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Research Article

COMPARING THE CURRENCY ECONOMY OF IRAN AND ARGENTINA

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ABSTRACT
This paper compares the dollarization of Iran and Argentina's economy through estimating the dollars in circulation and the degree of currency substitution. Currency substitution is important because it reduces a part of central bank supervision over the money in circulation. This comparison showed that the dollarization of Iran and Argentina's economy is lateral, which means that the domestic currency is replaced by the foreign currency but there is no demand for the domestic currency of Iran and Argentina in abroad (Iran Rial and Argentina pesos). In this study the "Kamin & Ericsson" method is used to compare the degree of currency substitution in Iran and Argentina economy.

Keywords: *Currency Substitution, Dollarization, Currency Demand, Inflation, the Economy of Iran and Argentina*

INTRODUCTION
In currency substitution phenomenon people prefer the foreign currency over their own currency in their portfolio. There are multiple reasons for this the most important of which include the continued decline in the value of the national currency, the continuation of the internal inflation, economic instability, negative real interest rates, withdrawal of capital due to legal or illegal immigrations and the development of smuggling activities. This phenomenon is observed in the developed countries as bilateral and in the developing countries as one sided. Currency substitution decreases the effectiveness of the policies through affecting the monetary policies. The lateral currency substitution refers to the situation that the citizens of the country A want to keep the currency of the country B but others are not willing to keep the currency of the country A. The substitution of the foreign currency instead of the national currency is symmetric when the outsiders are willing to keep the national currency as well.
The purpose of this paper is to compare the substitution of the domestic currency with the foreign currency in Iran and Argentina. The reason of comparing these two countries is the similarities between the devaluation of national currency and the degree of currency substitution. The main question is that what is the ration of the dollars in circulation among the citizens of Iran and Argentina to the total volume of money in circulation (foreign currency to the additional domestic currency)? The currency substitution theory assumes that the domestic currency demand is not only depends on the domestic interest, income and inflation rates variables but also it depends on variables such as foreign interest, income and inflation rates. This article is classified as follows: In the first part the review of the related literature is presented, in the second part the difference between the formal and informal dollarization phenomenon is addressed and the third part discusses about the methods of calculating and the process of dollars in circulation in Iran and Argentina. Then the degree of currency substitution In Iran and Argentina is discussed and the fourth part discusses about the irreversibility of dollarization of Iran and Argentina. The fifth part the irreversibility and currency demand in Iran and Argentina is provided. The sixth part analyzes the currency substitution phenomenon in Iran and Argentina and the seventh part concludes. The subject of currency substitution has entered the economic literature since three decades ago. Of course the dollarization phenomenon has a longer history. For example In Mexico long before the establishment of the Mexican national bank in 1925, the citizens could have foreign currency deposits (Ortiz, 1988). Keynes (1936) believes that if the domestic currency in circulation loses its monetary value, various substitutes such as short-term loans, foreign currency, the jewelry, precious metals and credits are replaced (Keynes, 1936).

Regarding the fact that the currency substitution literature has a history in this part the history of theory and empirical foundations of the currency substitution and weakness and turning points are analyzed. In the literature currency substitution and dollarization are synonymous. Some researchers distinguish the two terms and use dollarization for using the foreign currency with the intention of saving value and use the currency substitution term for using the foreign currency with the intention of making transactions. Since it is hard to measure the volume of the dollars in circulation, there is no single method to do it and it is always estimated, thus separating the dollars with saving value and making transactions intentions with the existing information is impossible. Therefore, in this paper the terms dollarization and currency substitution are used for the same sense.

In this paper currency substitution is analyzed by the portfolio approach. In this approach currency substitution is analyzed by the traditional currency demand function, with this difference that in the domestic currency demand function, there are variables such as foreign interest rates, foreign inflation rates or consumer price index as the cost opportunity of holding the domestic currency compared to the foreign currency.

