Middle-East Journal of Scientific Research 7 (2): 141-146, 2011
ISSN 1990-9233

The Effective Factors Model of Currency Substitution (CS) and Its Determinants in Iran

[1]Mohammad Lashkary and [2]Tooraj Sadeghi

[1]Moallem Avenue, Moallem71, Payam Noor University, Mashhad Center,
P.O. Box 91735-433, Zip code: 9189899544, Mashhad, Iran,
[2]Business Management Department, Islamic Azad University, Neyshabur Branch,
Pajohesh Avenue, Zip code: 9319613668, Neyshabur, Khorasan Razavi, Iran

Abstract: This research paper attempts to identify the determinants of currency substitution degree in Iran by using the currency substitution theory. The hypotheses of this paper include (1) the trend of currency substitution has been ascending In Iran, (2) there is a direct relationship between the degree of currency substitution and domestic inflation rate of the country (CPI), (3) The degree of currency substitution has an indirect relationship with the foreign exchange rate in the parallel market and finally (4) The degree of currency substitution has a direct relationship with GDP in Iran. The results reveal that the first, second and third hypotheses are confirmed and the fourth one is rejected. In according to research, despite the reduction in the volume of dollar in some years, the trend of currency substitution has been increasing.

Key words: Currency Substitution · Dollarization · Demand for Domestic Money · Demand for Foreign Money · Iran

INTRODUCTION

According to currency substitution theory, currency substitution degree is a function of the variables such as: the difference between domestic and foreign interest rates and the difference between domestic and foreign inflation rates.

In this research paper, the authors measure the relationship between currency substitution degree and macroeconomic variables and then the relationship between currency substitution degree and those variables which have been mentioned in theoretical as well as empirical studies.

For determining the factors that influence on currency substitution, the first step is measuring the ratio of foreign money into domestic money. This ratio that is known as currency substitution degree of foreign money into domestic one, is dependent variable.

macroeconomic variables such as: domestic as well as foreign interest rates, domestic as well as foreign inflation rates, the value of international trade are the independent variables.

In this study, the difference between domestic and foreign money is shown as rate of reduction in value of domestic money.

At the first of all, this paper devotes to a brief review of currency substitution literature and then explains a model that shows relationship between currency substitution and macro variables.

The authors estimate models in according to hypotheses and then explain Effective Factors on CS and the last part is finding and conclusion.

Literature Review: Calvo and Rodriguez (1977) analysed a two-sector model of exchange rate for a small economy with flexible prices. They have assumed that the residents keep foreign as well as domestic currency. Also, they have assumed that the function of liquidity preference of people depends on the difference of expected returns of domestic and foreign money.

The model has shown the increase in supplying money will lead to a critical real exchange rate simultaneously. According to them, a desired ratio between domestic and foreign currency which residents

Corresponding Author: Mohammad Lashkary, Lashkarym@yahoo.com, Moallem Avenue, Moallem71, Payam Noor University, Mashhad Center, P.O. Box 91735-433, Mashhad, Iran, Zip Code 9189899544.
Tel:+98-511-8683002-5, Fax: +98-511-8683936, Cell: +989153033352.

keep depends on the difference between their expected rates of return via a liquidity preference function.

In most of models, during the transformation, an increase in monetary expansion rate will decrease the net foreign exchange assets. In this model, currency substitution and flexible exchange rate, monetary expansion leads to increase in foreign exchange assets. [1]

Miles (1978) has suggested a new method to test currency substitution instead of the direct method of measuring currency substitution degree of foreign money into domestic money.

Miles has assumed that the production function is a CES function and homogenous function of one degree and exchange market has been determined by exchange transactions with complete interest. Miles maximize monetary service subject to assets and express that currency substitution degree only depends on the logarithm of foreign interest rate to the domestic one. [2]

Spinell (1980) analysed money demand in Italy (1867 – 1965). He believed that money demand function in Italy was a stable function of two key variables: permanent income and interest rate.

Under the flexible exchange rate system, exchange market will be settled and price level as well as money supply will be controlled by Italian Bank and monetary policies will be changed into powerful instrument.

