

Investigating the Effect of Monetary Treaty on Trade between Iran and Major Trading Partners

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In the present study, the effect of concluding and executing monetary treaties as well as membership of regional economic cooperation organizations (as a potential for using regional currency) on mutual exports between Iran and its 50 major trading partners during the period of 2000 to 2016 is investigated. The Generalized Commercial Gravity Model and Ordinary Least Square (OLS) regression of panel data with fixed effects is used. Countries' exports to each other is considered as dependent variable, and economic weight (log ratio of countries' GDP based on the purchasing power parity to each other), geographic distance between countries, real effective exchange rate and the degree of openness of the economy are independent explanatory variables. In addition, monetary treaties and the membership of the countries in the Asian Clearing Union, in the Economic Cooperation Organization (ECO) and in the Organization of Islamic Cooperation (OIC) are considered as dummy variables. The results show a positive and significant relationship between monetary treaties and the volume of exports of countries to each other. Also, the coefficients of dummy variables are significant and negative, indicating the lack of potential for the use of regional common currency among 51 countries over the considered period.

Keywords: Currency Swap, Optimal Currency Area, Economic and Monetary Convergence, Exchange Settlements, Panel Data, Gravity Model

JEL Classification: C23, F10

1 Introduction

The international economic and financial system of the twentieth century has witnessed tremendous developments. The most significant developments in money and currency economics were the collapse of the Bretton Woods system in 1973, which turned the U.S. dollar into the only international currency in the world trade. The extent to which the U.S. dollar was used, such as medium of exchanges, exchange settlement tools, and store of value has

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increased. It also increased the countries' economic dependence on the U.S. dollar. However, the outbreak of the financial crises and the fluctuations of the dollar value and gold value in international markets led many countries to take alternative methods to increase trade exchanges.

The first method is the formation of a European Union and the introduction of the Euro as the common currency of the European region. Since 2000, most countries have moved towards economic convergence with the formation and use of the regional economic cooperation organizations using the EU model. Also they have created a Common Currency Unit to strengthen the economic and trade relations and to cope with currency crises. Examples of such regional cooperation organizations are the Economic Cooperation Organization (ECO), the Organization of Islamic Cooperation (OIC), the Organization for Economic Cooperation and Development (OECD), and the Association of Southeast Asian Nations Plus Three (ASEAN + 3). In recent years, they have made great efforts to bring about economic convergence and to develop trade relations. In this research, the International Currency Union theory of John Maynard Keynes (1944) is studied in contrast to three other plans. The plan of globalization of the dollar introduced by Harry Dexter White, the Regionalism theory of Jacob Weiner (1950) for the economic convergence of countries, and the theory of Optimum Currency Area of Robert Mundell (1962). Mundell's theory provided the basis for the formation of the euro as the common currency of the European Union.

The second method for countries to facilitate trade relations is to design the trade settlement system using a common currency unit. This currency unit is consisting of a basket of international currencies similar to Special Drawing Right (SDR) and carrying out barter transactions. Calculating the currency unit value is based on an international currency, such as the U.S. dollar or the euro. The Asian Clearing Union has been one of these types of unions.

The third method is to use the capacities of one or more countries to conclude various Bilateral Monetary Agreements, Multilateral Monetary Agreements and Currency Swap Agreements, using the national currency of two countries, or local currency, or even common currency. Among these were Chiang Mai's innovative initiative from Japan, China, and South Korea in 2000, which has led to an increase in the level of trade between the countries of the East Asian region and the trade relations of this region with other parts of the world.

The prerequisite to create a common currency is the design of a golden-based or the World Currency-based settlement system. System such as the trade settlement in the Asian Clearing Union based on a defined currency

basket or a contract such as SDR are the examples. The settlement system can also be based on the national currency of one of the countries of the region with the high volume of transactions and more stability (such as China's Yuan moving internationally). Or a Regional Common Currency is established with a basket of currencies of the region with the highest levels of convergence and a special settlement and payment system (such as the euro). The main condition for the implementation of these treaties is the continuation of political and economic convergence.

The Asian Clearing Union of India, Iran, Nepal, Pakistan, Sri Lanka, Bangladesh, Bhutan, and Myanmar (formerly Burma) is one of the simplest regional settlement arrangements. Its members settle their commercial payments multilaterally through the commercial banks in their countries.

In recent years, the success of the euro made many countries to create regional currency using the capacity of regional economic cooperation organizations. The use of capacities of regional economic cooperation organizations such as the ECO and OIC are studied in this paper.

ECO is a state-owned regional organization established in 1985 by Iran, Pakistan and Turkey with the aim of promoting economic, technical and cultural cooperation between member countries. ECO is in fact the successor to the Regional Cooperation for Development (RCD), which existed from 1964 to 1979. RCD did nothing to achieve its goals of reducing tariffs and cooperation with the Chambers of Commerce. In 1992, the ECO accepted seven new member states, including Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, and currently the number of member states has reached to 10 countries.

The Organization of Islamic Cooperation (OIC) is the second intergovernmental organization after the United Nations, with members from the four continents. It is the voice of the Islamic World and the guarantee for the protection of the interests of the Muslim world. It promotes international peace and coordination among people from all over the world. The 57 member states based on their continents are as follows:

Asia: Azerbaijan, Uzbekistan, Afghanistan, Indonesia, Bangladesh, Pakistan, Tajikistan, Turkmenistan, Kyrgyzstan, Kazakhstan, Maldives, Malaysia

Middle East: Jordan, UAE, Iran, Bahrain, Syria, Iraq, Saudi Arabia, Oman, Palestine, Qatar, Kuwait, Lebanon, Egypt, Yemen

Africa: Algeria, Uganda, Brunei, Benin, Burkina Faso, Togo, Tunisia, Djibouti, Chad, Ivory Coast, Senegal, Sudan, Somalia, Sierra Leone,

Cameroon, Comoros, Gabon, Gambia, Guinea, Guinea-Bissau, Libya, Mali, Morocco, Mauritania, Mozambique, Niger, Nigeria

Europe: Albania, Turkey

Latin America: Suriname, Guyana

On the other hand, the outbreak of the financial crises and the fluctuations of the dollar and gold value in international markets often pushed countries to invent alternative tools to reduce dollar dependency and increase convergence. The conclusion of various monetary treaties in the form of currency swap contracts from the late 20th century, following the East Asian currency crisis, are the most successful currency swap contracts.