Daniel and Fried (1983) to determine the phenomenon of the substitution of the domestic currency with foreign currency show the demand for domestic currency as a function of the volume of transactions (Y) and the opportunity cost of holding money (i) as follows:

$$M/P=L(Y,i) \quad (1)$$

They believe that if the impact of the postal strikes is not considered in currency demand estimation, during the strike period the estimation of currency demand is lower than the real value because during the strike the firms that have not received the payments of the bonds through the post services, will turn to loans to pay their expenses and the high demand for loans causes the higher monetary supply on the part of currency authorities. Also after the strike period due to the enlargement of the dependent variable of delay an overestimated value is obtained. They finally presented the dummy variables of the impact of seasonal factors (D_1) and postal strikes (D_2) as follows:

$$m_t=f(m_{t-1},Y,i,D_1,D_2) \quad (2)$$

And using the seasonal data of 1970-1982 (the period of floating exchange rates) estimated the currency demand of Canada. Generally the sum of obtained coefficients has approved the existence of substitution of the domestic currency with foreign currency (through the negative coefficient of the foreign interest rate) and the influence of postal strikes on Canadian currency demand (Daniel, 1983).

Thomas (1985) assumes that it is equal in lending; he concludes that the currencies are substituted only when the cross-elasticity of the domestic currency (foreign) to foreign (domestic) interest rates is negative. This paper concludes that when both traders keep a currency, there is no need for the currency substitution (Thomas, 1985)

Germany, the UK, Italy and France estimated. Based on the results the substitution of the domestic currency with foreign currency cannot be ignored in any of these countries. The final result is that in the floating exchange rates system, the European countries have to join the currency union in order to gain currency independence (Melvin, 1985). The dollarization of economy may be a non-stationary time series but the difference between the domestic and foreign rate of inflation seems like a stationary process. In other words the economic dollar shocks have a stationary effect, however the difference between the domestic and foreign inflation rates have an immediate effect (Guidotti *et al.*, 1992).

Using the monthly data of 1978-1990 for the time series fount the following results:

A: Coefficients obtained have a waiting sign and affect the currency substitution process significantly.

B: The alignment of the changes of national income substitution variable with currency substitution indicates the dollarization of the Peruvian economy during the years studied.

C: The currency substitution adjustment process has been relatively slow in Peru (Suarez, 1990).

Domestic Studies

Iran's dollarization refers to early 80s and 90s when the dollar transactions was started proposed by the agencies and institutions and gradually penetrated most economic activities including flight ticket selling. Empirical research in this area is very limited and some of them are discussed here.

Noferesti (1995) studied currency demand during 1959-1992 and found out that in Iran's economy the equality of the exchange and inflation rate leads to the reduction of domestic currency demand. Of course the type of the effectiveness of the changes of equality in exchange and inflation rate has been controversial among the economists in terms of theory and evidence.

Currency substitution is symmetrical and bilateral in developed countries but it is lateral in developing countries which are reduced through affecting the monetary policies.

During some years the currency substitution degree has been ascending.

Currency substitution is considered as a function of internal and external variables of interest rates, inflation, foreign exchange rates and the value of imports and gross domestic production and is tested based on the coefficients of the independent variables of currency substitution in Iran. They showed that currency substitution is an important factor in the function of foreign and domestic currency demand by citizens. Since the demand for foreign currency is directly related to GDP, according to Codington the Iran's economy has entered the currency substitution phase and has passed the dollarization phase because the exchange incentives have overcome the portfolio incentives. In this study, the foreign currency demand function is estimated for the first time.

Generally all domestic studies confirm the currency substitution in Iran and all of them consider it as an ascending process. The main reason of this is reported as the high rate of inflation and national currency devaluation.

