Determining and estimating the effective factors on the export of urea petrochemical product to export destinations (UAE, Turkey, China and India) using auto-regression with distributive lag model (ARDL)

Ali Fakour[a]*, Vida Varahrami[b], and Shahram Gohari Far[c]

[a]*MSc Student, Energy Economy, Shahid Beheshti of Tehran University, Tehran, Iran, Email: al.fakour@mail.sbu.ac.ir*

[b]*Ph.D. Assistant Professor, Faculty of Economics and Political Science, Shahid Beheshti of Tehran University, Tehran, Iran, Email: vida.varahrami@gmail.com*

[c]*MSc, Master of Chemical Engineering, Islamic Azad University, North Tehran Branch, Tehran, Iran, Email: gowharifar974@gmail.com*

ARTICLE INFO

ABSTRACT

The growth and development of the petrochemical industry, as the largest exporter of non-oil products, has a significant role in economic prosperity. From this point of view, considering the sanctions on crude oil exports in recent years and the problem of crude oil sales, it is important to pay attention to this industry as an effective factor in circumventing sanctions and currency for the country, developing the country's economic strategy and achieving sustainable economic development. In this study, the factors affecting the supply of methanol exports to the export destinations of the UAE, Turkey, China and India in the period 2001-2009 are examined and analyzed. According to the studies, the factors that have affected the supply of Iranian methanol exports can be referred to as GDP of target countries, real exchange rate, exchange rate fluctuations, trade liberalization, price exchange ratio, refinery feed prices and sanctions as livestock variables. In this study, the real exchange rate volatility index was estimated using the GARCH model and then the export supply model of Iran's methanol product was estimated by ARDL method. According to studies, the variables of GDP and trade liberalization have a positive and significant effect on the supply of Iranian exports in the short and long term, but other variables have a negative and significant effect on the supply of Iranian exports in the short and long term.

1. Introduction

One of the most important issues that is widely discussed in macroeconomics is the selection of appropriate policies and tools to eliminate imbalances and create economic stability. Exports as one of the most important sectors of the economy interact with other sectors and are mutually influenced by other sectors. In order to conduct a comprehensive study, it is necessary to consider the developments within this sector while considering the totality of policies adopted for all sectors or macroeconomic policies (Mileva, 2015 and Sekkat, 2016). Developing countries, including Iran, have a high degree of macroeconomic instability. In these countries, exchange rates, inflation and other important macro variables are fluctuating more than advanced and industrial economies, and these fluctuations, in turn, create an uncertain environment for financiers and make economic agents and investors unable to easily Decide on immediate investment. In order to reduce the dependence of Iran's economy on revenues from oil exports and the sustainability of the country's economic development, the expansion of non-oil exports and diversification of export revenues has been raised as a necessity. Meanwhile, the petrochemical sector is of special importance for various reasons, including the greater dependence of products in this field on domestic resources and having a minimum valuation compared to other economic sectors. In addition, in recent years, the petrochemical sector has always had a significant role in the country's non-oil exports (Barghi Oskooi, 2014).

Given the importance of the exchange rate as a key variable in an open economy, extensive studies on the exchange rate and issues related to exchange rate instability and uncertainty have been conducted in recent years. This rate affects many government policies in the field of economics. As a result, deviations and instability in exchange rate behavior always affect other economic sectors, including the general level of prices, total production and especially non-oil exports. In the case of Iran, government interference in the foreign exchange market and the injection of petrodollars have disrupted the foreign exchange market and practically caused the real exchange rate to deviate from the long-run balance path. In estimating the investment cost, it will lead to a lack of appropriate and optimal allocation of resources and thus increase production costs. An increase in production costs will lead to an increase in price and, consequently, a decrease in non-oil exports (Kazeruni et al., 2016).

The present article examines how exchange rate volatility, real exchange rate, GDP of target countries, refinery raw materials prices, exchange rate relation, trade liberalization and sanctions affect the supply of Iran's urea exports during the period 2001 to 2019. . In the next chapter, the theoretical foundations of the subject are reviewed, and in the chapter after that, the literature and the domestic and international history of the subject are reviewed, and in the fourth chapter, the research method is examined. In the next chapter, the model is introduced and the appropriate model is specified to examine the research hypotheses. In the last chapter, the results of model estimation and analysis of research findings are presented and the final Part of the article is dedicated to concluding and providing policy recommendations.

2. Theoretical foundations

In recent years, the discussion of factors affecting the supply of a country's exports, especially factors affecting the supply of non-oil exports has become one of the main concerns of economists. Economic modeling has been proposed by various people to study this issue and macroeconomic factors affecting non-oil exports. One of the most important empirical studies conducted by Boug and Fagereng (2007), Chitt et al. (2008) is the model proposed for the export supply of non-oil products. Which is presented as Equation (1).

$$LNOX_t = \beta1 + \beta2 LRER_t + \beta3 LVOL_t + \beta4 LGDP_t \qquad (E1) + \beta5 LTOT_t + \beta6 \Delta LP_t$$

In this equation, the dependent variable indicates the logarithm of product exports and the explanatory variables include the real exchange rate logarithm, the real exchange rate volatility index logarithm, the GDP logarithm, the exchange relationship logarithm, and finally the real exchange rate deviation logarithm.

On the other hand, in addition to the economic factors discussed in relation (1), non-economic factors, including trade liberalization, also affect the export supply of products. Trade liberalization and the lifting of trade restrictions is one of the main concerns of policymakers in different countries. In Nigeria, the ARDL approach has been used to analyze the impact of trade liberalization policy on non-oil export trade. Evidence supports trade liberalization as a stimulant of non-oil export growth. Consequently, this study proposes a private partnership agreement for private

sector productivity (a major player in non-oil export trade) to make the most of the benefits of liberalization in Nigeria (Ojike et al. (2020)).

Besides, regarding the effect of real exchange rate instability on exports, it can be stated that real exchange rate instability indicates uncertainty in the process of relative prices between countries. These sharp fluctuations create an unstable and uncertain environment in the economy. Basically, with the disturbance of the real exchange rate, the savings and investment process becomes irrational, and the optimal allocation of resources will not be possible. In an international system, the value of the national currency plays a key role in determining the economic costs associated with investing, exporting and importing and its impact on economic growth. Frequent fluctuations in the real exchange rate can cause uncertainty and volatile conditions in the field of profits from international exchanges, reducing trade and also slowing the flow of capital by reducing investment in foreign activities and disrupting the portfolio of financial assets. And the multiplicity of real exchange rate fluctuations raises the price of tradable goods and increases the risk of covering unforeseen changes in the real exchange rate. , Creates on exports (Mtembu and Motlaleng, 2017)

Trade liberalization is considered as a non-economic variable in the model, which is equal to the ratio of total imports plus exports to the country's GDP. Given this issue, if diverse markets for exports are discovered and the necessary export support is increased, this issue will increase the effectiveness of trade liberalization variables and thus increase export supply. One of the factors affecting the country's export trend is the ratio of world prices to domestic prices. In other words, this ratio shows the competitiveness of the domestic product compared to the foreign counterpart. The lower the cost price of a domestic product compared to a foreign one, the higher the country's export potential and the higher the global demand for the domestic product.

Beside that, irregular instability of the real exchange rate can severely affect the value of exported goods and the cost of imported goods in the national currency. On the other hand, some importers and exporters may reduce their trading activities and with those Exporters and importers who continue to operate in global markets in an uncertain and volatile environment of the real exchange rate may demand more profit to bear the risks. Accordingly, the more risk-averse the country's foreign trade is and the greater the share of trade in GDP, these fluctuations will have a greater impact on reducing domestic production, increasing prices and limiting exports, and restricting the sense of stability and security required for economic planning and activities (Boug and Fagereng, 2014).