Following the 1997 financial crisis in East Asia and the shortage of dollar liquidity, their leaders in the form of the Manila Structural Group, introduced multilateral currency swap contracts under the Chiang Mai Plan. The intention was to deal with crises and mitigate financial damage caused by crises. Chiang Mai's plan was launched by Japan, China, and South Korea in 2000 to reduce the effects of global high-yielding money such as the dollar and the euro. In addition, various bilateral and multilateral monetary treaties in the East Asia region have been signed and implemented. So far, there are 56 bilateral monetary treaties signed between the 32 countries, and China is at the top. (Figure 1)

Monetary treaties are used in the form of currency swap contracts using national currencies as a substitute for the dollar. Currency swap is the exchange of principle and interest in one currency for the same in another currency. An exchange swap agreement requires that the principal amounts (loans) be defined in different currencies; these are normally paid at the start and end of the swap. The basic amounts (loan principle) are chosen to be equivalent to each other when paid at the beginning of the contract. This equation is defined according to the currency exchange rate of the relevant currencies at the beginning of the contract. Under a swap deal (contract), one party agrees to pay monthly, or annual payments on a specified currency for a specific period, until the balance of the other party's debt that is incurred in another currency, to be resolved. Also, the other side of the deal agrees to implement the same operation. Therefore, according to theoretical literature, currency swaps are conducted in three stages: The first step is to exchange of a loan principal or currency asset in the form of two different currencies that have usually same value on the exchange date. The second stage is the exchange of predetermined interest on a fixed or variable basis. And the third phase is the exchange of the principle of initial currency asset on maturity,

which is an agreement between the two parties on the replacement of two cash flows in the future.

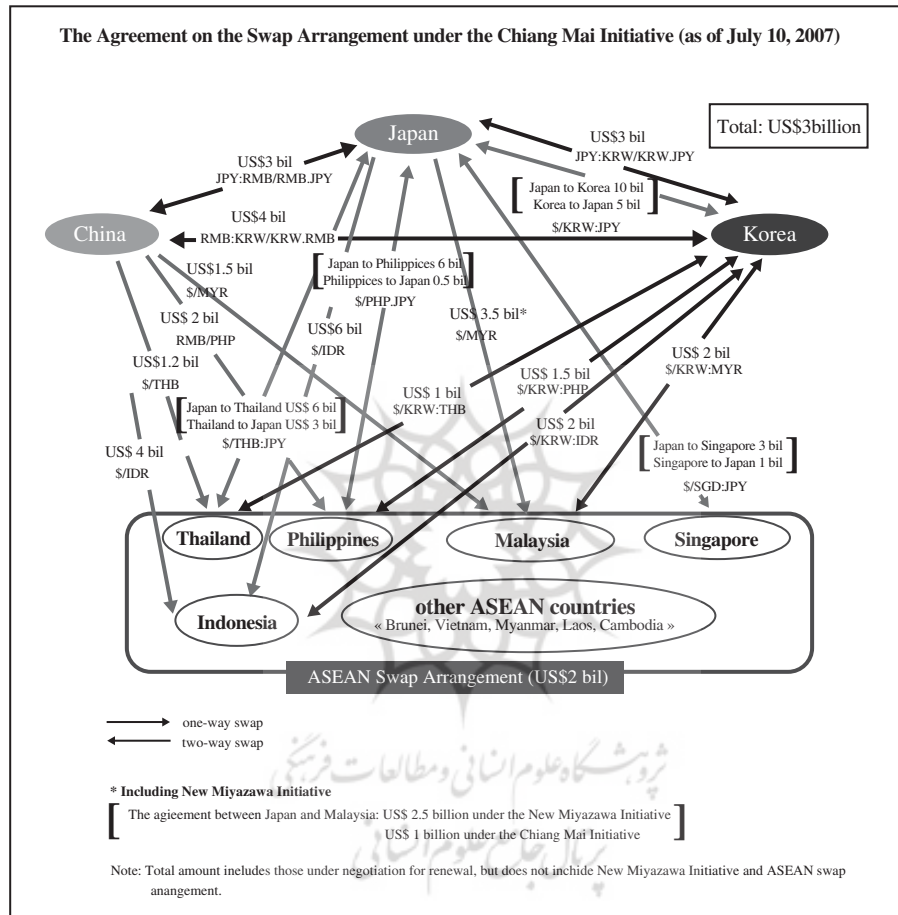


Figure 1. The bilateral currency swap-financed trade settlement facility network within the framework of Chiang Mai's innovative design. Source: Central Bank of Japan

When the foreign exchange system of the parties follows pegged regime, currency risk is minimized. If one or both parties follow the floating exchange rate system, the risk coverage instruments for currency fluctuations in the currency swap agreement should be taken into account. An exchange swap is

possible whenever any of the payment flows that swap are of the same value, regardless of whether those flows depend on or not on a fixed or fluctuating interest rate. (Cooper, 1991, 1996, 2006). Based on this model, political considerations and structural features including the business orientation of countries, the size of the economy, the level of strategic participation and international engagement, free trade agreements, the level of corruption, and economic stability are influential on the decision to sign bilateral currency swap contracts and bilateral monetary treaties. Based on this, models of monetary treaties decision making are designed and presented. (Shin, 2014)

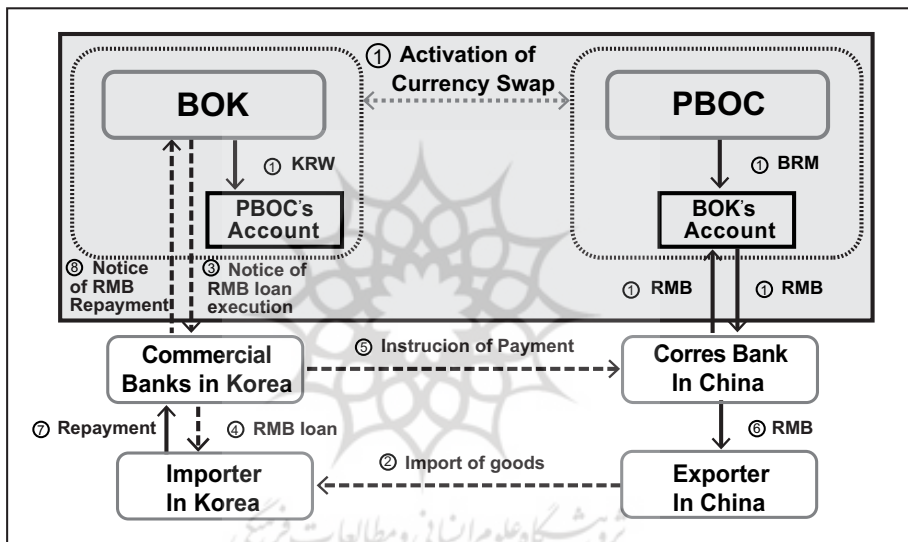


Figure 2. The Conceptual Model of Financing Swap Contracts for China and South Korea. Source: Central Bank of South Korea

An illustrative example of this monetary pattern is the China-South Korea Currency Swap-Financed Facility Agreement after the 2008 US crisis. It was presented in the form of a swap agreement in 2012, and as a result of currency risk reduction, the volume of trade between the two countries has been increased. These types of contracts were designed after the 2008 financial crisis to reduce the effects of the global financial crisis. (Figure 2)

