Investigating the Effects of Exchange Rate Fluctuations on the Import and Export of Medicine in Iran from 2001 to 2014

Soraya Nouraei Motlagh[1], Mohammad Hadian[2], Abdoreza Mousavi[2], Samira Alipour[2], Reza Jahangiri[2] and Moharam Ali Rostami[2, 3, *]

[1]Public Health Department, School of Health and Nutrition, Social Determinants of Health Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran
[2]Department of Health Economics, School of Health Management and Information Sciences, Iran University of Medical Sciences, Tehran, Iran
[3]Health Management and Economics Research Center, Iran University of Medical Sciences, Tehran, Iran

Corresponding author: Department of Health Economics, School of Health Management and Information Sciences, Iran University of Medical Sciences, Tehran, Iran. Tel: +98-9128424081, Email: moharam.rostami@yahoo.com

Received 2018 January 20; Revised 2018 July 24; Accepted 2018 July 26.

Abstract

Background: The exchange rate is one of the factors whose deviation from equilibrium amounts can lead to the instability in economy performance at the macro level. This study attempted to investigate the effects of exchange rate fluctuations on the import and export of medicine in Iran during 2001-2014.

Methods: This longitudinal study collected the required data in each season from 2001 to 2014. The sources of our data were Iran Central Bank, Islamic Republic of Iran Customs Administration, and Food and Drug Administration. The exchange rate and some other variables such as gross domestic product (GDP), oil revenues, and the relative price of medicine import and export were used in the medicine export and import model. Finally, by using E-views software, version 8, an Engle-Granger approach was utilized to investigate the long-term relationship between the study variables. The autoregressive integrated moving average model (ARIMA) was used to estimate the fluctuations in the exchange rate.

Results: The results of estimating the equations by the use of the regression method indicated that every 1% increase in oil revenues would lead to a 0.13% increase in the medicine import in short-term. Every 1% increase in GDP would averagely lead to a 1.61% increase in the same variable in long-term. Moreover, the exchange rate fluctuations had a reverse effect on medicine exports so that a 1% increase in the exchange rate fluctuations would moderately result in a 0.17% decrease in medicine export in short-term. The relative price of import had no statistically significant relationship with any of the variables.

Conclusions: Since medicine plays a specifically significant role in the health system and the pharmaceutical industry uses a large amount of exchange, fluctuations in the exchange rate have negative effects on the export of medicine; therefore, health officials and policy-makers need to pay much more attention to this issue.

Keywords: Exchange Rate Fluctuations, Import Medicine, Export Medicine

1. Background

During the last two decades, the world economy has experienced a rapid growth in international Business. Despite the constant growth of world markets, there exist some worries regarding the effects of exchange rate volatility on business in general and on import and export in particular (1). According to the economic theory, exchange rate movements cause changes in production, inflation, and interest rates by altering the relative prices of domestically and foreign produced goods and services (2). The exchange rate pass-through affects the demand for real imports and adjustment of real net exports (3). Real exchange rate volatility also is an important complication for investment planning, in particular for the investment in capacity in the exportable sectors. (4). The issue of exchange policies and their effects on the macro variables of the economy is a controversial topic in the economy of all countries, especially the developing ones. Since in developing countries, the exchange rate is influenced by domestic and foreign shocks, it experiences greater fluctuations (5). In every country, foreign business is known as the main factor in a way that the growth in this section is equivalent to the country's general economic growth; in addition, the exchange rate is considered as an influential factor in the foreign business volume (6). Health costs have been considerably increasing throughout the recent decades and the world is dealing with this issue, yet (7). Medicine section is one of the most significant and vital

parts of a country's health system and medicine as a fundamental requirement and strategic good in each country possesses an undeniable value (8, 9).

The medicine costs have experienced an increase in Iran, as well as some other countries, and these costs comprise about 30% of all health care costs and 50% of other costs in this realm (10). The analysis of the pharmaceutical industry in Iran indicated that from 1997 to 2010, the medicine use and consumption had 28.38% increases each year. Moreover, the analysis of the domestic product and medicine imports indicated that Iran has experienced an annual growth of 9.3% and 3.42% in these realms, respectively (11). According to the health ministry reports, domestic products have provided 96% of the country's medical requirements; however, the remaining 4% is very influential so that nearly 45% of the costs and values of the medicine market are allocated to this small portion. Meanwhile, the costs of producing domestic medicines are nearly 250 million dollars. In other words, 250 million dollars are allocated to 96% of the domestic products while 450 million dollars are spent on the remaining 4% of the medicines that are imported into the country (12). Due to the considerable significance of medicine, the enormous costs allocated to it, the growth of medicine industry in our country, and the capability of our country to produce medicines, we should keep it in mind that a huge amount of money is sent out of the country for importing medicine or its primary materials. Therefore, the question raised in this regard is that how the exchange rate fluctuations will affect the import and export of medicines in the country.