If the exchange rate is severely volatile, exporters and importers will not have a clear idea of the export earnings as well as the cost of imports in domestic currency at the time of the contract. Of course, the exchange value of exported and imported goods is known at the time of the contract, but since it takes a while to receive export revenue and sell imported goods, exchange rate fluctuations can severely affect the value of exported goods and the cost of imported goods. And these revenues and expenses may be very different when we make a transaction. In this situation, depending on the degree of risk aversion of foreign trade actors in the country and the situation of the domestic market is faced with one of the following situations (Kouchakzadeh et al., 2013)

Some importers and exporters will generally refrain from such trades because they do not bear the risk that their income will suddenly change. In such situation, the amount of foreign exchanges will be reduced. The optimal allocation of resources will be disrupted and investors will be forced to invest their capital in another direction that is more profitable and less risky.

Some exporters and importers who cease their activities demand higher profits for their risk-taking. If these profits do not accrue to them, they will invest in activities that constitute global demand and no country has the power to set world prices. Foreign trade operators will offset this increase in profits by buying cheaper from manufacturers and selling more expensively to domestic buyers. Buying cheaper than the producer will reduce the incentive to produce and reduce the production of export goods, and selling at a higher price to the domestic consumer will increase the general level of prices, which will lead to domestic inflation, so the more risk-averse the country's foreign trade agents are And the share of foreign trade in GDP is higher, Exchange rate fluctuations will have a greater impact on reducing domestic production, increasing prices and threatening foreign trade. In this situation, there will be many unforeseen gains and losses, but the stability and security required for economic activities will be greatly weakened.

Having a real balance exchange rate does not mean that the real exchange rate is always in equilibrium. Conversely, in practice, the real exchange rate in the

short run can deviate from its long-run equilibrium value. This deviation from the equilibrium rate at the real exchange rate is called imbalance. Sebastian Edwards, one of the economists who has conducted comprehensive studies on the real exchange rate of equilibrium and imbalance, believes that one of the most important reasons for imbalance at the real exchange rate is the inconsistency between monetary and financial policy and the equality rate system used. In other words, he expresses that the choice of an equality rate system places certain constraints on macro-policies. If these restrictions are not observed, unbalanced conditions will arise, followed by imbalances at the real exchange rate. McDonald, for example, attributes the real exchange rate deviation from purchasing power parity to the influence of variables such as efficiency, the combination of government spending between traded and non-traded goods, government fiscal policy, private savings, and real oil prices (Caputo, 2015).

3. A review of domestic and international empirical studies

In Iran, different studies have been conducted in relation to the supply of petrochemical products and non-oil exports using different economic models, which are discussed below.

In the study of Hosseini et al. (2016) on "Dynamic model for formulating effective capacity development policies in Iran's petrochemical industry to complete the value chain" This study aims to determine the factors affecting the development of the petrochemical industry and model the mechanism of budgeting to increase capacity with Using the system dynamics approach, the quantitative system dynamics model is made based on causal relationships and development budget allocation mechanisms among classified products. This structure is used to simulate the model and examine the basic variables related to each product such as production capacity value, production rate, domestic sales revenue and exports. According to the simulation results, in 2025, Iran will have an approximate capacity of 104 million tons of petrochemical products, which is not desirable. In this study, the policy of improving the budget plan and allocation is introduced as the most effective solution to achieve the development of the petrochemical industry and increase exports. By implementing this policy, total production capacity and revenue in 2025 will be improved by 4% and 13%, respectively, compared to the basic plan. (Hajiebrahimi Farashah, Sazvar, & Hosseini, 2021)

Saadati et al. (2016) in a study entitled "Real exchange rate shock and export-oriented trades in Iran" including the export of petrochemical industries as one of the industries studied in this study using nonlinear asymmetric model (NARDL) to analyze the effects of shock The real exchange rate of the industry's exports took place during the years 2012-2020, and the research findings showed that when the exchange rate increases, the price of products in the international arena increases, and according to this study, the positive effects of the exchange rate of the petrochemical industry were greater. . In this study, since the results of the whole NARDL model were statistically significant (based on FBound, for long-term models and F-statistic, for dynamic short-term models), the nonlinearity of the relationship between the variables was significantly confirmed. (Saadati, Honarmandi, & Zarei, 2020)

Promoters and Goodarzi (1399) in a study entitled "Study of the comparative advantage of petrochemical production and export of Arvand Mahshahr Petrochemical Company" to examine the comparative advantage of production and export of petrochemical products of this company and the factors affecting it using RCA indicators or obvious comparative advantage The apparent comparative comparative advantage of RSCA, trade intensity and production intensity index, Mitchell MI index, etc. has been discussed, and the result is that the higher the comparative advantage of a country in the production of petrochemical products, the more exports that country has. Will have more and more competitiveness in global markets.

In Bahadoran's (2016) study on "The Impact of International Sanctions on Iran's Petrochemical Industry with Emphasis on Exports and Foreign Direct Investment" the research method is descriptive and analytical and the ARDL vector autoregression method is used to study co-integration and relationships. Long-term has been used between variables. The result of model estimation shows a positive and significant effect of total production of petrochemical complexes on attracting foreign direct investment in the petrochemical industry during the research period. The effect of the ratio of export to production volume of petrochemical complexes on attracting foreign direct investment in the petrochemical industry is positive and statistically significant. The effect of profit variable on attracting foreign direct investment in the petrochemical industry is positive and significant, and the more foreign direct investment is attracted, the more positive and significant it will be on the export of petrochemical products.

Ali Karami et al. (1398) in a study entitled The study of the effects of price and non-price factors on Iran's non-oil exports study the issue that in addition to economic factors affecting exports such as prices and GDP, non-economic factors that are not visible are also effective . Therefore, the results indicate a significant difference in elasticities in the estimation of the export demand function despite non-price factors and without evaluating these factors. Therefore, ignoring these factors in estimating the export demand function leads to covering the effect of non-price factors by price factors and consequently skew in estimating elasticities. (Karami, Hadian, Zadeh, & Javaheri, 2019)

In a study conducted by Varhrami et al. (2015) entitled The Impact of Privatization on the Export Performance of Iranian Petrochemical Companies (Case Study: Polyethylene), the effect of privatization policy on the export performance of four major petrochemical companies (Amirkabir, Jam, Maroon and Ariasasol) was examined. The result was that; The effect of privatization on the export of petrochemical products (polyethylene) of the mentioned companies to the two target countries, namely (China and India) together and separately during the period under study in this study is negative, in other words, privatization of petrochemical companies with the method done in Iran Their export volume has increased. In fact, the present study shows that privatization has not been successful in the petrochemical industry (with the method done in Iran) and with the export approach that the present study sought to examine during the years under review. (Varhrami, Vida, Dargahi, Biranvand, & Frank, 2018)

Calligrapher Yazdi and Rajabzadeh (2017) in a study entitled The effect of real exchange rate changes on Iran's non-oil exports In this study, the effect of real exchange rate changes on Iran's non-oil exports, ARDL method for the period 1392-1362, in the short, long term and The error correction model is estimated. The obtained results show that the coefficients of the variables of GDP of Iran's trading partners, real exchange rate and GDP In Iran, at the level of 5%, both in the long run and in the short run, it was positive and significant, while the variable coefficient of credits granted to the private sector in the short run was meaningless and in the long run significant and positive. (Yazdi, Zadeh, & Ramin, 2017)

Kazeruni et al. (2016) in a study entitled The effect of real effective exchange rate deviation on Iran's non-oil exports assessed that given the importance of the exchange rate as a key variable in an open economy, extensive studies on exchange rates and related issues The instability and uncertainty of the exchange rate has been addressed in recent years. This rate affects many of the government's economic policies. As a result, deviations and instability in exchange rate behavior always affect other economic sectors, including the general level of prices, total production, and especially non-oil exports. In the case of Iran, government intervention in the foreign exchange market and the injection of petrodollars have disrupted the foreign exchange market and effectively diverted the real exchange rate from the long-run equilibrium path. Deviation of the real exchange rate from its long-run equilibrium path in the sense of disturbing relative prices and estimating investment costs will lead to inadequate and optimal allocation of resources and thus increase production costs. An increase in production costs will lead to higher prices and, consequently, a decrease in non-oil exports, especially of petrochemical products. (Kazeruni et al., 2016)