Generally currency has three responsibilities including exchange, evaluation and reserving value. If the national currency of a country does not satisfy its responsibility due to inflation, devaluation of the national currency and economic instability and a foreign currency assumes this responsibility it is said that the economy is dollarized. But if the domestic currency does not perform any of its responsibilities which means that both foreign and domestic currency are used to evaluate goods, it is called currency substitution and the national currency is replaced one or more than one foreign currencies. Currency substitution has various effects on the economy. Empirical studies show that this phenomenon weakens the national currency whether adopted formally under the government supervision or not. Currency substitution leads to public pessimism toward the future of the economy. It leads to the loss of control of the central bank on a part of currency (which is kept as foreign exchange) and decreased the power of seignior age and inflation taxation. Therefore, the monetary policies impact on the real variables of economy is weakened.

Dollarization is either formal or informal. The formal dollarization means that the government accepts the foreign currency as the stored value. For example, the government accepts that the USD stores value alongside the national currency. In this way the banks accept foreign currency deposits alongside the national deposits. Informal dollarization happens when the government does not accept the foreign currency as the stored value but people due to high inflation and continuing decline in value are unwilling to keep the domestic currency and convert a part of their money into the foreign currency; so due to the devaluation they replace the national currency with the foreign currency.

Informal dollarization is not obvious but is evident by the related causes and effects which are not covert. In order to estimate the volume of dollars in circulation one of the variables of "The volume of foreign currency deposits of the residents in the domestic banks "," The volume of foreign currency deposits of the residents in the foreign banks "and" the estimation of the volume of dollars in circulation" (which is used by people as currency) is used.

For Argentina in which the banks only accept the foreign currency deposits the first variable is used as the proxy for the dollars in circulation. The international institutions have provided the estimates of the volume of the foreign citizen's foreign currency deposits. Since there is no foreign currency saving deposit as time series so there is no status of the volume of foreign currency deposits of the domestic or foreign citizens, so there is no way except using the third variable, i.e. the volume of dollars in circulation. Kamin and Ericsson (1993) and (2003) provided an estimation of the volume of dollars in circulation in Argentina. In this article in order to measure the volume of the dollars in circulation the Kamin and Ericsson (2003) method is used. They assume that the currency demand is a function of the

interest rate, consumer price index and the maximum internal and external inflation rate up to the date under investigation (p^{max}). Their model is as follows:

The Log of the real total volume of the domestic and foreign currency based on Rial:

$ln(M_{df}/P)=\alpha x$ (1)

The Log of the real total volume of the foreign currency based on Rial:

$ln(M_{df}/P)-ln(M_d/P)=\beta y$ (2)

The Log of the real total volume of the domestic currency based on Rial:

$ln(M_d/P)= \alpha x- \beta y$ (3)

The volume of the total volume of the domestic and foreign currency based on Billion Rial:

$M_d=M_{df}+_fM\times PEX$ (1)

If we put the value of M_{df} from relation 4 in relation 2:

If the 4 in terms of the relationship whether it was in the top ten of the 2:

$\ln((M_d+M_f\times PEX)/P)-\ln(M_d/P)= \beta y$ (5)

$\ln(M_d+M_f\times PEX)-\ln P-\ln M_d+\ln P =\beta y$

$\ln((M_d+M_f\times PEX)/M_d)=\beta y$

$\ln (1 +(M PEX)/M_d)= \beta y_f\times$

$1+ (M_f\times PEX)/M_d=\exp(\beta y)$

$(M_f\times PEX)/M_d=\exp(\beta y)-1$

$M_f = M_d(\exp(\beta y)-1)/ PEX$ (6)

In order to estimate β we use the below domestic currency demand function in the regression equation. In the regression equation α_4 is the same as β and P^{max} is y which indicate the highest inflation rate up to the specified date.