After the demise of Bretton wood's system and implementation of floating exchange rate in the 1970s, it was proven that an increment in exchange rate fluctuations tends to create uncertainty, which can have a negative effect on commerce flows. Therefore, the effects of exchange rate fluctuations on business flows have been studied by the researchers and various lines of research were conducted in this regard. Although this issue is of considerable significance both inside and outside the Country, among the studies carried out in this realm, no specific research was conducted about the effects of exchange rate fluctuations on the medicine import and export. That is why some indirect studies accounting for this issue were drawn upon in order to provide an appropriate model. Employing the ARDL model, Alam (2012) estimated the demand function of Pakistan import and showed that there was a long-term relationship between import demand, real economic growth, real and effective exchange rate, and the fluctuations of the real exchange rate. These results indicated the negative effects between the fluctuations of the real exchange rate and Pakistan's import in a long-term period (13).

Making use of the season data during 1980 - 2006, Hall studied the relationship between exchange rate fluctuations and business volume of 10 fledgling economic markets, as well as 11 developed countries, and reported that exchange rate fluctuations had a negative effect on the export of developed countries but it did not have any influence on the export of the fledgling countries. They inferred that the open financial markets (markets with a high degree of openness in trade) in the new countries, in comparison with the developed countries, may decrease their exports due to the fluctuations of the exchange rate (14). Hericourt and Poncet conducted a study to investigate the effect of exchange rate volatility on the exporting performance and determine whether this impact depends on present fiscal constraints, which was carried out based on the experimental analysis of the export information of more than 100,000 Chinese exporters during 2000 to 2006. The results confirmed the prohibitive effects of exchange rate fluctuations on business and indicated that the decrease of export values has a considerable effect on the vulnerable financial companies. In addition, financial developments can adjust such negative effects, especially in exports (15).

In another study carried out by Bahmani-Oskooee et al. on the effect of exchange rate fluctuations on goods commerce between the United States of America and Brazil, it was stated that fluctuations of exchange rate do not always influence the business negatively. Analyzing the cointegration, this study aimed at investigating the effects of exchange rate fluctuations on the bilateral export and import between the United States of America and Brazil during 1971-2010 and came to three conclusions. First, most industries are not influenced by such fluctuations in the long-term run. Second, sensitivity to this risk in the industry section is considerably different from other sections. And third, during the increase of fluctuations, producers having smaller shares in business would probably be affected much more than the producers with the main shares (16).

2. Methods

The current study is an analytical and applicable research conducted based on time series data. The data for model's variables were season data from 2001 to 2014 collected from the Central Bank, Food and Drug Administration, and Islamic Republic of Iran Customs Administration.

In this study, the effects of exchange rate fluctuations on the import and export of medicine were investigated. One of the main economic factors that may influence many of the important variables is the exchange rate fluctuations. Both the supply side and the demand side will be

affected by the exchange rate fluctuations. The exchange rate fluctuation affects the demand sector via imports and exports in addition to variations in reserves while the supply sector will be affected by the exchange rate fluctuation via imported intermediate commodity. Many studies have focused on the variations in exchange rate owing to its important role in the price of many economic variables [17]. According to the experimental studies conducted on the exchange rate fluctuations [18], the model for Iran medicine market can be introduced as:

$$LXMt = \beta_0 + \beta_1 LGDPt + \beta_2 LINOt + \beta_3 LRERt \\ + \beta_4 LREXPt + \beta_5 LRIMPt + Ut$$

In this model, LXM is the logarithm of medicine export in the export model while it represents the logarithm of medicine import in the import model, LGDP is the logarithm of GDP as an index for the volume of economic activities, LINO is the logarithm of oil revenues, LRER is the exchange rate fluctuations, LREXP is the logarithm of the relative price of medicine export, LRIMP is the logarithm of the relative price of medicine import, and UT is the disturbance term. Since a two-way logarithmic model was used, the coefficient of each explanatory variable denotes the elasticity of that variable and reflects the percentage of variations in the dependent variable per the percentage of changes in an explanatory variable.

The first step in using time series data is to study the data stationarity. Newbold and Grenger [19, 20] indicated that working with non-stationary time series data will result in spurious regression and the final results will not be reliable. However, the stationary time series data will not make such problems while for non-stationary data, we may question the reliability of the results. Then, the rank of variables' integration should be determined in order to make use of the appropriate model and to detect the long run relationship between variables [21]. One of the most important methods for testing the stationarity of time series data is the Dicky Fuller test [22]. In this study, the augmented Dicky Fuller test was used for determining the stationarity of the date.

In the next stage, an Engle-Granger approach was applied to specify whether there is a long-term relationship between the dependent variable (import and export of medicine) and explanatory variables. This approach supposed that all of the variables are I [1] and they may cointegrate to form a stationary long-term relationship; thus if the residual term of the estimated equation was stationary, there would be an equilibrium relationship between the variables [23].