In a study on "Does Trade Liberalization Policy Improve the Performance of Non-Oil Export Trade in Nigeria?" This study uses the ARDL approach to analyze the impact of trade liberalization policy on non-oil export trade. Evidence supports a policy of trade liberalization as a driver of non-oil export growth. As a result, this study proposes a private partnership agreement for private sector productivity (a major player in non-oil export trade) to make the most of the benefits of liberalization in Nigeria. (Ikpe et al., 2020)

In a study, they examined the importance of non-price competition and financial factors in explaining the performance of non-oil exports of 20 regions of Italy during the years 2013-2000 and the years before the crisis using the method of dynamic panel data analysis. The results of the study show that supply side factors are important determinants of export behavior and performance. Financial development also has a strong impact on regional trade, because higher financial development means more credit is available and, consequently, the value of exports is higher. This study also shows that investment and the desire for research and development are effective in increasing non-oil exports. (Algeria, Aquino, & Mannarino, 2018)

A study examining the short-term and long-term effects of Sri Lankan export determinants, in which the export of petrochemical products is also seen as one of the most influential sectors, in the period 1980-2013 with the help of the vector error correction model. In this study, foreign direct investment, interest payments on

foreign debt, imports, gross capital and per capita income were examined as determinants of exports. The results show that all factors have a significant impact on exports in the long run, including foreign direct investment, interest payments on foreign debt and imports, a positive and significant effect, and the formation of gross capital and per capita income of these destination countries have a negative effect. Have had. In the short run, the effects on foreign direct investment and the per capita income of the destination countries, as well as the effects on interest payments on foreign debt, imports and gross capital formation, were negligible. (Bhavan, 2016)

A study examined the effect of the exchange rate of Nigeria's non-oil exports during the years 1986-2013. In this study, the generalized Dickey-Fuller test (ADF) was used to investigate the staticity of the research variables and the Johansson co-integration test was used to investigate the short-term and long-term relationships between the variables. The results of the Johansson co-integration test showed that there is a long-term relationship between the research variables. In order to investigate the impact of economic factors on Nigeria's non-oil exports, the ordinary least squares (OLS) technique was used. The results of this study showed that effective exchange rates, money supply, loans to the private sector and economic performance have a significant impact on the growth of Nigeria's non-oil exports. The results of this study also showed that the increase in the exchange rate has a negative impact on Nigeria's non-oil exports during the study period. (Imoughele & Ismaila, 2015)

A study examined the effect of fluctuations in the exchange rate of Nigeria's non-oil exports during the years 1986-2008. In this study, in order to study the statics of variables, the generalized Dickey-Fuller and Phillips-Prone tests were used to investigate the existence of long-term relationships, the Johansson co-integration test and to estimate the model and the factors affecting non-oil exports. The results of this study showed that exchange rates, exchange rate fluctuations and foreign income have positive effects on non-oil exports in the long run. While imports have adverse effects on exports in the long run. The results of the vector error correction (ECM) model also showed that in the short run, intermittent foreign income has a positive effect on Nigeria's non-oil exports. It has a positive effect on non-oil exports and, finally, in the short run, exchange rate fluctuations do not have a significant effect on non-oil exports. (Akinlo & Adejumo, 2014)

A study examines the "effect of real exchange rates on non-oil exports" in Azerbaijan using the method of asymmetric error correction. He has used the threshold autoregressive method (MTAR) and the threshold autoregressive method (TAR) in the framework of asymmetry and asymmetric adjustment and has used the annual data of 2000-2010 quarterly. The main finding of his study is that there is a significant relationship between non-oil exports, non-oil trade volume based on real exchange rates and foreign income, but the adjustment process is not asymmetric to the equilibrium level. (Hasanov, 2012)

According to the studies conducted and reviewing these studies, it is concluded that economic factors and variables such as real exchange rates, exchange rate fluctuations, exchange rate, GDP of countries affect the supply of non-oil exports. In the present study, the proposed innovation is the introduction of a non-economic variable, including the trade liberalization variable. In this study, the effects of this variable on Iran's methanol exports are discussed.

4. Research method

In this research, the supply model of urea export to the target export destinations is estimated. Assuming that Iran, as a developing country, is a small and cost-effective supplier and sells its products in a competitive market, based on the economic literature and empirical studies conducted by Boug and Fegerang (2007), Chitt et al. (2008) The proposed model for the supply of exports of Iranian petrochemical products is as follows:

$$LX_i^s = \alpha_0 + \alpha_1 LRER_t + \alpha_2 LGDP_t + \alpha_3 LTOT_t + \alpha_4 LGP_t + \alpha_5 LCL_t + \alpha_6 LVOL_t + D_{SA} + V_t$$

Where the index t represents the time dimension and the index i represents the countries in the data.

LX: Supplied export logarithm of methanol and urea, LRER: real exchange rate logarithm, LGDP: target country GDP logarithm, LTOT: exchange relationship logarithm, LTC: transportation cost logarithm, LGP: natural gas feed price logarithm, LCL: trade liberalization logarithm , LVOL: Real exchange rate volatility D_{SA}: Virtual variable of sanctions.

The real RER exchange rate is obtained by multiplying the informal market rate by the ratio of the US wholesale price index to the Iranian consumer price index (Abbasian et al., 2012).

RER = NER*(WPI_{ic}/CPI_{IR})

Where in NER: nominal exchange rate in the informal market (parity of one US dollar against the rial, source: Central Bank)

WPI_{us}: The wholesale price index of the destination country is used as a representative of the commodity price index (base year 1390, no unit, source of the International Monetary Fund IFS).

CPI_{IR}: Iran Consumer Price Index (base year 90, Central Bank source).

In this project, the exchange relation is calculated as follows:

$$TOT = \frac{PEX}{PIM}$$

PEX is the price index of exported products and PIM is the price index of imported products. D_{SA} as a virtual variable of sanctions (sanctions on the petrochemical industry that has been in force since 2010), which is number one for sanctions years and zero for non-sanctions years.[1]

In the present study, after specifying the export supply function, the ARDL method is used to investigate the factors affecting the export of petrochemical products

(urea); Then, after examining the reliability of the model variables by export destinations of UAE, Turkey, China and India [2] for the years 1380-1388, the model is specified and estimated separately by the self-regression vector model with wide distribution intervals (ARDL).

The novelty of the present study compared to previous studies is that in this study, non-economic variables including trade liberalization variable in the export supply model along with economic variables have been used and the effects of these variables on the export supply performance of the country's urea product have been studied.

4.1. Checking the reliability of variables

One of the important requirements in estimating economic equations with time series data and estimating the model by the conventional least squares method is to perform a reliability test. There are several methods for distinguishing stable time series from unreliable, the most important of which is the generalized Dicky-Fuller and Dicky-Fuller unit root test. Therefore, first, the reliability of the proposed model variables based on the generalized Dickey-Fuller (ADF[3]) test is examined to determine whether the regression is false or not. The null hypothesis of this test based on the unit root of time series variables based on McKinnon test statistics is examined in the following tables.

Table 1: Results of the reliability of variables for Turkey.

LCL	LVOL	LGP	LTOTu	LGDPtur	LRER	Lxutur	Variable name
I(1)	I(0)	I(1)	I(1)	I(0)	I(1)	I(1)	Condition
-3.7700	-12.3500	-3.8207	-4.4320	-5.7264	-3.7121	-5.4975	Statistics
0.0126	0.0000	0.0121	0.0034	0.0012	0.0141	0.0021	Prob

Source: Research Findings

Table 2: Results of the reliability study of variables for China.