$\ln m_d=\alpha_0+\alpha_1 i_d+ \alpha_2 rcpii + \alpha_3 lnpex+ \alpha_4 p^{max} +\alpha_5 lngdp$ (7)

In order to show the dummy oil shock effect in 1974 and the effect of the Islamic Revolution in 1978 we estimated the Log of the variable of real currency volume with one interval and the Log of real GDP as the scale variable in 6 scenarios using the E view application the results of which is presented in Table 4. Kamin and Ericsson considering Argentina as a hyperinflation economy have removed the GDP scale variable from their model. The purpose of estimating the above demand function is to estimate the coefficient P^{max} that this variable coefficient does not have a significant difference in all the 6 scenarios with other models and this indicates the explanatory power of this variable ib the currency demand function. In order to estimate the volume of the dollars in circulation we should choose one of the 6 scenarios. The following scenario in terms of significance of the P^{max} coefficient is more acceptable; thus, we choose the P^{max} coefficient which is presented as follows:

lnm_d=-3/087+1/133lngdp-0/0615lnpex+0/0063rcpii -0/048i_d– (8)
(-5/48) (17/28) (-2/028) (1/821) (-4/5)
$0/0147p^{max}$+1/016D_1
(-1/99) (13/363)

$\overline{R}^2$=0/99 n=46 D.W=1/39 F=531 (1338-1384)

Granger (1986) and Engel (1987) showed that if two time series each one being a sum of a rank but their linear combination is lower than the sum of the rank, there is a long-term equilibrium relationship between the two series.

So in the present study in order to test the stationarity of the variables the augmented Dicky Fuller test is used. The results show that all the variables are non-stationary and have a unique root. Since the residual of the models is a sum of the first order, thus all variable are coinegrated and there is a long term equilibrium relationship among them. For the unit root test first the cointegration of the 3rd order variable are tested against 2nd order and then the 2nd order are tested against 1st order and the 1storde is tested against the 0 order. As you can see the variables explain 99% of the changes in currency demand. All the coefficients are significant at 95% level and the domestic inflation rate variable is significant at 90% significance level and the F statistic has a high value. The signs of all variables is theoretically approved

(Mazar, 1990). Based on the fact that the model is estimated using time series variables and the residual I (0) there is no worries.

Durbin and Watson statistic in all models indicates the lack of sever correlation between the explanatory variables. Since the Log variable of the real currency volume with one interval has entered the model 4 as an independent variable, the model is auto regressive and the Durbin and Watson statistic is not relevant and the h statistic of Durbin and Watson was used. The h statistic of Durbin and Watson indicated that there is no problem of correlation between the explanatory variables. The purpose of measuring the regression 8 was to obtain the coefficient of national currency devaluation in the domestic currency demand function. Now by using the coefficient of national currency devaluation in the above equation (pmax 0.0147) we place the value in the equation of the volume of the dollars in circulation and measure the volume of the dollars in circulation:

$$M^{r}_{t}=M^{d}_{t}(\exp(0/0147p^{max})-1)/PEX_{t} \quad (6)$$

The time series of the volume of dollars in circulation is presented at the end of the paper with other variables in the data table. In 1960 the total volume of dollars in circulation was 61 million dollars. In 1973 the total volume of dollars in circulation was 470 million dollars. In 1974 at the time of the oil shock and the oil revenues have become four folded the total volume of dollars in circulation has reached 1.053 billion dollars. Regarding that the measured values represent the cointegrated dollars in circulation as the average amount of dollars in circulation before the Revolution (1959-1976) was 535 million dollars.

After the revolution the volume of dollars in circulation has continued the ascending trend and in 1981 (one year after the war) it reached 6.138 billion dollars. Since 1982 due to foreign restrictions and exchange limitations the volume of dollars in circulation has had a descending trend and in 1987 it reached the minimum rate of 2.562 billion dollars since the Islamic Revolution. And then it has its ascending trend again and reached 8.322 billion dollars in 1996. In 1996-1997 it had a descending trend and since 2000 it has a rising trend and in 2001 it reached its maximum rate which was 11.129 billion dollars during the period under investigation.

The average volume of dollars in circulation after the Islamic Revolution (1978-2001) was 5.177 billion dollars which is significantly higher than before the Islamic Revolution (1959-1976) which was 535 million dollars.