Miles and Stewart (1980) have examined currency substitution phenomenon. According to them, currency substitution degree is a function of logarithm of foreign interest rate to domestic one. [3]

Arango and Nadiri (1981) have shown that when domestic money becomes weak, or exchange rate increases, most probably, demand of domestic money will be increased. Of course, they have already paid attention that exchange rate increase, maybe, leads to a decrease in domestic money demand; because people prefer to substitute foreign money for domestic money. In other words, Gresham Law becomes inverse and good money sends out bad money from market [4].

Fisher (1982) has considered the economy of those countries which had a high inflation rate and usually have desired to use foreign money. He has analysed costs as well as benefits of using domestic money with a reference to seigniorage. According to him, if a country prefers fixed exchange rate and does not use from its money, its seigniorage will be decreased.

In other words, increase in inflation rate in a country, cause people desire to choose foreign money for their transactions. This process is called dollarization. Fisher has emphasized on seigniorage and optimum inflationary tax in his paper [5].

McKinnon (1982) has expressed that the world's money demand is relatively fixed. He believes that CS in an international level will lead to a decrease in monetary controls. Most of money holders will be affected by the changes of interest rate, which is an indirect form of CS in some countries that the degree of economy openness is increasing, risk of exchange rate fluctuations to dollar will increase. Therefore, CS will be exist [6].

Bordo and Choudri (1982) have criticized the Miles' model (1978) and they believed that his function was wrong. They found different result by using Miles' data [7].

Ortiz (1983) believed that dollarization is degree of real and financial transactions which is done by dollar instead of domestic money. He believes also that the economy dollarization degree is a ratio of foreign currency to domestic currency. According to him, CS degree is a function of the difference between foreign inflation rate and domestic one, exchange rate and delayed variable of CS degree [8].

Ramirez-Rojas (1985) has considered CS as substitution degree of foreign to domestic money. He has introduced three models for CS degree:

- A model that expresses CS degree is only a function of the difference between foreign and domestic inflation rates;
- A model that expresses CS degree is only a function of the difference between foreign and domestic inflation rates and delayed variable of CS degree; and
- A model that expresses CS degree is only a function of exchange rate and delayed variable of CS degree [9].

Vegh (1989) has examined optimum inflationary tax in a small open economy which contains foreign and domestic money as transaction instrument. He has shown that foreign money presence enable the state to combat disorders which have been created by foreign positive real interest rate. [10]

Bahmani-Oskooee and Malixi (1991) have shown that decrease of exchange rate in short run probably leads to a decrease or an increase in money demand, but, in long run, it leads to a decrease in demand of domestic money. [11]

Guidotti and Rodriguez (1992) have examined economy of some Latin American countries which have experienced a high inflation rate and dollarization phenomenon. Their model has investigated CS under the condition of capital mobility. They have introduced 2 models for CS degree:

- A model that expresses CS degree is only a function of the difference between foreign and domestic inflation rates;
- A model that expresses CS degree is only a function of the difference between foreign and domestic inflation rates and the trend variable [12].

Rogers (1992) has examined CS in Mexico and Canada. He believes that CS degree is a function of domestic interest rate, exchange rate and delayed variable of CS degree [13].

Ramirez-Rojas (1996) has investigated CS in 16 less developed countries and defined CS as a demand of foreign money by domestic residents. He has expressed that effective factors on CS are: institutional factors such as real wealth, the difference between expected and real rates of return and foreign and domestic investments. According to him, institutional factors that have created CS in less developed countries are: level of international transactions, non availability of domestic investment and transactional costs of CS [9].

Mongardini and Muller (1999) have examined dollarization and CS. They believed that CS degree is a function of the difference between foreign and domestic interest rates, exchange rate and delayed variable of CS degree [14].

Edwards and Magandoz (2001) have investigated dollarization affect on inflation and economic growth with a macro approach. Their basic question was: weather dollarization leads to a decreased inflation and rapid growth? They have come to these conclusions: a) Inflation in a dollarized country is less than in a non-dollarised country; b) Dollarized countries have a slower growth in comparison with non-dollarised countries [15].