LGDPch	Lxuch	Variable name
I(1)	I(1)	Condition
-4.8468	-3.4738	Statistics
0.0082	0.0259	Prob

Source: Research Findings

---

[1] Statistical information related to the data was derived from the National Iranian Petrochemical Company.

[2] The reason for selecting these four countries as export destination countries in the present study is that in recent

years, the largest volume of urea exports has been toward these destinations.

[3] Augmented Dickey-Fuller

Table 3: Results of the reliability of variables for India.

LGDPin	Lxuin	Variable name
I (1)	I (1)	Condition
-4.8167	-3.9626	Statistics
0.0070	0.0092	Prob

Source: Research Findings

Table 4: Results of the reliability of variables for the UAE.

LGDPuae	Lxuuae	Variable name
I (1)	I(1)	Condition
-4.0947	-5.2266	Statistics
0.0255	0.0007	Prob

Source: Research Findings

4.2. Specifying the exchange rate instability model

The final step in estimating the real exchange rate volatility index is to estimate the conditional variance equation, including the disorder under variance heterogeneity conditions. To estimate the conditional variance equation, the squared squares of the mean equation disorder are estimated and then the self-regression order and the moving average are determined based on the correlation graph. In addition, it is necessary to test the distribution of disorders in the conditional variance equation and, if the distribution is not normal, use the generalized error distribution. The results of the conditional variance equation disorder distribution test are as follows:

Table5: Results of Jarque-Bera test to check the normality of the conditional variance equation distribution terms.

Probability value	Jarque-Bera statistic value (J-B)
0.0000	81.34

Source: Research Findings

The results of the table above show that the distribution of sentences of the mean equation disorder does not have a normal distribution and therefore the generalized error distribution can be considered to estimate the conditional variance equation.

In order to study and estimate exchange rate fluctuations, it is necessary to use the GARCH model in Ives software. Before estimating the GARCH model, the effect of the arch must first be examined. In fact, this model is the background for estimating the GARCH model. According to the results obtained from the ARCH model estimate, which is shown in the table below. The results indicate that Arch has an effect on estimating the real exchange rate volatility model.

Table 6: Results of ARCH test for standardized wastes of GARCH model (0,1).

F-statistic	7.6372	Prob. F(1,14)	0.0021
Obs*R-squared	6.2195	Prob. Chi-Square (1)	0.0043

Source: Research Findings

The results obtained from estimating the mean model and conditional variance are as follows:

Mean equation:
DL(VOL) = -0.001621 + 0.174 AR (12) + 0/412 MA (1) + ε

(0.00023) (0.031) (0.054)

Equation of variance:
ht = 2.45 εt-12 + 0/483 ht-1

(0.761) (0.275)

Also, to estimate the conditional variance equation of the perturbation sentences, the square diagram of the

perturbation sentences of the mean equation should be used, based on which the optimal autoregressive interference and the moving average in the variance equation should be determined. Therefore, the most suitable model for estimating the real exchange rate

volatility index is the GARCH model (0,1), the results of which are presented in the table below:

Table 7: GARCH model estimation (0.1)

Probability value	Statistical value of Z	Coefficient	Variable name
----	----	----	H_t
0.0347	2.1122	0.004	C
0.0000	6.4678	0.86	H_{t-1}

Source: Research Findings

Considering the necessary and sufficient conditions of the generalized self-regression model under the conditions of variance heterogeneity, the GARCH (0,1) model is a suitable model compared to other competing models. Therefore, using Ives software, the real exchange rate fluctuations extracted by the GARCH model and entered the model, which according to the model estimation results, the negative impact of this variable on the supply of methanol and urea exports has been proven.

5. Estimation of research model

In this section, in order to estimate the effect of real exchange rate deviation and nominal exchange rate instability on methanol and urea exports, it is estimated using the ARDL method and annual data from 2009-2010. Before estimating the model, the mana test should be performed using the generalized Dickey-Fuller method, which was performed in the previous section to ensure that none of the mana variables are higher than one. In this case, false regression is prevented. Because when there are mana variables of order higher than one in the model, calculated F is not reliable and meaningful. The F test is based on the assumption that all variables in the model are I (0) or I (1). The results show that the time series are either staggered from zero and at a static level or are static with a one-time differentiation. Therefore, there is no problem in terms of the existence of variables I (2) and more and the results can be assured. Then, using the bond co-integration test, the existence of a long-term relationship in the model is examined and the classical hypotheses test and the coefficient stability test and the presentation of a long-term relationship are discussed. Finally, the short-term relationship of the model is presented. The results of diagnostic tests and structural stability tests show that the classical assumptions for the

desired estimate are established and the coefficients are stable.

Given that the order of co-accumulation of the variables is the same, the Johansson summative test can be used to determine the convergence vector. The concept of cohesiveness evokes the existence of a long-term equilibrium relationship to which the economic system moves over time. In multivariate analysis of time series, there may be more than one long-run aggregation relationship between variables, in which case Johansson has the ability to detect multiple aggregation and the best aggregation vector through maximum likelihood estimators. In addition, this method has the ability to test the aggregate vector in a constrained manner and to estimate the speed adjustment parameters. Therefore, this test is one of the most complete tools in estimating economic time series patterns.

In the combined test of this research, a systemic approach has been prevailing, although the principle of modeling has been a single equation. In this method, the determination and estimation of convergence vectors (determination of coefficients related to long-run equilibrium relationships) between variables is done using the vector coefficients of self-explanatory model (VAR) between those variables. The basis of this method is based on the relationship between the order of a matrix and its characteristic root, and in this method, two types of tests are presented to obtain the number of integral vectors.

The Eviews computer package and the Johansson summative test, called the Ratio Likelihood, are introduced as the basis for the judgment. If the LR is less than the critical values of the table at different levels of confidence, the assumption of the existence of a cohesive vector is accepted. The following table, which is related to the Johansson summative test, was performed with the

Eviews program, in which the existence of a long-run relationship between dependent and explanatory variables was tested and the existence of a long-term relationship was proved.

Table 8: Results of the collective test of urea exports to China.

Statistics of maximum eigenvalues		Effect test		Special amount	Hypothesis zero
Critical value at 95% level	Statistics of maximum eigenvalues	Critical value at 95% level	Effect statistics		
75.88736	117.36212	145.23174	263.28214	0.993413	r=0
45.96429	67.82613	96.35271	168.37322	0.945321	r≤1
39.36481	42.23743	v73.64829	s83.92713	0.853852	r≤2
34.35795	21.44721	53.27452	45.43094	0.725520	r≤3
22.77497	11.36492	27.63781	20.47252	0.648227	r≤4
16.37462	5.26487	11.73521	6.36260	0.362494	r≤5
4.24772	0.53728	2.74210	0.75381	0.013592	r≤6

Source: Research Findings

les. Confirmatory factor analysis evaluates the degree of conformity between the theoretical structure and the experimental structure of the research. In the below shows the factor analysis model with standardized path coefficients and loads (Figures 3 & 4).

Table 9: Distribution of variables based on Kolmogorov-Smirnov test.

Parameters	Kolmogorov-Smirnov test		Distribution type
	Statics value	Significance level	
Human resources	0.113	0.00	Abnormal
Leadership	0.157	0.00	Abnormal
External environment	0.097	0.00	Abnormal
Internal processes	0.199	0.00	Abnormal
Financial factors	0.108	0.00	Abnormal
Production & procurement	0.161	0.00	Abnormal
Marketing	0.079	0.00	Abnormal

Source: Research Findings

Table 10: Results of the collective test of urea exports to Turkey

Statistics of maximum eigenvalues		Effect test		Special amount	Hypothesis zero
Critical value at 95% level	Statistics of maximum eigenvalues	Critical value at 95% level	Effect statistics		
48.37642	74.58732	167.37255	224.53126	0.995742	r=0
44.50392	60.37573	104.74824	169.37214	0.936614	r≤1
35.018355	35.95742	83.76309	94.28452	0.858391	r≤2
27.60031	25.55829	59.32758	58.37251	0.757690	r≤3
23.91836	11.58463	28.47673	25.85626	0.549581	r≤4
15.99058	7.80537	18.49462	14.95984	0.446640	r≤5
2.45193	1.44429	3.857443	2.598375	0.071913	r≤6

Source: Research Findings

Table 11: Results of the collective test of urea exports to the UAE.