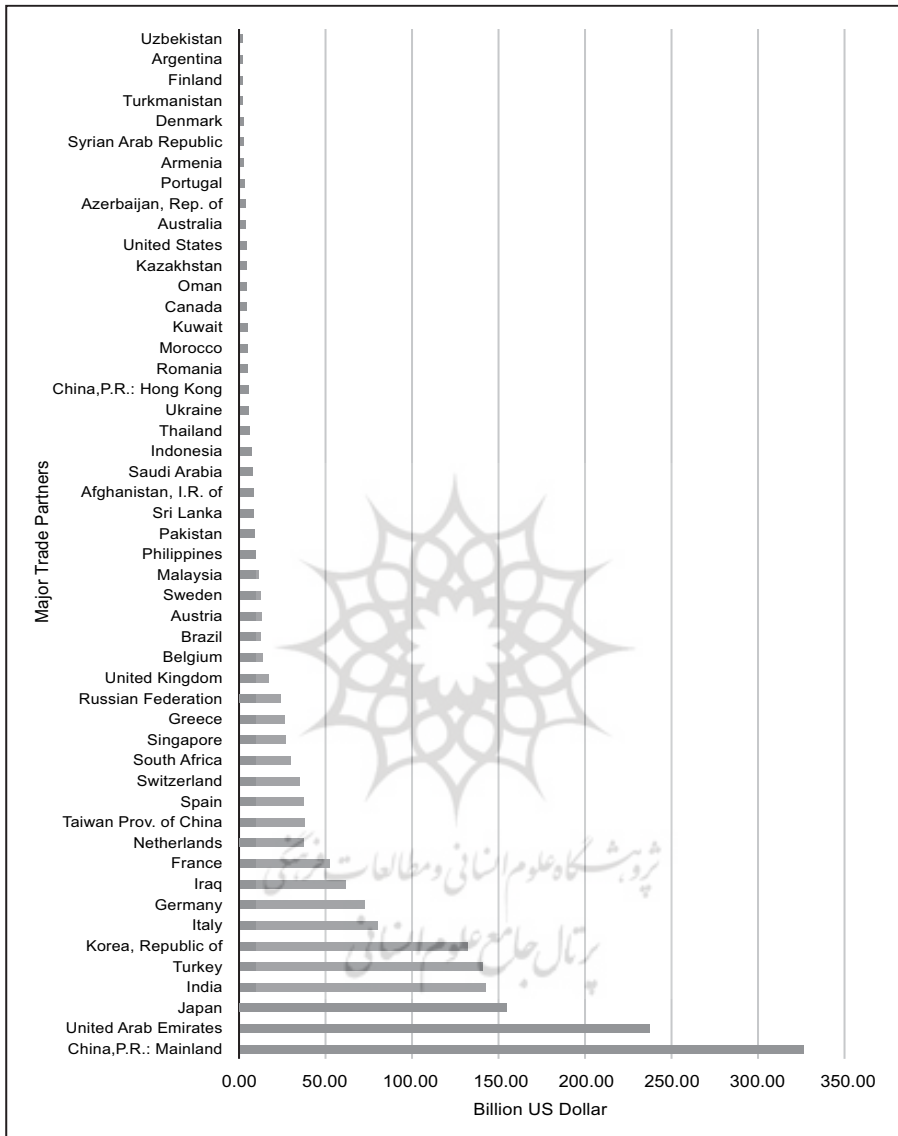


Figure 3. The volume of Iran's trade with 50 major trading partners from 2000 to 2016. (Billion US Dollars). Source: Researcher's findings based on the annual statistics (1991-2016) of the Islamic Republic of Iran Customs Administration and the International Financial Reporting- IMF

Another type of monetary treaty is a bilateral or multilateral monetary treaty that is similar to currency swap contracts. The trades between counterparties takes place through Local Currency or Common Currency, but at the end of the contract period, the balance of the account between two countries will not be replaced. However, after settlement operations, the balance of the account will be deposited with the counterparty as a reserve asset. Storing the above value can be in the form of the opposite currency (subject to the stability of the currency market), gold, or one of the world's currencies. It can also be granted to the opposite country in the form of credit lines with new conditions. The main condition for the implementation of these treaties is the stability of the foreign exchange market and the implementation of a sustainable exchange rate uniformity policy. In these treaties, the settlement of transactions is carried out through the World's Currency or a Full Convertible Currency such as the dollar or the euro, a defined currency basket, or a contract such as SDR or an invaluable asset such as gold.

The present study addresses the effect of concluding all kinds of monetary treaties, as well as the membership of countries in the ACU, the ECO and the OIC as potential for monetary and economic convergence. They use common currency and form a monetary union as a means of facilitating the trade and foreign exchange settlement between Iran and 50 major trading partners (as shown in Figure 3).

This research investigates the effect of above factors on the level of trade relations between the countries under study over the period of 2000-2016. Using the generalized gravity model, the variables affecting exports, including the gravity, repulsive variables of trade relations including the size of the economy, the distance, and the dummy variables of the monetary treaty and the membership in the Asian Clearing Union, ECO and OIC are measured indicating the degree of monetary convergence.

2 Theoretical Foundations

After the presentation of the international currency theory by John Maynard Keynes in 1944, the theory of regional economic convergence was introduced by Jacob Weiner in 1950. In his article entitled "The Customs Union Issue", he shows that the economic convergence between members will increase the level of international trade and international investment among members of the union by influencing issues such as geographic distance, and lower shipping costs.

The economic and monetary unions that are economic integration of the same economic policies at all levels with the common currency of the union

members or the economic cooperation organization, are the highest and most effective form of convergence. They ensure the integrity of the union countries. The formation of the monetary union will bring benefits and costs, which causes traders not to worry about unanticipated changes in exchange rates and the risk of currency fluctuations. The monetary union, like all fixed exchange rates systems, eliminates the risk of exchange rate fluctuations. Economic convergence is defined as a variety of free trade or preferential agreements and the elimination of customs barriers. It is also defined as common market of free production and free production factors, customs unions, and economic and monetary unions, which is the highest form of economic convergence.

Research shows that effective components in the formation of economic convergence at an initial level are geographical distance of the countries from one another, the size of the economy, the population of the countries of the region, and everything that creates a sense of identity between two or more countries in a region. (Pirayandeh, 2016) Intermediate economic convergence can take the form of a variety of free trade or preferential agreements, the removal of customs barriers, the common market of free production and free production factors, customs unions, economic unions and the similarity of trade cycles between countries.

The formation of the monetary union and the use of the common currency with the aim of facilitating the payment system and settlement of trade and exchange are the highest level of economic convergence. The use of the common currency as the inventive money is referred to the countries that trade in the highest level of convergence in the region (such as the euro). The common currency is completely different with a strictly pegged currency regime, in which the currency of one or more countries of the region is stabilized against a world currency such as the US dollar. (Arjmandi & Mehrara, 2014)

The theory of the optimal monetary region introduced by Robert Mundell in 1961 under the traditional model, or Mundell I (1961) and the extended model of Mundell II (1977), has evolved by economists such as McKinnon (1963), Kenen (1969), Frankel and Rose (2002), as well as Dobija (2018). It is the formation of a common currency and a monetary union that economic convergence at the primary and middle levels provide the potential for the formation of a monetary union and the creation of a common currency region (McKinnon, 2004).