Research Metod: Data which has been used in this paper is related to the period 1959-2007. Sources of data are the Central Bank of Islamic Republic of Iran and Management and Planning Organization. The used exchange rate is the rate of parallel market. GDP and Import are on the basis of base year prices (1982) and by Rials.

The Research Hypotheses Are:

- In Iran's economy, the trend of CS degree has been increasing;
- In Iran, CS degree has a positive relation with domestic inflation rate;
- In Iran, CS degree has a positive relation with exchange rate in parallel market (foreign money by domestic money);
- In Iran, CS degree has a positive relation with GDP.

Models' Estimation: On the basis of existing theories, to test the above hypotheses, following models have been estimated:

Estimation of the First Model: Regarding research hypotheses, we estimate a model via OLS method includes variables of: exchange rate in parallel market, GDP, domestic inflation rate and trend variable as well as dummy variables for petrol shock in 1973(D2) and constitutional failure in 1978 and 1979 (D3).

$$CS=0.84+(1.50E-05)pex -(4.03E-06)gdp+ 0.002\ rcpii + 0.004T+ 0.08D2+0.04D3$$
$$t\quad (7.95)\quad (5.824)\qquad (-1.839)\qquad (2.413)\qquad (4.262)\quad (5.04)\quad (2.495)$$
$$\bar{R}_2 =0.97\qquad n=48\qquad D.W=1.34\qquad F=183.63\qquad (1959\text{-}2007) \tag{1}$$

Estimation of the Second Model: In this model, variable of import (that shows the amount of international transactions as well as demand of foreign money with transactional motivation) and dummy variables for Islamic Revolution in 1978 (D1) and petrol shock in 1973 (D2) are exist. Estimation of this model via OLS method for the period 1959-2007 has shown these conclusions:

$$CS=0.099 +(3.51E-05)\ im-(3.59E-06)\ gdp+ 0.017\ rcpii +(2.90E-05)pex+0.064D1+0.048D2$$
$$t\ (11.640)\ (2.78)\qquad (-1.56)\qquad (2.95)\qquad (4.69)\qquad (6.698)\quad (3.004)$$
$$\bar{R}_2 =0.97\qquad n=48\qquad D.W=1.34\qquad F=183.63\qquad (1959\text{-}2007) \tag{2}$$

Estimation of the Third Model: In the third model, in addition to import variable, trend variable as well as the difference between foreign and domestic interest rates variable (which shows cost of keeping foreign money in comparison with cost of keeping domestic money are exist. Estimation of this model via OLS method for the period 1959-2007 reveals these conclusions:

$$CS=0.01+(5.71E-05)im-(1.35E-05)gdp+0.0019\ rcpii+(4.33E-05)\ pex +0.0048T -0.0027(\ if\ -id)+0.0427\ D2 +0.057\ D3$$
$$t\ \ (12.72)\quad (4.4)\qquad (-4.66)\qquad (3.41)\qquad (5.88)\qquad (5.96)\quad (-3.38)\qquad (4.4)\qquad (5.29)$$
$$\bar{R}_2 =0.98\qquad n=48\quad D.W=1.87\qquad F=194.38\qquad (1959\text{-}2007) \tag{3}$$

In this model, coefficients have a higher degree of significance and the amount of $\bar{R}_2$ is higher than previous models, so the third model is accepted.

Examination of Estimation Validity: The accomplished tests expresses that all of explanatory variables are not stationary and most of them are I (2), but disturbance terms of all regressions are stationary or I(0). Therefore, none of regressions are not Spurious and it is possible to estimate regression coefficients by OLS method.

In all estimated models we have used time series data, therefore we should do the autocorrelation test. Durbin-Watson test confirms non-autocorrelation between explanatory variables in all models. So, there is no worry about autocorrelation of explanatory variables.

All models have a relatively high coefficient of determination. In model (1) and (2) =0.97 and in model (3) $\bar{R}_2$ =0.98 Regarding a relatively high $\bar{R}_2$ in these models, explanatory variables show changes of CS degree in Iran with a high limitation.

In all models, the amount of F test is very high and its comparison with critical values shows that regressions are significant. t test shows that coefficient of all explanatory variables are significant at 95 percent level and GDP coefficient is significant at 90 percent level.