Statistics of maximum eigenvalues		Effect test		Special amount	Hypothesis zero
Critical value at 95% level	Statistics of maximum eigenvalues	Critical value at 95% level	Effect statistics		
48.48772	115.82092	128.48261	217.31065	0.990021	r=0
43.57392	49.94025	97.47414	163.82014	0.957251	r≤1
36.47620	46.94762	79.47203	121.47359	0.927553	r≤2
30.57495	29.57360	75.39203	73.28502	0.827453	r≤3
27.36103	24.90736	49.88508	46.38104	0.756625	r≤4
14.47200	4.58610	15.74924	11.59373	0.394014	r≤5
2.57391	1.15029	3.89201	2.457750	0.083501	r≤6

Source: Research Findings

In order to estimate the main relationship of the research model, first due to the limited number of observations, the maximum value of 1 interrupt for the dependent variable and for the explanatory variables was not considered interrupt due to alignment between variables and the impossibility of estimating the model. Ordinary squares were estimated, then using the Schwartz-Bayesian criterion, one of the estimated equations was selected as the dynamic relationship between the variables. The following table in the obtained dynamic relation, the optimal interruption of the total export of methanol and urea petrochemical products, one and the other variables were considered without interruption and the model was estimated as ARDL (1,0,0,0,0,0,0). Exports of urea to China in 1982,

1987 and 1994, exports have jumped and caused structural failure, so these seals have entered the model as a livestock variable. That is, due to the existing years, the shock has entered the model and the model has experienced fluctuations in the country's export supply, which has affected the dependence of the dependent variable on the explanatory variables. These seals have had a significant negative impact on urea exports to China in the short term. Classic assumptions are also appropriate. For the analysis of coefficients, for the sake of brevity in the article, a case is referred to as an example of the exchange relationship in the short term, if it increases by one percent, the export rate decreases by 2.74 percent.

Table 12: Results of dynamic model estimation (short-term estimation of urea export supply function to China).

t statistic	Standard deviation	Coefficient	Variable name
2.985 (0.0235)	0.0621	1.059	LXUCH(-1)
-5.190 (0.0020)	0/7524	3.905	LGDPCH
-2.920 (0.0266)	1.0026	-2.928	LRER
1.928 (0.0121)	0.3873	-2.747	LTOTU
-4.912 (0.0027)	1.8817	2.341	LCL
4.529 (0.0040)	0.4442	-2.012	LGP
6.025 (0.0009)	0.3855	-2.322	LVOL
-0.3558 (0.7341)	0.3548	-0.126	DSA
-2.1837 (0.0717)	0.3085	-0/673	Dum82
-3.7227 (0.0098)	0.3679	-1.369	DUM87
-14.667 (0.0000)	0.3662	-5.371	DUM94
R^2=0.991	F(11,4)=67.095	DW=2.1211	-
Assumption test			
Analysis of variance χ2= 0.3310 [0.4218] Self-correlation test χ2 = 0.8543 [0.9653] Normality test χ2 = 1.1792 [0.5545]			

Source: Research Findings

Table 13: Results of dynamic model estimation (short-term estimation of urea export supply function to India)

t statistic	Standard deviation	Coefficient	Variable name
9.101 (0.0003)	0.0960	0.874	LXUIN (-1)
-1.518 (0.0214)	0.9227	1.401	LGDPIN
-2.642 (0.0459)	0.6160	-1.627	LRER
-0.094 (0.928)	0.2969	-0.027	LTOTU
-4.1526 (0.0089)	1.2732	5.287	LCL
-1.944 (0.1094)	0.4647	-0.903	LGP
1.774 (0.0012)	0.3461	-0.614	LVOL
-2.335 (0.0667)	0.4937	-1.153	DSA
-6.895 (0.0010)	0.2308	-1.591	Dum82
-3.543 (0.0165)	0.4342	-1.538	DUM88
4.811 (0.0048)	0.3447	1.658	DUM91
2.4523 (0.0578)	0.2215	0.543	DUM96
R^2=0.997	F (12,5) =154.68	DW=3.144	-
آزمون فرض			
Analysis of variance $\chi2$= 0.4369 [0.6203] Self-correlation test $\chi2$ = 0.6591 [0.6512] Normality test $\chi2$ = 0.5076 [0.7758]			

Source: Research Findings

In Table 14, urea exports to India jumped in 1982, and in 1988, 1991 and 1996, the exchange rate and the real exchange rate jumped. Also, in 1991 and 1996, trade liberalization shows a jump, so these years have been included in the model as livestock variables. In the short term, the embargo has had a significant negative impact on urea exports to India. Refers to a case of coefficient analysis; For example, with a one percent increase in sanctions, exports will decrease by 1.15 percent.

Table 14: Results of dynamic model estimation (short-term estimation of urea export supply function to Turkey)

t statistic	Standard deviation	Coefficient	Variable name
4.530 (0.0062)	0.0724	0.328	LXUTUR (-1)
-3.164 (0.0612)	0.7096	0.115	LGDPTUR
-3.424 (0.018)	0.5472	-1.873	LRER
4.944 (0.0043)	0.2537	-1.254	LTOTU
-0.293 (0.7806)	0.9433	0.277	LCL
-3.554 (0.0163)	0.2490	-0.885	LGP
2.713 (0.0421)	0.3093	-0.839	LVOL
3.565 (0.0161)	0.1633	-0.582	DSA
-5.042 (0.0040)	0.1833	-0.924	Dum83
-2.708 (0.0424)	0.1803	-0.488	DUM85
9.879 (0.0002)	0.1737	1.716	DUM93
-4.675 (0.0055)	0.1789	-0.836	DUM96
R^2=0.999	F (12,5) =445.51	DW=2.606	-
Analysis of variance $\chi2$= 0.2036 [0.1244] Self-correlation test $\chi2$ = 0.7231			

[0.1321]			
Normality tes χ2 = 03358			
[0.8454]			

Source: Research Findings

In the export of urea to Turkey and the UAE, some years have been used as a variable, which is due to fluctuations in model variables in these years.

Table 15: Results of dynamic model estimation (short-term estimation of urea product supply supply to UAE)

t statistic	Standard deviation	Coefficient	Variable name
-6.894 (0.0023)	0.1250	-0.862	LXUUAE (-1)
3.689 (0.0210)	2.2410	8.269	LGDPUAE
2.984 (0.0406)	2.1945	-6.549	LRER
-1.729 (0.0312)	0.7698	-1.331	LTOTU
2.389 (0.0752)	4.634	11.076	LCL
-2.925 (0.0430)	0.8210	-2.402	LGP
-1.864 (0.0120)	0.7189	-1.340	LVOL
-2.945 (0.0421)	0.3974	-1.170	DSA
-5.216 (0.0064)	0.5234	-2.730	Dum81
-2.374 (0.0765)	0.4094	-0.972	DUM90
9.761 (0.0006)	0.3443	3.361	DUM92
9.143 (0.0008)	0.4761	4.353	DUM93
6.519 (0.0029)	0.3985	2.598	DUM96
R^2=0.994	F (13,6)=55.071	DW=2.453	-
Analysis of variance χ2= 0.1894 [0.4312] Self-correlation test χ2 = 0.5310 [0.2508] Normality test χ2 = 0.3788 [0.8274]			

Source: Research Findings

In estimating the above tables, all variables had a high t-statistic and were mostly significant at the 5% error level. The hypothesis test also indicated the establishment of classical hypotheses.