In the above relations :α the coefficients vector; β Parameter; CPII consumer price index for goods and services in USA urban areas (1995=100); CS the degree of the dollarization of Iran's economy(%);D1 the dummy variable of the revolution shock; D2 is the dummy variable of the oil shock; D3 the Dummy variable of structural failure; gdp is the Gross domestic production of 1982 (billion Rial); id the domestic interest rate (long-term deposit interest) if foreign interest rate (USA long-term deposit interest); M1 the volume of currency in circulation; M2 the liquidity volume; M61 the volume of currency in circulation at the fixed price of1982 (billion Rial); M261 the real volume of liquidity at the fixed price of1982(billion Rial); Md the volume of domestic currency in circulation (billion Rial); fM the volume of foreign currency in circulation (billion Rial); Mdf the total volume of domestic and foreign currency in circulation (billion Rial); Mfr the volume of foreign currency in circulation (billion Rial); Mfr61 the real volume of domestic currency in circulation at the fixed price of1982 (billion Rial); N the number of samples; pmax The maximum rate of interest up to the desired date, PEX the rate of USD in the parallel market; RCPI Inflation rate; x the vector of income variables; interest rate, the expected rate of inflation and the intercept; y The expected rate of the domestic currency and the expected rate of high inflation vulnerability and T process.

In the study conducted by Lashkari in order to measure the volume of dollars in circulation the Kamin and Ericsson (2003) method is used. They assume that the demand for domesic and foreign currency is a function of the interest rate, consumer price index, the exchange rate and inflation rate upto the date under study (P^{max}). Their model is described in Lashkari (2003) and (2006). Table 1 represents the annual and cumulative volume of dollars in circulation. During 1988-1993 In Argentina the volume of dollare in Argentina is 4 and 1.5 folded in Iran.

Table 1: **The results of the research on the volume of dollars in circulation in Iran and Argentina**

Year	Average amount of dollars imported to Argentina in 1 year	Cumulative amount of dollars in circulation in Argentina	Average amount of dollars imported to Iran in 1 year	Cumulative amount of dollars in circulation in Iran
1988	¼	8	-0/1	2/9
1989	2/7	9/4	0/2	2/8
1990	6/7	12/1	0.61	3/09
1991	6/8	19/8	0.5	3/7
1992	7/1	26	0.6	4/2
1993	-	33/1	-	4/8

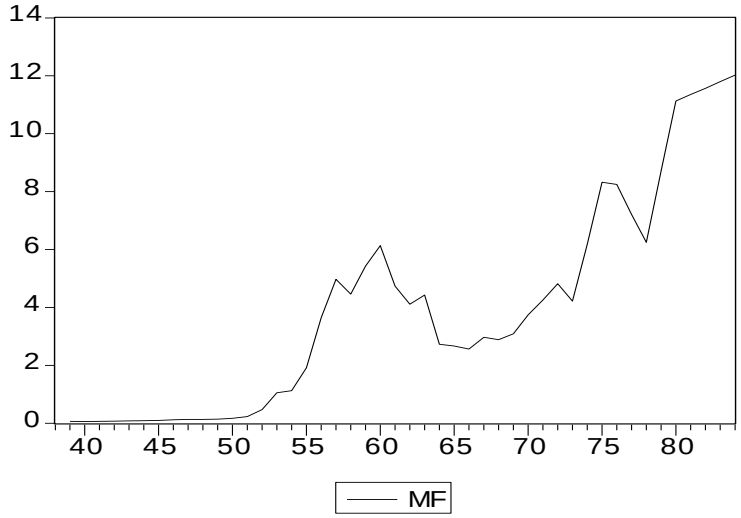

Figure 1: The volume of dollars in circulationin Argentina (1988-1993)

One of the methods to calculate the degree of currency substitution is the following formula:

$$CS = \frac{PEX \times M_f}{M_d + PEX \times M_f} \quad (1)$$

This formula was used by Erian (1988) to calculate the degree of currency substitution in Yemen and Egypt (Erian, 1988). Following him the volume of dollars in circulation (based on Rial) was calculated and then divided by the total domestic money (M_d) plus the volume of dollars in circulation ($PEX \times M_f$) to estimate the degree of the dollarization of Iranian economy by time series fore the period under discussion. In the relation (1) MF is the volume of the dollars in circulation and PEX is the exchange rate of the parallel market.