Coefficients Interpretation: The model's intercept is positive; it means if all explanatory variables be zero, still a degree of CS exists. In other words, in Iran's economy, regardless of exchange rate, foreign and domestic interest rates, domestic inflation rate, amount of import and some other factors, still there is a minimum foreign money in its residents' portfolio.

Coefficient of domestic inflation rate is positive. This coefficient shows that CS degree has a positive relation with domestic inflation rate; it means, ceteris paribus, if domestic inflation rate increases, CS degree of foreign money to domestic one will increase on the average; because demand of foreign money has a direct relation with domestic inflation rate.

In all models, exchange rate coefficient in parallel market is positive. This coefficient shows that CS degree has a positive relation with exchange rate in parallel market; it means, ceteris paribus, if exchange rate in parallel market increases, CS degree of foreign money to domestic one will increase on the average; since motive to keep domestic money decreases and motive to keep foreign money increases.

In all models, real GDP coefficient is negative. This coefficient shows that CS degree has a negative relation with real GDP.

An increase in GDP shows a better economic situation; so domestic money demand will increase and foreign money demand will decrease. Consequently, CS degree of foreign money to domestic one will decrease. Increase in GDP, will lead to an increase in demand of foreign as well as domestic money, but the increase in foreign money demand is less than that for domestic money.

Import coefficient is positive. This coefficient shows that CS degree has a positive relation with import; it means, ceteris paribus, if import increases, the ratio of foreign money to domestic money will increase on the average. It supports by theoretical bases because when import increases, demand of foreign money will increase.

The difference between foreign and domestic interest rates variable has a negative coefficient. This coefficient shows that CS degree has a negative relation with variable of difference between foreign and domestic interest rates; it means if foreign interest rate increases, CS degree of foreign to domestic money will decrease and if domestic interest rate increases, CS degree of foreign to domestic money will increase.

In all models, coefficient of the second dummy variable, Islamic Revolution, is positive. This coefficient shows that on the average, CS degree has increased after Islamic revolution in comparison with the years before revolution.

The coefficient of constitutional failure is positive. This coefficient shows that CS degree in years 1978 and 1979 (when Iran's economy has experienced a constitutional failure) has increased more than other years.

Research Hypotheses Testing: Coefficient of the trend variable shows that CS degree of foreign to domestic money has been increased during time. Therefore, the first hypothesis, namely, in Iran's economy, the trend of CS degree has been increasing, is confirmed.

Coefficient of rcpii shows that CS degree of foreign to domestic money has a positive relation with domestic inflation rate. Therefore, the second hypothesis, namely, in Iran, CS degree has a positive relation with domestic inflation rate (consumer price index) is confirmed.

Coefficient of pex shows that CS degree of foreign to domestic money has a positive relation with exchange rate in parallel market. Therefore, our third hypothesis, namely, in Iran, CS degree has a negative relation with exchange rate in parallel market, is rejected.

Coefficient of GDP shows that CS degree of foreign to domestic money has a negative relation with real GDP. Therefore, the fourth hypothesis, namely, in Iran, CS degree has a positive relation with GDP is rejected.

Effective Factors on CS: CS affects on macroeconomic variables and is affected by some macroeconomic variables. Effective factors on CS which have been mentioned in literature are:

- Limitation of capital markets and exchange controls which lead to transfer of financial assets from domestic to foreign money;
- as much as institutional factors such as real wealth and potentialities are high, CS of foreign to national money will be taken seriously;
- as much as expectation of a decrease in official value of national money increases, desire of keeping foreign money will increase; because expected rate of weakness in national money acts as opportunity cost of foreign money substitution to domestic money;
- Expectation of decrease in value of national money that relates to expected relative return and risk of keeping both currencies (foreign and domestic);
- difference between expected real rate of return of foreign and domestic investments;
- awareness of political risk;
- Level of international transactions;
- Limitation of access to domestic investment; and
- transactional costs of money changes

Factors influencing on CS degree in Iran and have been tested by this research are as follows:

- difference between foreign and domestic interest rates;
- domestic inflation rate;
- exchange rate in parallel market;
- import; and
- several changes after Islamic Revolution.