6. Comparison of short-term coefficients of urea export supply function

The urea export supply variable with one lag has the greatest impact on China's export model (1.059), followed by India, the UAE and Turkey. The important point is that in the UAE model, this variable has a negative and significant effect. UAE GDP with a coefficient of 8.269, China 3.905, India 1.401 and Turkey 0.115 have the greatest impact on exports, respectively. The real exchange rate in the UAE model with a coefficient of -6.549 has the most negative impact on exports, followed by China, Turkey and India. The urea exchange relationship has a negative and significant effect on exports. In the estimated models, the Chinese model has the most negative impact (2-928), followed by the UAE (-1.331) and Turkey (-1.254). For India, this variable is meaningless. Trade liberalization for the UAE has a coefficient of 11.076, followed by India with a coefficient of 5.287 and China with a coefficient of 2.341 (this variable is not significant in the export model to Turkey). The variable of feed price has a negative and significant effect on the supply of exports. The most impact is related to the UAE (2-402), followed by China (-2.012) and Turkey (-1.885). This variable is not significant in the export model to India. Real exchange rate volatility has a significant negative effect on all models of urea export supply. The most influential models are China (-2.332), UAE (-1.340), Turkey (-0.839) and India (-0.614), respectively. In the short term, the embargo variable has had a negative impact on

exports to India (-1.153) and the UAE (-1.170) and has a negative and significant impact on Turkey (-0.582). This variable is not significant for the supply model of urea exports to China.

6.1.. Long-term estimate of urea export supply

After ensuring the classical hypotheses and the existence of a long-term relationship and the stability test, the coefficients of long-term results are presented. The results of long-term estimation by ARDL method, with a maximum of one interval and based on Schwartz-Bayesian criteria are presented in the following tables.

Table 16: Results of long-term estimates of supply of urea exports to China ARDL (1,0,0,0,0,0,0).

Probability	t statistic	Standard deviation	Coefficient	Variable
0.0020	-5.190	0.7524	3.905	LGDPCH
0.0266	-2.920	1.0026	-2.928	LRER
0.1020	1.928	0.3873	-0.747	LTOTU
0.0027	-4.912	1.8817	9.243	LCL
0.0040	4.529	0.4442	-2.012	LGP
0.0009	6.025	0.3855	-2.322	LVOL
0.7341	-0.3558	0.3548	-0.126	Dsa

Source: Research Findings

The results of long-term estimates of the supply of urea exports to China show that China's GDP ratio is 3.905, ie with a one percent increase in China's GDP, exports increase by 3.905 percent. Trade liberalization has a coefficient of 9.243, ie with an increase of one percent in trade liberalization, exports increase by 9.243 percent. The real exchange rate coefficient is -2.928, ie with an increase of one percent in the real exchange rate,

exports decrease by 2.928 percent. The feed price coefficient is equal to -0.012, ie with an increase of one percent in the feed price, urea exports decrease by 2.012 percent. The real exchange rate volatility coefficient is -2.232, ie with a one percent increase in real exchange rate volatility, urea exports to China decrease by 2.322 percent.

Table **17**: Results from the long-term estimate of supply of urea exports to India ARDL (1,0,0,0,0,0,0).

Probability	t statistic	Standard deviation	Coefficient	Variable
0.0432	-1.518	0.9227	1.401	LGDPIN
0.0459	-2.642	0.6160	-1.627	LRER
0.9287	-0.0941	0.2969	-0.027	LTOTU
0.0089	-4.152	1.2732	5.287	LCL
0.1094	-1.944	0.4647	-0.903	LGP
0.1362	1.774	0.3461	-0.6140	LVOL
0.0667	-2.335	0.4937	-1.153	Dsa

Source: Research Findings

In the long-run model of supply of urea exports to India, only the variables of India's GDP, real exchange rate and trade liberalization have significant coefficients. As the coefficient of GDP is equal to 1.401, ie with a one percent increase in India's GDP, urea exports increase by 1.401 percent. The real exchange rate coefficient is -1.627, ie with a one percent increase in the real exchange rate, the export rate decreases by 1.627 percent. Finally,

the trade liberalization coefficient is equal to 5.287, which means that with a one percent increase in trade liberalization, exports increase by 5.287 percent. The embargo animal variable has a negative impact on the trend of methanol exports to the UAE, so that its coefficient is equal to -1.153, ie with a one percent increase in the embargo on urea exports to India, it decreases by 1.153 percent.

Table 18: Results from the long-term estimate of supply of urea exports to Turkey ARDL (1,0,0,0,0,0,0)

Probability	t statistic	Standard deviation	Coefficient	Variable
0.8770	-0.162	0.7096	0.115	LGDPTUR
0.0188	-3.424	0.5472	-1.873	LRER
0.0043	4.944	0.2537	-1.254	LTOTU
0.7806	-0.293	0.9433	0.277	LCL
0.0163	-3.554	0.2490	-0.885	LGP
0.0421	2.713	0.3093	-0.839	LVOL
0.0161	3.565	0.1633	-0.582	Dsa

In the long-run supply model of urea exports to Turkey, the estimation results are that the real exchange rate coefficient is -1.873, ie with a one percent increase in the real exchange rate, the export rate decreases by 1.873 percent. The exchange ratio has a coefficient of -1.254, ie with an increase of one percent in the exchange ratio, the export amount decreases by 1.254 percent. The feed price variable has a coefficient of -0.885, ie with a one percent increase in feed prices, exports decrease by 0.885 percent. The real exchange rate instability coefficient is -0.839, ie with a one percent increase in real exchange rate instability, the export rate decreases by 0.839 percent.

Table 19: Results from the long-term estimate of the supply of urea exports to the UAE ARDL (1,0,0,0,0,0,0)

Probability	t statistic	Standard deviation	Coefficient	Variable
0.0210	3.689	2.2410	8.269	LGDPUAE
0.0406	2.984	2.1945	-6.549	LRER
0.1588	-1.729	0.7698	-1.331	LTOTU
0.0752	2.389	4.6347	11.076	LCL
0.0406	-2.925	0.8210	-2.402	LGP
0.1357	-1.8644	0.7189	-1.340	LVOL
0.0421	-2.945	0.3974	-1.170	Dsa

Source: Research Findings

In the supply model of urea exports to the UAE, the UAE GDP is equal to 8,269, ie with a one percent increase in the UAE GDP, exports increase by 8,269 percent. The real exchange rate coefficient, contrary to the results of other models in terms of exports to the UAE, is positive and significant and is equal to 6.549. That is, with a one percent increase in the real exchange rate, the amount of exports decreases by 6.549 percent. The coefficient of trade liberalization is equal to 11.076, ie with a one percent increase in trade liberalization, urea exports to the UAE increase by 11.076 percent. The feed price coefficient is equal to -2.402, ie with a one percent increase in the feed price of refineries, exports decrease by 2.40 percent. Other variables in this model are not significant in the long run.

meaningless for Turkey. The real exchange rate for the UAE has a coefficient (-6.549) followed by China (-2.928), Turkey (-1.873) and India (-1.627). In the long run, the exchange relationship is meaningless for all countries except Turkey. This coefficient for Turkey is -1.254. Trade liberalization is 11,076 for the UAE, 9,243 for China and 5,287 for India, and is meaningless for Turkey. In the long run, the price of food is -2.402 for the UAE, -2.232 for China and -0.885 for Turkey, and is meaningless for India. Exchange rate volatility is -2.322 for China and -0.839 for Turkey and is meaningless for Zappa other countries. The coefficient of variable livestock of sanctions in the long run has the greatest impact on exports to India with a coefficient of -1.153, the UAE -1-170 and Turkey -0.582.