Based on the results the degree of currency substitution in 1960 was about 10%; which means that only 10% of the currency was allocated to the foreign currency. This ratio was increased into 14, 18, 25% in 1973, 1974 and 1977 respectively before the revolution. The changes in the degree of currency substitution have been relatively slow. This index after the revolution became 25% in 1978- 1986 and 27% in 1987, 28% in 1988-1994 and 38% in 1995-2001. As it can be observed despite the increase in the volume of the dollars in circulation in some years including 1985-1989 the trend of currency substitution was ascending in the whole period. The reason for this is that in the time of dollar demand reduction the demand for Rial is decreased and since the demand for both currencies is a function of the scale variable which is the national revenue and the opportunity cost of holding money, thus althor the currency demand

is reduced in 1985-1989 the degree of the dollarization of economy was ascending which indicated that this demand is less decreased for dollar than Rial because the opportunity cost of holding money for dollar was lower.

Table 2 represents the degree of currency substitution in Iran and Argentina in 1992 and 2000. The figure 3 and 4 represent the degree of currency substitution in Iran and Argentina in various years. In Argentina the degree of currency substitution in 1992 was 50% and in 2000 was 68.5%. This means that people in Argentina only use 31.5 of national currency in their transaction. This ratio is 62% in Iran because the currency substitution in Iran is 38%. Although the currency substitution is ascending in both countries but due to the differences in economical structure Iran's dollarization is lower. The reason is the dollarization of Iran is informal and Argentina's dollarization is formal. In addition in Argentina there is an exact statistics about the dollar deposits but such statistics is absent in Iran. So such results must be analyzed carefully because the calculations represent a part of reality.

Table 2: The research results of the degree of currency substitution in Iran and Argentina

Year	the degree of currency substitution in Argentina	the degree of currency substitution in Iran
1992	50	32
2000	68/5	38

According to the results it seems that the currency substitution in Iran is informal and without the intention of the government and in Argentina it is both formal and informal; thus the degree of currency substitution in Argentina is higher than Iran. Lashkari and Arab Mazar have shown that in 2000 the degree of currency substitution was 68.5% in Argentina and 38.4 in Iran. This trens is still ascending in both countries. (Lashkari and Arab Mazar, 2004: 25-44).

The Irreversibility of Dollarization of Iran and Argentina

Usually inflation has an ascending trend the rate of inflation may decrease but the general level of the prices does not thus the irreversibility of inflation exists in currency demand. When the inflation increases the currency demand decreases but when inflation decreases this demand reduces lower.

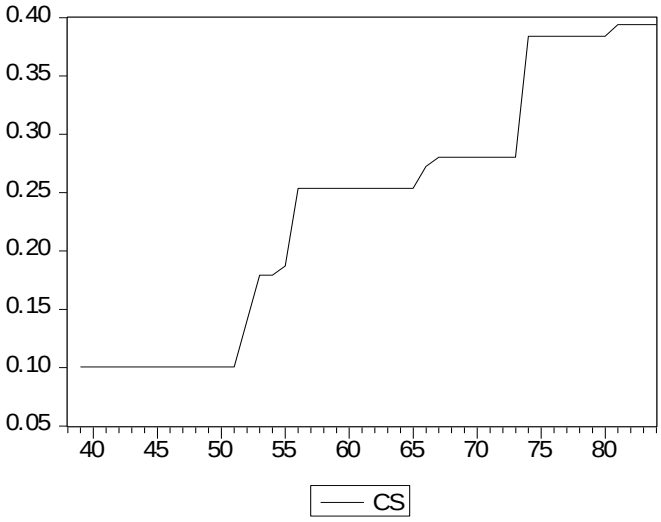

Figure 2: The degree of currency substitution in Iran (1959-2005)