An optimal monetary region is an inter-regional area that has an optimal fit for the exchange rate structure. So economic convergence among the

member states of the monetary union is of great importance. In the traditional theory that Mundell introduced in 1961, the criteria such as the flexibility of wages and prices, the high mobility of the factors of production, the degree of openness of the economy, the high variety of production, the high convergence of finance, the convergence of inflation rates, as well as the political factors were considered as the most important variables of joining the monetary unions.

In the modern theory of optimal monetary region, the benefits and costs of the members of the optimal monetary region are also mentioned. The benefits are met through macroeconomic stability, solving the problem of time incompatibility, increasing trade, saving foreign currencies, and political benefits. The costs associated with the accession of countries to monetary unions also fall within the definition of losing monetary policy independence, the similarity of shocks, coincidence in business cycles, the nature of shocks, production expertise, the negative effect of fiscal policies, and loss of independence of financial policy (Frankel and Rose, 2002). In general, it can be said that the theory of an optimal monetary region is an approach to the convergence of money (Dobija, 2018).

Also, with the emergence and contagion of the 2008 US financial crisis, and the financial losses to some EU member states, as well as the weakening of the euro against the US dollar, according to Mundell theory (1973), different countries have moved towards economic convergence. Therefore, by sharing the risk, replication of business cycles, rethinking trade practices with each other and removing trade barriers in one region, they reduce the reliance on US dollars and the euro on the way to creating a common regional currency (Glick, 2017).

3 Research Background

Zara-Nejad et al. (2013), in the article entitled "The Study of the Effect of Common Currency on Foreign Trade of Islamic Countries during the Period of 1990-1991 based on the Theory of Optimal Monetary Region", study the effect of common currency on 49 OIC member countries using the gravity model. The results of this study show that common currency in the form of gravity model is justifiable. The variables used in this model are the common border, gross domestic product, exchange rate changes, trade unions, common currency, and the distance between countries that explain the flow of trade between OIC member states. So the gross domestic product, the common border, the existence of trade unions and common currency have a positive and significant effect. The exchange rate fluctuations and the distance between

the country of origin and destination have a negative and significant effect on the trade flow between the member states of the OIC.

Pirayandeh (2016), in his thesis entitled "The Feasibility Study of Creating Economic Convergence between the Five Countries of Iran, China, India, Russia and Turkey", examines the effect of the formation of regional trade arrangements between the countries of Iran, China, India, Russia and Turkey, on the degree of mutual trade between these countries in the period of 2014-2000. He uses the gravity model and fixed effects panel data. He introduces the convergence agreement variable as an indicator consistent with the concept of economic convergence. In this model, gross domestic product, population and geographic distance of studied countries are considered as independent variables, and the common border between countries is considered as a dummy variable.

The results indicate that all coefficients are significant, and except for the population coefficient of the importing country, all of them have the expected sign. The trade arrangements have a positive effect on the trade volume of the above countries. The researcher concludes that creating economic convergence between countries of Iran, China, India, Russia and Turkey leads to increased trade in these countries.

Rose and Stanley (2005), in a joint paper entitled "Multiple Regression Analysis of the Effect of Common Currency on International Trade", with reference to 34 articles on the effect of the monetary union on trade, consider the basic model of trade gravity. In their model, natural logarithm of the volume of trade between two countries i and j at time t is considered as a dependent variable and a function of the log of the size of the economy and the log of the distance. The variables used for the size of the economies are GDP as an independent variable, trade restrictions between the two countries as an explanatory variable and the membership of the two countries in the regional union as a dummy variable. In this paper, the Meta-Regression Analysis (MRA) model of fixed effects and random effects is estimated. In particular, the estimation of "random effects" led to a 90 percent increase in bilateral trade with 95 percent confidence. In most estimations of fixed effects models, estimates of the impact of common currency on trade with a coefficient of determination (R^2) of 0.093 have a positive and significant effect. In the case of the European Union, this coefficient has increased to 0.677 and represents a better fit of the model for European Union countries, but it cannot be trusted due to heterogeneity and bias. The multi-dimensional analysis strongly rejects the hypothesis that the common currency does not

affect trade, to the extent that the monetary union increases bilateral trade between 30% to 90%.

Glick and Rose (2002), in a paper titled "Does the Monetary Union Affect Trade", analyze the effects of common currency on mutual trade of 230 countries between 1948 and 1997 using panel data. During this period, a number of countries have left the monetary union or have joined the monetary union. The dependent variables are the natural log of the mutual trade of countries at time t . The natural log of the GDP of the countries, per capita income, and geographical distance between countries are independent variables. Common language, trade agreements, common borders and common currency unit are used as dummy variables. The researcher has used a fixed effects model to analyze the entrance and exit from the monetary union. The results indicate that if a country moves out of the monetary union or joins the monetary union, its trade volume will be double increased or double decreased, respectively.

Gil-Pareja, Liorca-Vivero and Martinez-Serrano (2008) analyze the effect of monetary treaties on trade flows using panel data of the 25 member countries of the OECD. The Gravity Model with fixed effects and random effects in the period of 1950-2004 is estimated. The model states that bilateral trade flows depend directly on the size of the economies. The distance variable will have a negative effect on trading flows between the countries of the group. Independent variables are gross domestic product and distance. Dummy variables include common language, common borders, and the membership of countries in a regional trade agreement such as the Regional Trade Agreement (RTA), and Monetary Agreement (MA), each of which will somewhat reduce the cost of trading flows. The results indicate that the effect of joining monetary treaties, in addition to curbing exchange rate fluctuations, reduces the volume of trade between countries that have formed the monetary union. Also, the selected currency used in trade interactions, can also be used in the trade relations of the member states with other non-member countries and internationally, and acquires features of the world currency. This conclusion is valid for the euro as the currency unit of the European Union and as a world currency.

Shin (2014), in an article titled "Facilitation Trade Settlements using Exchange Swap between China and Korea" presents a conceptual model that facilitate the settlement of currency exchanges between South Korea and China. With the outbreak of 2008 financial crisis in the United States and its international spread, most Emerging Market Economies (EMEs) found that international crises that stem from the economic problems of some countries

are increasingly shifting to their economies through international financial markets. The root of this crisis is the dependence of countries in the US dollar. In order to escape this undesirable cycle, most emerging markets, and specifically China, put the use of national currencies in the trade system on their agenda. In the meantime, the People's Bank of China (PBOC) and the Bank of Korea (BOK) have been discussing ways to use bilateral swaps of South Korean's Won and China's Yuan for settling trade between the two countries since 2009. In December 2012, a new monetary model was introduced to help improve the trade settlement with national currencies based on the "Korea-China currency swap-financed facility".

Glick and Rose (2017), in their paper titled "Currency Unions and Regional Trade Agreements between 20 European Countries", examine the effects of the formation of the European Monetary Union over the period from 1948 to 2013, using the Gravity Model and fixed effects panel data. The effect of the formation of the monetary union and common currency of the European Region (Euro) on trade have been investigated. The results show that the countries of the region often pay more attention to exports, and 40% of trade in this region is related to the mutual trade between the member states, while the European Union holds more than 70%. In addition, there is a significant difference in the volume of trade between the main countries of European Union and the new countries of EU, especially after the 2008 financial crisis, due to the impact of commercial agreements and common currency of former and new members in the European Union.