7. Comparison of long-term coefficients of urea export function of destination countries

The GDP variable has the most impact on the export model to the UAE with a coefficient of (269.8), followed by China (3.905) and India (1.407). This variable is

8. Results of estimating the error correction model with Schwartz-Bayesian criterion

The error correction model (ECM) is used to investigate how much of the deviation in the supply function of urea product exports from its long-term path

is corrected by pattern variables in the next period when moving from one period to the next. This model is given in the following tables.

Table 20: Results of estimating the error correction model with Schwartz-Bayesian relationship (urea export to China)

t Statistic (probability)	The standard error	Coefficient	Variable
-1.201 (0.2749)	0.7524	-0.903	dLGDPCH
-1.623 (0.1556)	1.0026	-1.627	dLRER
-0.072 (0.9448)	0.3873	-0.027	dLTOTU
-2.809 (0.0308)	1.8817	5.287	dLCL
-3.153 (0.0197)	0.4442	-1.401	dLGP
1.592 (0.1623)	0.385	0.614	dLVOL
-3.249 (0.0175)	0.3548	-1.153	dDsa
-2.022 (0.0896)	0.0621	-0.125	ECM(-1)
DW=2.121		F(7,4)=67.095	R^2=0.991

Source: Research Findings

As shown in Table 21, the coefficient of determination indicates the high explanatory power of the pattern. The error correction factor states that when we move from one period to the next, what percentage of the deviation in the studied regression function from its long-term path is corrected by the pattern variables in the next period. The error correction factor is significant and has a negative sign and shows that when we move from one period to the next, 12.5% of the deviation in the supply function of urea exports to China from its long-term path by pattern variables in The next period is corrected.

Table 21: Results of estimating the error correction model with Schwartz-Bayesian relationship (urea export to India)

t Statistic (probability)	The standard error	Coefficient	Variable
-1.518 (0.1894)	0.9227	-1.401	dLGDPIN
-2.6421 (0.0459)	0.6160	-1.627	dLRER
-0.094 (0.9287)	0.2969	-0.027	dLTOTU
-4.152 (0.0089)	1.2732	5.287	dLCL
-1.944 (0.1094)	0.4647	-0.903	dLGP
1.774 (0.1362)	03461	0.614	dLVOL
-2.335 (0.0667)	0.4937	-1.153	dDsa
-1.308 (0.0238)	0.0960	-0.165	ECM (-1)
DW=3.144		F (7,4)=154.68	R^2=0.997

Source: Research Findings

As shown in Table 22, the coefficient of determination indicates the high explanatory power of the pattern. The error correction factor is significant and has a negative sign and shows that when we move from one period to the next, 16.5% of the deviation in the supply function of urea exports to India from its long-term path by pattern variables in the next period is corrected.

Table 22: Results of estimating the error correction model with Schwartz-Bayesian relationship (urea export to Turkey)

t Statistic (probability)	The standard error	Coefficient	Variable
-1.974 (0.1053)	0.7096	-1.401	dLGDPTUR
-2.974 (0.0310)	0.5472	-1.627	dLRER
2.420 (0.0601)	0.2537	0.614	dLTOTU

t Statistic (probability)	The standard error	Coefficient	Variable
-5.604 (0.0025)	0.9433	5.287	dLCL
-3.629 (0.0151)	0.2490	-0.903	dLGP
-0.090 (0.9315)	0.3093	-0.027	dLVOL
-7.057 (0.0009)	0.1633	-1.153	dDsa
-1.734 (0.0328)	0.0724	-0.198	ECM (-1)
DW=2.606		F (7,4) =445.51	R^2=0.999

Source: Research Findings

As shown in Table 23, the coefficient of determination indicates the high explanatory power of the pattern. The error correction coefficient is significant and has a negative sign and shows that when we move from one period to the next, 19.8% of the deviation in the supply function of urea exports to Turkey from its long-term path by pattern variables in the next period is corrected.

Table 23: Results of estimating the error correction model with Schwartz-Bayesian relationship (urea export to Emirate)

t Statistic (probability)	The standard error	Coefficient	Variable
-0.625 (0.5657)	2.2410	-1.401	dLGDPUAE
-3.741 (0.0453)	2.1945	-1.627	dLRER
-0.036 (0.9827)	0.7698	-0.027	dLTOTU
-1.140 (0.3176)	4.6347	5.287	dLCL
-1.1007 (0.3328)	0.8210	-0.903	dLGP
0.8540 (0.4412)	0.7189	0.614	dLVOL
-2.901 (0.0441)	0.3974	-1.153	dDsa
-2.004 (0.0342)	0.1250	-0.205	ECM (-1)
DW=2.453		F (7,4) =55.071	R^2=0.994

As shown in Table 27, the coefficient of determination indicates the high explanatory power of the pattern. The error correction coefficient is significant and has a negative sign and shows that when we move from one period to the next, 20.5% of the deviation in the supply function of urea exports to the UAE from its long-term path by pattern variables It will be corrected in the next period.

9. Conclusions and suggestions

In recent years, with the growth and development of the petrochemical industry, the need for special attention to this industry is obvious. Due to the abundance of oil and gas resources in the country and the availability of cheap raw materials for refineries to produce petrochemical products is one of the suitable opportunities to expand production in this area and extensive exports. Given the stated conditions, the need to invest in the refinery and downstream industries of the oil and gas industry, including petrochemicals, is essential to prevent crude sales and create high added value, as well as to circumvent sanctions. Due to the stated importance, creating appropriate infrastructure to increase production and discover new markets for the country's petrochemical products is one of the most important things that must be done.

In this study, in the proposed model, the supply variable of urea export was introduced as a dependent variable; and the variables of trade liberalization, GDP of the destination country, real exchange rate, real exchange rate instability, raw materials price, exchange relation and sanctions (livestock variable) Explanatory variables were included in the model. According to the fitted results, the variables of trade liberalization and GDP of destination countries in the short and long term have a positive and significant effect on the supply of urea exports.

In the short-term urea export supply model, the highest GDP coefficient was related to the UAE, which had the most positive and significant impact on Iran's urea export supply. The trade liberalization variable in the supply model of urea exports in the short term has also been the most positive effect related to the export model to the UAE, the coefficient of this variable is estimated to be larger than other countries. The real exchange rate had a negative and significant coefficient in the short and long term, and in the supply of urea exports, the coefficient of this variable was higher than the supply of exports to the UAE compared to the other three countries. Real exchange rate instability has had a significant negative impact on the supply of urea exports in the short term, which in the short term has been the

most negative impact on the supply model of urea exports to China. The exchange relationship has also had a negative and significant impact on the supply of urea exports in the short term, so that the most negative impact on the supply model of urea exports has been related to China. The feed price coefficient had a negative impact on the country's exports, and in the urea export supply model, the most negative impact was related to the export supply model to the UAE, and this coefficient was meaningless for Turkey in urea exports. The livestock variable of sanctions as a virtual variable has had a negative and significant impact on exports in the short term. In the short run, the highest negative coefficient in the urea export supply model was related to the export model to the UAE and then India, and was not significant for the other two countries. In the supply model of urea exports in the long run, the variables of GDP and trade liberalization have had a positive and significant effect on the country's exports, so that the most positive impact on GDP to the UAE and in trade liberalization has been the UAE. The real exchange rate has had a negative and significant impact in the long run and the most negative impact has been related to the export model to the UAE and the volatility of the real exchange rate has had a negative impact on the supply of urea exports in the long run. For India and the UAE, this variable has become meaningless. In the long run, the price of food has had a negative and significant effect on the country's export supply, so that the most negative impact was related to the supply of exports to the UAE and the least impact was to Turkey. In the long run, the exchange relationship in the supply model of urea exports has also had a negative impact on exports and has had the greatest impact on the export model to Turkey, and for other countries this meaningless variable has been fitted. The sanction variable also had a negative impact and the most negative impact was to the UAE, and this variable was meaningless in the export model to China. The real exchange rate in the short and long term has had a significant negative impact on the supply of Iranian urea exports to target destinations. Therefore, if the real exchange rate increases in the short term, it seems that it will further affect the export market to the UAE and reduce exports to this country. Therefore, it is recommended to prevent exchange rate fluctuations and increase them by implementing appropriate exchange rate policies. The relationship between exchange as the ratio of the foreign price of methanol to its domestic price as one of the variables in the short and long term has a negative and significant effect on urea exports; Therefore, in relation to this issue, the policy that can be proposed is that due to the fact that domestic prices are partially lower than world prices due to the cheapness of raw materials, so we can reduce this ratio to increase exports. By not providing cheap feed to petrochemicals,

it increased the price in this sector, as a result of which the price gap inside and outside was minimized.