This explains the demand reduction M1 and M3 in Iran and Argentina throughout the period. However, recently the rate of inflation is recently reduced. This explains how the current dollar reserves may lead to

fixation of inflation in 1989 and 1990 in Argentina and 1995 (49%) in Iran. These events that impose severe losses to the holders of national currency assets create intention toward dollar assets. In most cases for all economic purposes such as the domestic function of Peso and Rial assets may lead to lower intention to return to Peso and Rial assets

Increased currency demand for dollar and Rial in Iran and for pesos and dollar in Argentina is irreversible; which means that it increases in gear ratio and rarely decreases. That is why both the peso and Rial as well as dollar savings are suitable for the irreversible econometric. Despite the irreversibility the inflation increase must stimulate the reduction in peso and Rialassts and the permanent increase of dollar savings. He data related to dollar savings in circulation in Argentina and Iran confirms the irreversibility of inflation. The long term demand for dollar assets shows the effect of the irreversibility of dollarization. The irreversibility may be a substitute for the dollar inventory that strengthens the real irreversibility assumption of the research.

The currency substitution is an extended phenomenon in the developing countries especially in the Latin America. The existence of high rate of inflation and the expectation of reducing the exchange rate has made the citizens of these countries to increase the foreign currency in their portfolio in order to maintain the real value of their wealth. All the researchers who have studied the dollarization of the economy and the currency substitution believe that this phenomenon has happened in Iran and Argentina but there are some disagreements about the degree and trend of currency substitution (Khatatbari, 1989; Zalpour, 1994; Yazdanpanah and Khiabani, 1996). Many of the authorities considered the exchange market volume as above 2 billion dollars in 1990 (Khalatbari, 1990). The calculations of the present study of the volume of the dollars in circulation indicate that since 1978 the average volume of dollars in circulation was about 5.177 billion dollars. Dollarization of economy directs various resources toward buying dollar and some people will keep their saving as dollar instead of Rial. Even if 10 percent of market transactions have saving aspect, about 518 million dollars of domestic savings is in the form of dollar that with the equivalent rate of 9000 rials per a dollar, it creates 4662 billion rials of the liquidity beyond the national currency. The analysis of this market leads to the question that how this liquidity is gained and registered? There is no doubt that the existence of this liquidity is beyond the currency authorities and will increase the monetary policies. Increased rate of the degree of currency substitution is a factor in the extensity of the underground economy against formal economy. As the Figures 1 and 2 indicate the process of the volume of dollars in circulation and the degree of currency substitution has been ascending in both countries during the period under study. Due to structural differences including formal dollarization in Argentina and informal dollarization in Iran the rate of dollarization is slower in Iran.

Research hypotheses include:

- The degree of currency substitution is ascending in Iran and Argentina;
- The currency substitution in Iran and Argentina is asymmetric (lateral).

Results indicate that both hypotheses are confirmed; because the degree of currency substitution is ascending in Iran and Argentina and this substitution is lateral and Rial and peso are not substituting the national currency.

RESULTS AND DISCUSSION

The result of this study is that the degree of currency substitution is ascending in Iran and Argentina. It seems that the main reasons of which are high inflation, negative real interest rates of Iran compared to foreign countries interest rate, and the devaluation rate of the national currency of both countries. The scientific accomplishment of the article is that open and extensive economies such as Iran and Argentina must enter the exchange rate of the parallel market and the maximum inflation rate in the national currency demand function besides domestic inflation and earning rate. The recent variable leads to reduction in national currency demand and the resource transfer toward the demand for foreign currency. In these countries the currency substitution is lateral and asymmetric and other countries rarely use the currency of them in their transactions. For example Iran's Rial is used in the Arabian and Iraq transaction but the volume is lower than the dollars in circulation id Iran.

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