Finding and Conclusion: CS degree is a ratio of domestic money to sum of foreign and domestic money. In any country, CS degree is a function of domestic variables such as interest rate, inflation rate, GDP and also a function of foreign variables such as interest rate, inflation rate, exchange rate in parallel market and some shocks like revolution and petrol shock.

On the basis of estimated models, CS degree is related to some of the above variables and sign of variables' coefficients are correct theoretically. From four hypotheses of this research, three have been confirmed and one hypothesis has been rejected. Confirmed hypotheses are:

- in Iran's economy, the trend of CS degree has been increasing;
- in Iran, CS degree has a positive relation with domestic inflation rate;
- in Iran, CS degree has a negative relation with exchange rate in parallel market (foreign money on the basis of domestic money).

And a Rejected Hypothesis Is:

- in Iran, CS degree has a positive relation with GDP.

Our scientific conclusion in this paper is that in small open economies (like Iran), due to structural and institutional factors and regardless of variables such as foreign and domestic interest rates and foreign and domestic inflation rates, an amount of foreign money exists. Therefore, existence of a degree of CS is natural. Variables such as domestic inflation rate, exchange rate in parallel market and import will increase CS degree.

REFERENCES

1. Calvo, A. Guillermo and C.A. Rodriguez, 1977. "A Model of Exchange Rate Determination Under Currency Substitution and Rational Expectations", Journal of Political Economy, 85: 617-25.
2. Miles, Marc A., 1978/. "Currency Substitution: Perspective, Implications and Empirical Evidence", In Bluford H. Putnam and D. Sykes Wilford (Eds.), The Monetary Approach to International Adjustment, praeger, pp: 170-183.
3. Miles, Marc A. and Marion, B. Stewart, 1980. "The Effects of Risk and Return on the Currency Composition of Monet Demand", Weltwlrtschaftliches Archiv, Bd.CXVI, Heft, 4: 613-625.
4. Arango, Sebastian and M. Ishaq Nadiri, 1981. "Demand for Money in Open Economies"; J. Monetary Econom., 7: 69-83.
5. Fisher, Stanley, 1982. "Seigniorage and the Case for a National Money"; Journal of Political Economy, 90(2): 295-313.
6. McKinnon, Ronald, 1982. "Currency Substitution and Instability in the World Dollar Standard", American Economic Review, 72: 320-33.
7. Bordo, Michael D. and Ehsan Choudri, 1982. "Currency Substitution and the Demand for Money:Some Evidence for Canada", Journal of Money Credit and Banking, 14, February, pp: 48-57.

8. Ortiz,Guillermo, 1983. "Currency Substitution in Mexico: The Dollarization Problem", Journal of Money, Credit and Banking, 15(2): 174-85
9. Ramirez-Rojas, C. Luis, 1996. "Monetary Substitution in Developing Countries", Finance and Development, June no, 4: 35-41
10. Vegh, Carlos A., 1989. "The Optimal Inflation Tax in the Presence of Currency Substitution"; J. Monetary Econom., 24: 139-146.
11. Bahmani-Oskooee, Mohsen and Margaret Malixi, 1991. "Exchange Rate Sensitivity of Demand for Money in Developing Countries", Appl. Econom., 23: 1377-1384.
12. Guidotti, Pablo E. and Carlos A. Rodriguez, 1992. "Dollarization in Latin America, Gresham`s Law in Reverse?", IMF Staff Papers, 39(3): 518-544.
13. Rogers, John, H., 1992. "The Currency Substitution Hypothesis and Relative Money Demand in Mexico and Canada", Journal of Money, Credit and Banking, Vol.24; no.3, August [A], pp: 300-318.
14. Mongardini, Joannes and Johannes Muller, 1999. "Ratchet Effects in Currency Substitution: An Application to the Kyrgyz Republic"; IMF; WP/99/102, July, pp: 1-23.
15. Edwards, Sebastian, 2001. "Dollarization and Economic Performance: an Empirical Investigation"; Working Paper 8274, National Bureau of Economic Research, May