4 Research Methodology

The monetary pattern of countries in trade exchanges is a function of a variety of factors, including the exchange rate, the foreign exchange systems, the economic conditions of each country and the trade relations governing the countries. Among the variables that affect international trade, the foreign exchange system of countries, whether Pegged Exchange Rate Regime or Floating Exchange Rate Regime, the Real Exchange Rate (RER) or the Real Effective Exchange Rate (REER) play a decisive role in this area. The reduction of the exchange rate, in other words, the strengthening of the national currency of the countries is increasing the imports of goods and services, reducing exports and inflows of foreign capital to the country. Conversely, the increase of the exchange rate, in other words, the weakening of the national currency of the countries, is the factor for increasing exports of goods and services, reducing imports of goods and services and the entry of foreign capital into the country (Fahimi-Fard et al., 2016).

Based on studies and information collected and the background to existing studies on monetary treaties, monetary unions, the common currency, and the level of economic and monetary convergence between countries has directly affect trade in countries. In the present study, the generalized gravity model of trade is estimated. In addition to trade gravity and trade repulsion, variables including the size of the economy, the geographic distance, the effect of monetary treaties and the membership of the countries in the economic cooperative organizations as the potential for monetary union formation is also used. After identifying 50 major trading partners of Iran, the export statistics of these countries to each other are considered as a dependent variable.

The exports data of these countries between 2000 and 2016, according to Chart 1, is extracted from the International Monetary Fund's Direction of Trade Magazine (DOT). Then information about other variables including GDP at fixed prices based on purchasing power parity (GDP_PPP), degree of openness of the economy (Openness) by calculating the ratio of total exports and imports to GDP of each country, extracted from the electronic publication information of the International Financial Statistics of IMF (IFS). Country-specific population information are extracted from the United Nations Database. Real Effective Exchange Rate (REER) are extracted through the World Bank Group database. Finally, the distance between countries are collected and classified according to the Big Circle method, using data published in the World Economic Knowledge and Research Center (CEPII)¹ website. Considering the membership of Iran and other countries under study in the Asian Clearing Union, ECO, and the OIC, their information are also extracted from websites of the above organizations. There are 9 countries in the Asian Clearing Union, 10 countries in ECO and 62 countries in OIC. Dummy variables of ACU_{ijt} , ECO_{ijt} and OIC_{ijt} are used in a way that the membership of both countries i and j at time t is considered with the number 2, membership of one of the countries i or j with the number 1 and the absence of the two countries in each of the above organizations is considered zero in the model.

Information on the types of monetary treaties and currency swap contracts concluded between all countries of the world (including 254 bilateral monetary treaties) during the period from 1990 to 2016 are extracted from the countries' central banks websites. And the dummy variable BMA_{ijt} is created. The values of this variable are indicated by 1 where a monetary treaty has been concluded, and by zero when the monetary treaty between the two countries i

¹ <http://www.cepii>

and j is not signed up or only negotiated. It should be noted that the monetary treaties related to Iran with the countries examined during the period from 2000 to 2016 are still in the negotiation phase and are not effective.

In the research model, the export of countries to each other is considered as the dependent variable. Economic weight is calculated as the log of the ratio of GDP of countries based on purchasing power parity (GDP_PPP). This variable is calculated based on the fixed price of the base year 2011, based on the purchasing power parity of the countries. The geographic distance between countries, as independent variables, Real Effective Exchange Rate (REER), and degree of openness (Openness) as explanatory variables, Bilateral Monetary Agreement (BMA), and the membership of the countries surveyed in the ACU, the ECO and the OIC are considered as dummy variables. In order to identify the major trade partners of Iran, the annual information on the volume of annual exports and imports of Iran are extracted from the I.R.I Customs Administration database (from 1991 to 2016) and the International Financial Statistics of IMF.

Among the major trading partners of Iran, the 50 countries that have had the most trade exchanges with Iran over the period of 2000-2017 are China, the United Arab Emirates, Japan, India, Turkey, South Korea, Italy, Germany, Iraq, France, the Netherlands, Taiwan, Spain, Switzerland, South Africa, Singapore, Greece, Russia, United Kingdom, Belgium, Brazil, Austria, Sweden, Malaysia, Philippines, Pakistan, Sri Lanka, Afghanistan, Saudi Arabia, Oman, Indonesia, Thailand, Ukraine, Hong Kong, Romania, Morocco, Kuwait, Canada, Kazakhstan, the United States of America, Australia, Azerbaijan, Portugal, Armenia, Syria, Denmark, Turkmenistan, Finland, Argentina, and Uzbekistan which are selected as the countries surveyed (Figure 3).

The research model is developed based on the generalized gravity model of trade and fixed effects panel data regression (OLS) over the period 2000 to 2016. Research data amounting to 41,700 observations, is extracted from international sources and classified by Excel2013 software. The model is estimated using the Eviews 9.0, and the outcomes are re-evaluated in order to ensure results using the R10 software.

5 Presenting the Model

In the present paper, the trade gravity model is used based on the optimal monetary region theory as well as theories of economic convergence at the highest level between the member states of a regional organization. This model has been designed to examine the impact of the most important factors

of economic, commercial and financial attraction and repulsion. Factors such as the size of the economy, the degree of openness of the economy as a factor for trade facilitation and attracting capital, and types of monetary and trade agreements are included. Over time, other factors, such as GDP per capita, regional agreements, and monetary treaties, are added to the gravity model.

The innovation of this research is the use of bilateral monetary treaties between countries as the most indicative of the willingness of countries to engage in business and monetary cooperation. Also the capacity created by the formation of the union and regional organizations that shows the highest level of economic convergence between two or more countries, is an innovative approach. The bilateral monetary treaty variable has not been used in any of the previous studies, and in the study of Shin (2014) only the conceptual model is presented. Meanwhile, more than 250 monetary treaties have been concluded between countries under study, according to which the use of the national currency of countries, the common currency among countries (such as the euro) or the currency of one of the countries of the region (such as China's Yuan) has played an important role in the trade relations of countries. However, quantitative studies based on econometric methods for the effect of this variable on trade between countries have not been carried out.

Also, although different countries have formed a regional cooperation organization due to regional interests such as common religion, common border, common language or neighborhoods as well as monetary union, the impact of these regional organizations on trade relations in several studies have been carried out that are included in the studies of Zara-Nejad et al. (2013). However, the innovation of the present research is that, assuming that these regional organizations have the potential or capacity to use the common currency, the impact of these organizations on trade between countries are studied.

The introduction of dummy variables for the membership of the countries in the Organization for Economic Cooperation and Development (OECD) of the developed countries is presented in the study of Gil et al. (2008). However, due to the difference in the degree of convergence, the results differ from the present research. Also, according to Glick and Rose (2002), Rose and Stanley (2005) and Glick and Rose (2017), European countries with a higher convergence level have been creating monetary union and using a common currency. So an optimal monetary region is considered for some of the countries studied in the above research, which shows the effect of the monetary convergence of a number of European countries on trade. From this

point of view, there is similarity to Pirayandeh (2016) research, which deals solely with the economic convergence between Iran and the four countries of China, India, Russia, and Turkey.