The trade liberalization variable, which is equal to the ratio of the sum of imports and exports to the country's GDP, has been mentioned as one of the variables that had a positive and significant effect in the short and long term. Therefore, according to this matter, the discussion of increasing trade liberalization and removing trade restrictions and customs formalities and establishing economically active diplomacy is one of the important strategies in increasing petrochemical exports to countries. Exchange rate fluctuations as one of the variables that have a negative impact on urea exports in the short term showed that the most impact of this variable has been India's export destination, so the government should create a deep foreign exchange market and prevent rents and corruption in the foreign exchange market. Establish stability and transparency in the foreign exchange market.

References

Barghi Osgooi, Mohammad Mehdi, 2014, The effect of real exchange rate instability on Iran's petrochemical sector exports (Markov switching approach), Bimonthly Monetary, Financial (formerly Knowledge and Development) Quarterly, No. 8, pp. 202-231.

Bahadoran, Fatemeh, 1399, The Impact of International Sanctions on Iran's Petrochemical Industry with Emphasis on Foreign Export and Foreign Investment, Second Accounting and Management Conference, https://civilica.com/doc/1114167.

Abbasian, Ezatullah, Moradpour Oladi, Mehdi. Mehregan, Nader (2012), The effect of real exchange rate uncertainty on economic growth; Economic Research, Volume 47, Number 98, pp. 153-169.

Akinlo, A. E., & Adejumo, V. A. (2014). Exchange Rate Volatility and Non-oil Exports in Nigeria: 1986-2008. International Business and Management, 9(2), 70-79

Algieri, B., Aquino, A. & Mannarino, L. (2018). "Non-Price Competitiveness and Financial Drivers of Exports: Evidences from Italian Regions". Italian Economic Journal, 4(1), 107-133

Ali Karami, Somayeh; Hadian, Ebrahim; Rostamzadeh, Parviz; Sadraei Javaheri, Ahmad, Fall 2017, Investigating the Effects of Price and Non-Price Factors on Iran's Non-Oil Exports: A Latent Variable Approach, Economic Growth and

Development Research, Volume 9, Number 36, Pages 56-35.

Boug, P, Fagereng. A (2010), "Exchange rate volatility and export performance: a cointegrated VAR approach", Applied Economics, Vol. 42, No. 7. pp 851 – 864

Caputo, R. (2015). Persistent real misalignments and the role of the exchange rat regime. Economics Letters, 135, 112-116.

Chit, M., Moe, R., Rizov, M. And Middlesex, D, Exchange Rate Volatility and Exports:New Empirical Evidence from the Emerging East Asian Economies, Munich Personal Repec Archive, (2008) , No.9014, 1-35

Chit, M.M, Rizov, R, Willenbockel, D. (2010)," Exchange Rate Volatility and Exports: New Empirical Evidence from the Emerging East Asian Economies", The World Economy, Vol.33 ,No.2. pp 239- 263

Fang, W., Lai, Y. & M._MiLler, S, Does exchange rate risk affect exports asymmetrically? Asian evidence, Journal of International Money and Finance, 2009, no.28, 215-239

Hajiebrahimi Farashah, Vahid & Sazvar, Zeinab & Hosseini, Seyed Hossein, 2021. "A dynamic model to formulate effective capacity expansion policies in Iranian petrochemical Industry to complete the value chain," Energy Policy, Elsevier, vol. 148(PB).

Hasanov, F. (2012) "The impact of the real exchange rate on non-oil exports. Is there an asymmetric adjustment towards the equilibrium?"; RESEARCH PROGRAM ON FORECASTING RPF Working Paper No. 2012-005: 1-24

Imoughele, L. E., & Ismaila, M. (2015). The Impact of Exchange Rate on Nigeria Non-Oil Exports. International Journal of Academic Research in Accounting, Finance and Management Sciences, 5(1), 190-198

Kafle, K., & Kennedy, P. L. (2012). Exchange rate volatility and bilateral agricultural trade flows: the case of the United States and OECD countries. LAP LAMBERT Academic Publishing

Kazeruni, Alireza, 2016, The Impact of Real Effective Exchange Rate Deviation on Non-Oil Exports of Iran Applied from BEER Approach, Financial Knowledge of Securities Analysis, Volume 9, Number 32, Pages 13-195

Kazeruni, Alireza. Asgharpour, Hossein and Mozaffari, Zana (2015). The effect of exchange rate deviation and instability on Iran's agricultural exports, Agricultural Economics Research, Volume 8, Number 3, pp. 197-173.

Kuchakzadeh, Asma. Jalaei Esfandabadi, Seyed Abdul Hamid. (1392). "The Impact of Exchange Rate Uncertainty on Iran's Non-Oil Exports", Agricultural Economic Research, Volume 5, Number 3 (19), pp. 137-123.

Marius Ikpe & Richard Okey Ojike & Kenneth Onyeanuna Ahamba, 2020. "Does Trade Liberalisation Policy Enhance Performance of Non-Oil Export Trade in Nigeria?," Foreign Trade Review , vol. 55(2), pages 248-260, May.

Mileva, M. (2015). Valuation effects and long-run real exchange rate dynamics. Journal of International Money and Finance, 51, 390-408.

Mtembu, M. D., & Motlaleng, G. R. (2017). The Effects of Exchange Rate Volatility on Swaziland's Exports. Review of Economic and Business Studies, 167.

Olayungbo David, Yinusa Olalekan, Akinlo Anthony (2011) Effects of Exchange Rate Volatility on Trade in Some Selected Sub-Saharan African Countries; Modern Economy, 2011, 2, 538-545.

Promoters, Mojtaba and Goodarzi, Elham, 1399, Comparative advantage of production and export of petrochemical products of Arvand Petrochemical Company, National Conference on Building, Environment and Energy Consumption Management, Ahvaz, https://civilica.com/doc/1040847

Saadati, Alireza and Honarmandi, Zahra and Zarei, Samira, Real Exchange Rate Shocks and Export-Oriented Businesses in Iran: An Empirical Analysis Using NARDL Model, MPRA Paper No. 101554, posted 07 Jul 2020 07:16 UTC

Sekkat, K. (2016). Exchange rate misalignment and export diversification in developing countries. The Quarterly Review of Economics and Finance, 59, 1-14.

Thangamani , B (2016). "The Determinants of Export Performance: The Case of Sri Lanka Department of Economics, Faculty of Commerce and Management, Eastern University, Sri Lanka, Vol. 5(8), 8-13, August (2016)

Todeva, E. and Fu, Y. (2010) 'Multinational Investment Projects in the Petrochemical Industry in China',

Journal of Knowledge-Based Innovation in China, 2010, 2(1): 46-72.

Varhrami, Vida; Dargahi, Hassan Biranvand, Frank; 1397; The Impact of Privatization on the Export Performance of Iranian Petrochemical Companies (Case Study: Polyethylene Exports), Quarterly Journal of Economics and Modeling, 34, pp. 101-124.

Yazdi calligrapher, Soheila; Rajabzadeh, Ramin, 1396; The Impact of Real Exchange Rate Changes on Iran's Non-Oil Exports, Journal of Economics and Business, Volume 8, Number 14, Pages 59-43.