above error-correction representation is that any movements in the RER and/ or the price level will immediately change the premium so that the equilibrium relationship among the three variables is maintained. To keep the premium at a sustainable level, government should avoid excessive expansionary monetary policy. However, this is not enough.

Any unexpected oil revenue shock will also immediately affect the premium. This is evident from the fact that several positive and negative oil revenue shocks after the revolution led to a chaotic parallel market for foreign currency. Our empirical finding is also consistent with the findings in a sense that both real and nominal shocks will affect the parallel market premium.

VI- Conclusion

The main conclusion of the paper is that both real and monetary shocks contributed to the rapidly rising parallel market premium in the post-revolution period in Iran. The revolution-induced exogenous capital outflow caused a huge real and nominal depreciation in the parallel market and consequently led to an unprecedented parallel market premium. The Iranian economy is highly dependent on oil revenue. A big negative shock to oil revenue in 1980 and several other shocks thereafter not only affect the whole economy, but also the parallel market for foreign currency. In addition to an expectation effect, negative shocks to oil revenue reduced government ability to inject official dollars to the parallel market and as a result increased the premium.

In addition to the real shocks, excessive money supply to finance the fiscal deficit increased inflation tax on holding domestic currency. The post-revolution evidence shows that private individuals have always been involved in escaping inflation tax by buying other assets including dollars in the parallel market. A continuous portfolio adjustment was carried out and the parallel market premium increased continuously. The resistance of the post-revolution government on holding an overvalued official normal exchange rate and its rising inability to satisfy all sources of demand for foreign currency at the official rate accentuated the situation in the parallel market through excessive parallel market premiums.

The policy implication of our empirical analysis is that parallel market premium can not be controlled unless government follows manageable fiscal and monetary policies. Money supply and the fiscal deficit should be taken under control. An official devaluation was also needed to, at least, decrease rent-seeking activities and the pressure on demand for an official dollar rate. In addition to these macroeconomic policies, the economy must rely as much as possible on non-oil sources of foreign exchange to reduce the effect of oil shocks on itself in general and on the market for foreign exchange in particular.

Referenes

1- Agenor, Pieere Richard, "Parallel Currency Markets in Developing Countries: Theory, Evidence, and Policy Implications," Princeton Essays in International Finance No. 188, 1992.

2- ----------, "Stabilization Policies in Developing Countries with a Parallel Market for Foreign Exchange," IMF Staff Papers 37, No. 3, September: 560-592.

3- Bhagwati, Jadish N., and Bent Hansen, " A Theoretical Analysis of Smuggling, " The Quarterly Journal of Ecnomics, 87, 1973, 172-87.

4- Bahmani- Oskooee, M. : "Black Market Exchange Rates Versus Official Exchange Rates in Testing Purchasing Power Parity: An Examination of the Iranian Rial", Applied Economics, 1993, 465-72.

5- Banerjee, A., Dolado, J., Galbraith, J. W., and Henry, D. F., Co-integration, Error-Correction, and the Econometric Analysis of Non-stationary Data, Oxford University Press, 1993.

6- Branson, William H., and Jorge Braga de Macedo, "Smuggler's Blues at the Central Bank: Lessons from Sudan," in Guillermo Calvo, Ronald Finally, Pentti Kouri, and Jore Braga de Macdo, eds., Debt, Stabilization and Development: Essays in Memory of Carlos Diaz – Alejandro, Oxford, Blackwell, 1989, 191-204.

7- Culbertson, W., " Purchasing Power Parity and Black Market Exchange Rates, " Economic Inquiry, 13, 1975, 287-96.

8- De Macedo, Jorge Braga, " Currency Inconvertibility, Trade Taxes and Smuggling, " Journal of Development Economics, 27, 1987, 109-25.

9- Dickey, D. A., and Fuller, W. A., " Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root", Econometrica, 1981, 1057-72.

10- Dornbusch, R., Dantas, D. V., Pechman, C., Rocha, R. De R., and Simoes, D. " The Blank Market for Dollars in Brazil" , The Quarterly Journal of Economics, 98, 1983, 24-40.

11- Dornbusch, R., " Special Exchange Rates for Capital Account Transaction," The World Bank Ecnomic Review, 1, 1986, 3-33.

12- Edwards, S., " Real and Monetary Determinants of Real Exchange Rates: Theory and Evidence from Developing Countries", Journal of Development Economics, 29, 1988, 311-41.

13- ----------, Real Exchange Rates, Devaluation and Adjustment, the MIT Press, 1989.
14- Edwards, S., and Peter J. Montiel, "Devaluation Crises and the Macroeconomic Consequences of Postponed Adjustment in Developing Countries, "International Monetary Fund Staff Paper, 36, 1989, 875-904.
15- Fuller, W.A., Introduction to Statistical Time Series, John Wiley, New York, 1976.
16- Frenkel, M., "Exchange Rate Dynamics in Black Markets, "Journal of Economics, 51, 1990, 159-76.
17- 16- Helleiner G.K., "Trade Policy and Industrialization in Turbulent Time", Mimeo, University of Toronto, 1992.
18- Kamin, Steven B., "Devaluation, Exchange Controls, and Black Markets for foreign Exchange in Developing Countries," Journal of Development Economics, 1991.
19- Kharas, Homi, and Brian Pinto, "Exchange Rate Rules, Black Market Premia, and Fiscal Deficits: The Bolivian Hyperinflation," The review of Economic Studies, 56, 1989, 435-47.
20- Kiguel Miguel A. and O'Connell Stephen A. "Parallel Exchange Rates in Developing Countries", Policy Research Working Paper, 1265, The World Bank, March 1994.
21- Lizondo, J. Saul, "Unification of dual Exchange Markets," Journal of International Economics, 22, 1987, 57-77.
22- -------- "Alternative Dual Exchange Market Regimes: Some Steady State Comparisons," International Monetary Fund Staff Papers, 38, 1991, 560-581.
23- Nowak, Michael, "Quantitative Controls and Unofficial Markets in Foreign Exchange: A formal Framework," International Monetary Fund Staff Papers, 31, 1984, 406-31.
24- Peasran, M. H., "The Iranian Foreign Exchange Policy and the Black Market for Dollars", International Journal of Middle East Studies, Vol. 24, February 1992, 101-25.
25- Pinto, Brian, "Fiscal Deficits, Inflation, and Parallel Exchange Markets in Ghana: Monetarism in Tropics?," Country Policy department Discussion Paper No.56, Washington, D.C., World Bank, September 1986.
26- -------- "Black Market Premia, Exchange Rate Unification and Inflation in Sub-Saharan Africa, "The World Bank Economic Review, 3 1989, 321-38.

27- -------- "Black Markets for Foreign Exchange, Real Exchange Rates, and Inflation", Journal of International Economics, February 1991, 121-25.
28- Pitt, Mark, "Smuggling and the Black Market for Foreign Exchange," Journal of International Economics, 16, 1984, 243-57.
29- Phylakits, Kate, "The Black Market for Dollars in Chile, "Journal of Development Economics, 37, 1991, 155-72.
30- Sheikh, Munir A., "Black Market for Foreign Exchange, Capital Flows and Smuggling, "Journal of Development Economics, 3, 1976, 9-26.