Table 1
Variables of the model and their calculations

Variable Symbol	Variable Defining	How to calculate the variable
TIJT	LnT_{ijt}	Natural log of export of country i to country j in year t
GDP_PPP	$\text{Ln}(\text{GDP_PPP}_{it} / \text{GDP_PPP}_{jt})$	Natural log (GDP based on the purchasing power parity of country i to GDP based on the purchasing power parity of country j in year t)
DIJT	LnD_{ijt}	The natural log of the distance between capitals of countries i and j with each other
REERIT	$\text{LnREER}_{it}, \text{LnREER}_{jt}$	The natural log of the real effective exchange rate of countries i and j in year t
REERJT	$\text{LnOpenness}_{it}, \text{LnOpenness}_{jt}$	Natural log of the degree of openness of the economy (total exports and imports to gross domestic product multiplying by 100 for countries i and j in year t)
DUMMYBMA	$\text{Dummy(BMA)}_{i,jt}$	Bilateral Monetary Agreement or Currency Swap for countries i and j in year t
DUMMYACU	$\text{Dummy(ACU)}_{i,jt}$	The membership of the countries i and j in the Asian Clearing Union in year t
OPENNESSIT	$\text{Dummy(OIC)}_{i,jt}$	Membership of countries i and j in the Organization of Islamic Cooperation in year t
OPENNESSJT	$\text{Dummy(ECO)}_{i,jt}$	Membership of the countries i and j in the Economic Cooperation Organization in year t

The capacity of the Asian Clearing Union and the Economic Cooperation Organization and the Organization of Islamic Cooperation to form a monetary union and to have an impact on trade, is the prerequisite for the formation of a monetary union. The use of the common currency among the union member states depends heavily on the level of economic and monetary convergence of countries. But the current research answers this question that whether the membership of the Asian Clearing Union, ECO and OIC, alone, leads to the development of trade relations between the member states. It seeks to achieve the quantitative effect of the above factors on exports between countries.

In addition, the use of the real effective exchange rate shows the effect of the exchange rate factor on exports of countries to each other.

These factors are shown as logarithmic equations using panel data based on the Rose model (2005) and applying changes, it is designed as the generalized gravity model based on following variables (Table 2):

$$T_{ijt} = \beta_0 + \beta_1 \ln(GDP_{PPP_{it}}/GDP_{PPP_{jt}}) + \beta_2 DI_{ijt} + \beta_3 REER_{it} + \beta_4 REER_{jt} + \beta_5 Openness_{it} + \beta_6 Openness_{jt} + \beta_7 dummy(BMA)_{ijt} + \beta_8 dummy(ACU)_{it} + \beta_9 dummy(OIC)_{it} + \beta_{10} dummy(ECO)_{it} + v_t + \varepsilon_{ijt} \quad (1)$$

6 Results

The analysis of the correlation of the variables is described in Tables 2 and 3, which shows that high correlation between variables is not observed, but, there is a slight correlation between the variables (Table 3)

Table 2
Correlation of Variables

DUMMY ECO	DUMMY ACU	DUMMY BMA	OPENNESS IT	REERIT	DIJT	GDP_PPP	TIJT	Correlation
							0.06	GDP_PPP
						0.004	-0.10	DIJT
					-0.08	0.103	0.26	REERIT
				0.23	0.006	0.018	0.12	OPENNESS IT
			0.0004	0.03	0.01	-0.001	0.15	DUMMY BMA
		-0.01	-0.09	0.07	-0.05	0.009	-0.02	DUMMY ACU
	0.29	-0.02	-0.14	-0.08	-0.15	-0.01	-0.22	DUMMY ECO
0.56	0.08	-0.03	-0.04	0.002	-0.15	-0.03	-0.32	DUMMY OIC

Source: Researcher Findings

The correlation coefficient table is used to study the existence or non-existence of collinearity between independent variables. However, since correlation coefficients are only used to examine the collinearity, the Variance Inflation Factor (VIF) criterion is used to identify multicollinearity. The results from R software are as follows:

Table 3

Correlation Coefficient Table Using Variance Inflation Factor

Variable	VIF
GDP	1.019
Distance between Countries	1.054
REER	1.823
Degree of Openness of the Economy	1.121
Bilateral Monetary Agreement	1.004
Membership in ACU	1.135
Membership in OIC	1.508
Membership in ECO	1.668

Source: Researcher Findings

Since the VIF values are less than 5, there is no collinearity among the variables. In this test, if the variance inflation factor is greater than the numerical value of 5, then the collinearity is confirmed and, for better estimation, the variable should be eliminated.

Table 4

Stationarity Tests (Reliability) of the Variables

Test Variable	<i>Openness</i> ¹		GDP ratio ²		REER		Export ³	
Test method / Statistic and probability	Statistic	Prob.**	Statistic	Prob.**	Statistic	Prob.**	Statistic	Prob.**
LLC Test # of Observations: 40800	-2420.63	0.0000	-10.947	0.0000	-53.9958	0.0000	-51.1944	0.0000
Phillips Perron (PP) and Fisher Chi-Square Method. # of Observations: 40800	22588.7	0.0000	9247.67	0.0000	10606.6	0.0000	8746.75	0.0000

1. The degree of openness of the economy.

2. Natural log of the ratio of GDP based on the purchasing power parity of the country i to GDP based on the purchasing power parity of the country j.

3. Export of country i to country j

Source: Researcher Findings

6.1 Unit Root Tests

Stationarity test or unit root test of variables is one of the prerequisites for estimating an appropriate regression model. There are several methods for analyzing the stationarity or non-stationarity of the data. In this study, Levin, Lin-Chu method (LLC), Im, Pesaran-Shin W-Stat Method (IMP), Adjusted Dickey Fuller Test (ADF), and the Phillips Perron (PP) and Fisher Chi-Square Method, are used. The assumptions of this test are:

- Null Hypothesis: The existence of a unit root and non-stationarity (H0: $\rho=1$)
- Alternative Hypothesis: The absence of a unit root and stationarity (H1: $\rho\neq 1$)

If the results of these tests show the non-stationarity of time series data, the problem can be solved using logarithmic or differential equation in the first or second order. In this study, logarithmic method is used to eliminate the non-stationary time series data. The results of unit root tests indicate that the null hypothesis is rejected and the data is stationary. The variables are the log of export of countries to each other, the natural log of ratio of GDP at constant prices based on the purchasing power parity of the country i for year t to GDP at constant prices based on the purchasing power parity of the country j in year t , log of the real effective exchange rate and the log of the degree of openness of the economy. Data on dummy variables are also stationary without the need for log calculations or first or second order differentials. Given that the probability of probing unit root tests in all above conditions is less than 0.05, the assumption of statistical probability of the unit root of all the above variables is rejected. Thus, the model is estimated without worrying about stationarity (Table 5).

6.2 Fixed Effects Test

There are two general models of pooled data analysis and panel data analysis that is identified with appropriate tests. In the case of pooled data, the coefficients are the same for all cross-sections, which then is analyzed by a pooled data method. In the second case, the coefficients are different for all cross-sections, in which case the panel data method is selected. The F-Limer test is used to identify two modes. The assumptions of this test are:

- Null Hypothesis (H0): No heterogeneity or individual differences: Pooled Model: OLS
- Alternative Hypothesis (H1): Individual effects or heterogeneity in the cross-sections: Fixed Effects

If the hypothesis H0 is accepted, it means that there is no individual effects and cross-sections are not heterogeneous, and the use of the pooled regression model (pooled data method) is statistically significant. But if the null hypothesis is rejected, the panel data method is accepted and the research hypotheses are tested using the panel data method. Since in this research the probability of F-Limer test is less than 0.05, therefore, the null hypothesis is rejected, and fixed effects model is suitable (Table 6).

Table 5

Fixed Effects Test

F-Limer Test	Statistic	Probability (P-Value)	Degree of Freedom	Result
F-Statistic	26.633	0.0000	-16.418	Fixed Effects Model
Chi-Square	424.245	0.0000	16	Fixed Effects Model

Source: Researcher Findings

Table 6

Fixed Effects Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	18.63300	0.057083	326.4175	0.0000
GDP_PPP	0.020936	0.002484	8.428508	0.0000
DIJT	-0.523642	0.017949	-29.17347	0.0000
REERIT	0.014447	0.000540	26.73485	0.0000
REERJT	0.010288	0.000537	19.15164	0.0000
OPENNESSIT	0.002059	0.000245	8.400977	0.0000
OPENNESSJT	0.002202	0.000255	8.628516	0.0000
DUMMYBMA	3.241885	0.113929	28.45537	0.0000
DUMMYACU	-0.125032	0.041212	3.033846-	0.0024
DUMMYECO	-0.181888	0.040097	4.536234-	0.0000
DUMMYICO	-1.681417	0.027628	60.85978-	0.0000
R-squared	0.2304	Akaike info criterion		5.0284
Adjusted R-squared	0.2299	Schwarz criterion		5.0340
Sum squared resid.	373190.4	Hannan-Quinn criterion		5.0302
F-Statistics	481.01	Durbin-Watson stat.		0.1217
Prob. F-Stat.	0.0000			

Source: Researcher Findings

6.3 Hausman Test

The Hausman test is used to determine which method (the fixed effects or random effects) is more suitable for estimation.

The assumptions of this test are:

Null hypothesis (H0): There is no relationship between the disturbance component and the explanatory variables and they are independent of each other.

Alternative hypothesis (H1): There is a relation between the disturbance component and the explanatory variables and they are not independent of each other.

If H1 is accepted (H0 is rejected), fixed effects method is used. Under null hypothesis, the fixed effects and random effects are both compatible, but the steady-state effects method is ineffective. In other words, the null hypothesis states the suitability of the random effects model and the alternative hypothesis states otherwise. According to the chi-square value of 316,648 obtained with a P-value of zero, the Hausman test is significant. Therefore, the null hypothesis is rejected and it is a fixed effects model.

6.4 Fitness Test of the Fixed Effects Model

The most well-liked fitting statistic is the coefficient of determination (R²), which is between zero and one. If the coefficient of determination is large and close to one, the data model is well fitted, while if the low R² is close to zero, the model does not fit the data. In the table below, the value of the coefficient of determination is 0.2304, which indicates that the model fits the data and is acceptable. Additionally, the Adjusted R-squared value is 0.2299. The value of the F statistic and the probability value for F statistics are 481.01 and 0.000, which indicate that the model is significant, since the probability of this statistic is less than 0.05 (Table 7).

Estimation of regression model: The fixed effects model of this research is estimated and the coefficients are obtained as follows:

$$\begin{aligned} \text{TIJT} = & 18.6329 + 0.0209364\text{GDP_PPP} - 0.5236\text{DIJT} + 0.01445\text{REERIT} + \\ & 0.01029\text{REERJT} + 0.0021\text{OPENNESSIT} + 0.0022\text{OPENNESSJT} + \\ & 3.2419\text{DUMMYBMA} - 0.1250\text{DUMMYACU} - 0.1819\text{DUMMYECO} - \\ & 1.6814\text{DUMMYOIC} \end{aligned}$$

The results show that all the variables used in the model are stationary. Also, based on the F-Limer test, panel data with fixed effects is used. Hausman test results also show that a fixed effects model is significant, and based on the fitting test, a fixed effects regression model is used. The coefficient of determination (R²) of the model at 0.2304 represents a good fit of the fixed effects model. Also, the F-value of 481.01 and the probability of 0.000,

indicate that the model fits the data and is acceptable. Also, given the probability of less than 5%, indicates that the model is significant in general.

7 Discussion

Over the past decades, many studies have been done on gravity models by international economists and financial scholars. Among these studies, Andrew Rose's studies track over the years 1998 and 2008 under titles of "One Money, One Market: The Impact of Common Currency on Trade" (Rose, 2000), "Common Currency in Action" (Rose, 2001), "The Impact of Common Currency on International Trade" (Rose, 2002), and "Is the European Monetary Union an Optimal Monetary Region?" (Rose, 2008), "The Effect of the Common Currency on Trade and Income", Frankel and Rose (2002), and "Effects of Monetary and Commercial Arrangements on Trade", Glick (2017). They are all pursued in the present study, so that according to the theory of the optimal monetary region of Robert Mundell and the theory of economic convergence of Jacob Weiner, the effect of variables that has the potential for economic convergence are examined. So, the highest level of convergence in the form of using common currency or forming a monetary union, on cross-industry trade between the studied countries are studied.

Therefore, the basis of model is the commercial gravity models provided by Andrew Rose studies, and the models presented by Rose and others, in particular the Rose and Wincoop model (2003), and the Standard Model of Rose (2008), named Standard and Generalized Commercial Gravity Models. By recognizing and applying the factors of gravity and repulsion affecting economic convergence and trade relations of countries, these models are developed and investigated.

In current research with the transformations of the commercial gravity model, the membership effect of Iran and its major trading partners in the Asian Clearing Union, ECO and OIC as potential for the use of the common currency or the creation of a monetary union are examined. This potential is presented in the form of three dummy variables in the model.

The results indicate that the coefficients of the above three variables are significant, but the negative signs of the variables indicate that the membership of the countries in the above three organizations has negative relations with the exports of these countries to each other. In other words, the potential for creating the common currency for the highest level of convergence among these countries, has not been yet established. Therefore, the hypothesis of using the common currency and the monetary union among this group of countries is rejected.

On the other hand, in order to investigate other variables that influence the mutual exports of the studied countries, the monetary treaties that have been emphasized by most countries, especially East Asian countries, is investigated in the model. According to previous researches on monetary cooperation in East Asia by Rocomp (2014) and Shin (2014), titled "Facilitating Trade Settlements using the Exchange Swap between China and South Korea", and Gil-Pareja et al. (2008), titled "The Effects of Monetary Commitments on Trade in the Countries of the Organization for Economic Cooperation and Development" (OECD), as well as the model presented by Lin et al. (2016) in their paper, titled "Monetary Treaties and Currency Swap Contracts of China", the dummy variables of monetary treaties between the countries are added to the model.

In all previous studies, the factors of gross domestic product and GDP per capita have positively correlated with trade. The geographic distance variable used in the original study of Tinbergen (1961) is expanded in the subsequent researches into any factors that could affect commercial costs, such as language, culture, and geographic borders, common national, religious, and ethnic customs. In this study, only the geographic distance variable is considered. To emphasize on the importance of the level of economic and monetary convergence, common currency and monetary treaties variables are also included as dummy variables. According to the results, the monetary agreement between the countries has a significant coefficient of up to 3.242 which indicates that the conditions are suitable to use these tools to facilitate mutual business relationships.

An important point about monetary treaties is the design of a payment system and an appropriate settlement system for trading and foreign exchanges between countries. According to the positive coefficients of the real effective exchange rate of countries i and j , one unit increase in the real effective exchange rate of the country i increases the amount of exports of country i to j by 0.0145 units. Also one unit increase in the real effective exchange rate of the country j in year t increases the country i 's exports to country j by 0.103 units. That means the export of country j in year t to country i in year t is 0.0103 units. Therefore, the conclusion of a monetary treaty between countries that have the least difference in the real effective exchange rate, have a positive effect to a high degree of 3.242 units on trade.

According to the results, the coefficients of log variables of the GDP based on the purchasing power parity of countries to each other, the real effective exchange rate and the degree of openness of the economies are positive and significant at the level of 0.05. Which indicate these factors have positive

effects on increasing the volume of exports, which also helps the convergence of these economies.

Also, the weak and negative correlation between the dummy variables for the membership of Uzbekistan, Afghanistan, Turkmenistan, Turkey, Iran and Pakistan in ECO with natural log of the ratio of GDP based on the purchasing power parity is 0.01096. In addition, the real effective exchange rate of -0.0875 and the degree of openness of the economy at -0.1481 represent the weak level of economic convergence of these countries.

Also, the correlation between the dummy variables of membership in the Asian Clearing Union (including Iran, Sri Lanka, India and Pakistan) and in OIC (including Uzbekistan, Afghanistan, UAE, Indonesia, Iran, Azerbaijan, Pakistan, Turkmenistan, Turkey, Syria, Iraq, Saudi Arabia, Oman, Kuwait, Malaysia and Morocco) as the potential of using common currency and creating a monetary union, with the natural log of the ratio of GDP based on the purchasing power parity of countries to each other is 0.009 and -0.0333 respectively. And the OIC and ACU membership with the real effective exchange rate of countries is 0.0748 and 0.0029 respectively. All are showing a direct and positive correlation between the real effective exchange rate of the countries and the membership in the Asian Clearing Union and the OIC.

The strengthening of the potential for using common currency and the creation of a monetary union between the countries which are a member of the Asian Clearing Union, ECO and OIC, requires the economic convergence. The increase of the level of economic convergence to the point of using common currency, have a positive effect on the mutual trade. Also the negative coefficients of these variables are due to the lack of economic and monetary convergence and the impossibility of using the common currency.

Although membership of economic cooperation organizations is effective in shaping the process of economic convergence, the effect of monetary treaties on the volume of trade is far greater than the effect of membership of the countries in the regional organizations. However, the use of monetary instruments in the form of bilateral or multilateral monetary treaties or currency swap agreements requires less time to conclude a contract. By facilitating the settlement of trade and foreign exchanges using national currency or the common currency have positive effect on the level of trade relations with other major trading partners.

The coefficients of the degree of openness of the economies also indicate a direct and significant relationship between these variables and the mutual exports of these countries. So that for one unit of increase in the openness of the country i , exports from county i to country j increases by 0.002 unit, and a

unit increase in the degree of openness of the country j , increases the export of country j to i by 0.002 unit. This result implies the effectiveness of the degree of openness of countries i and j on exports.

8 Conclusions and Policy Recommendations

The present paper answers the question of whether monetary treaties and membership of countries in regional trade unions and organizations as potential for the formation of a common currency, affect the export of countries. Based on this, using the data of Iran and 50 major trading partners, the research model is designed and estimated based on the generalized gravity model using variables affecting the country's exports. Variables include GDP based on the purchasing power parity, real effective exchange rate, distance between countries, the degree of economic openness and dummy variables of the bilateral monetary treaty, membership of the Asian Clearing Union, membership of the Economic Cooperation Organization (ECO) and membership of the Organization of Islamic Cooperation (OIC). Based on the results, the impact of monetary treaties on trade is far greater than the impact of membership of countries in regional cooperation organizations.

In addition, the capacity to enter into bilateral monetary treaty between Iran and 50 major trading partners and the positive impact of these treaties on trade is very high. The feasibility study for a monetary treaty starts from countries with the highest levels of trade relations with Iran. Also, economic and monetary convergence among countries under study, which is a member of the Asian Clearing Union, ECO and OIC, can be created by designing a foreign exchange and trade settlement system based on a common currency.

The design of this system is completed using one of the world's currencies, the currency of one of the member countries that have the highest economic strength and trade volume and the minimum currency fluctuations, or a basket of currencies of countries that are members of the ACU, ECO and the OIC. They must have the biggest economy, least fluctuations in exchange rates and the highest degree of economy openness for positive impact on cross-trading between them.

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Appendix

Annex 1

Membership of Countries in the Asian Clearing Union, ECO and OIC

No.	Country	Date of Membership in Asian Clearing Union	Date of Membership in ECO	Date of Membership in OIC
1	Austria			
2	Armenia			
3	Uzbekistan		1992	1995
4	Spain			
5	Australia			
6	Afghanistan		1992	1969
7	United Arab Emirates			1971
8	Indonesia			1969
9	England			
10	Ukraine			
11	United States of America			
12	Italy			
13	Iran	1974	1964	1969
14	Azerbaijan		1992	1991
15	Argentina			
16	Germany			

17	Brazil			
18	Belgium			
19	Pakistan	1974	1964	1969
20	Portugal			
21	Thailand			
22	Taiwan			
23	Turkmenistan		1992	1992
24	Turkey		1964	1969
25	China			
26	Denmark			
27	Russia			
28	Romania			
29	Japan			
30	Sri Lanka	1974		
31	Singapore			
32	Syria			1970
33	Sweden			
34	Switzerland			
35	Iraq			1976
36	Saudi Arabia			1969
37	Oman			1970
38	France			
39	Finland			
40	Philippines			
41	Kazakhstan			
42	Canada			
43	South Korea			
44	Kuwait			1969
45	Malaysia			1969
46	Morocco			1969
47	Netherlands			
48	India	1974		
49	Hong Kong			
50	Greece			

Source: Researcher findings based on information extracted from the following resources:

1- www.asianclearingunion.org

2- www.eco.int

3- www.oic-oci.org