There are several methods for determining the fluctuations of the exchange rate, which include autoregressive

conditional heteroscedasticity and moving average deviation. According to Cote, [24] there is no basis for the superiority of one model over the other one. In this study, we first used autoregressive conditional heteroscedasticity for the better explanation of the exchange rate behavior, which was rejected. Therefore, the autoregressive integrated moving average (ARIMA) model was employed for accounting the fluctuations of the exchange rate. ARIMA methods have three separated models, namely: moving average (MA) model, autoregressive (AR) model, and autoregressive-moving average (ARMA), which is a mixed model and has the features of both models. In the MA model, the movement of the output variable is defined via the past residual. In the AR model, the value of output variable depends on the previous value of the variable. Meanwhile, an error is added to the model to determine the random noise that may not be explained by the model. The combination of MA and AR models will constitute a new model, which is named ARMA [25]. After modeling of the exchange rate fluctuations via the ARIMA model, finally, a multiple regression was used for estimating the pattern. Then, the E-views software, version 8, was used for data analysis.

3. Results

In this section, the experimental results are shown. According to the findings, the average values of medicine export, medicine import, GDP, and oil revenues were 13192, 1124, 1798534, and 288206 Billion Rials, respectively, in Iran from 2001 to 2014 (Table 1).

In the next section, the trends in the import and export of medicine are exhibited in Figure 1.

Before using the ARCH model, two stages should be taken into consideration. First, for examining the stationarity of the data, the augmented Dickey-Fuller test was used and the results are shown in Table 2.

The results of the Dickey-Fuller test in the variables level indicated that the variables are not stationary but all of them are stationary in the first order difference at the 95% probability level. It is observed that after one differencing step, all variables become stationary, so they were integrated into the first rank.

Subsequently, the ARCH test was administered to recognize the heteroscedasticity. The results of the ARCH test indicated no heteroscedasticity. The null hypothesis of the current study was the homoscedasticity of residuals, and the obtained results confirmed the null hypothesis and rejected the alternative hypothesis that introduced the residuals heteroscedasticity. Therefore, the hypothesis of residuals homoscedasticity was not rejected.

Table 1. Descriptive Statistics (Billion Rials)

Variables	Minimum	Maximum	Mean	SD
Oil revenues	71957	628834	288206	200152
GDP	1279193	2157934	1798534	274770
Export of medicines	25.9	4250	1124	1190
Import of medicines	723	44700	13192	12200
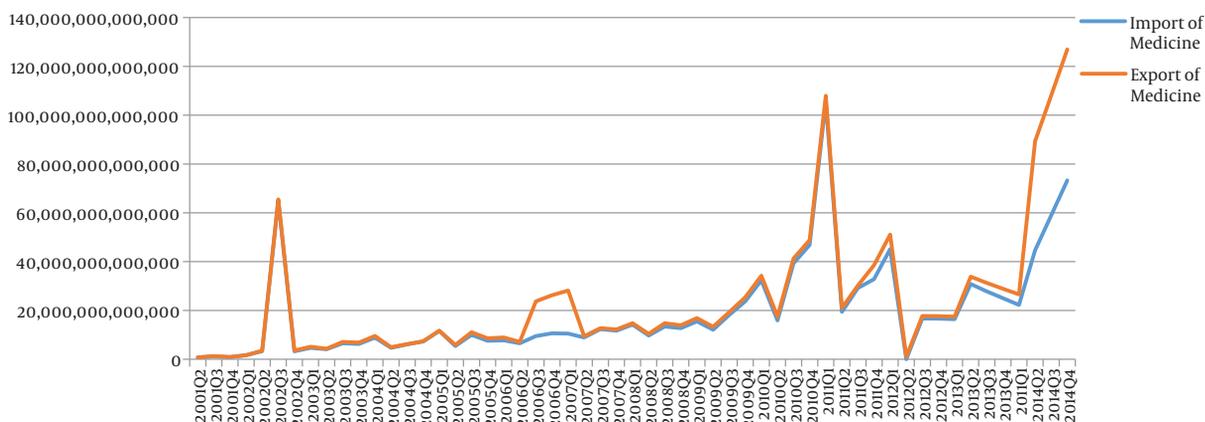
Figure 1. The trends in the import and export of medicine (2001 - 2014)

Table 2. The Results of Augmented Dicky Fuller Unit Root Test[a]

Variable	Stationary in Level	Probability	Stationary in Difference	Probability	Integration Rank
GDP	2.23	0.195	1.8	0.04	I (1)
Oil revenues	1.44	0.96	3.55	< 0.001	I (1)
Exchange rate fluctuation	0.18	0.96	2.89	0.004	I (1)
Export relative price	1.09	0.71	3.48	< 0.001	I (1)
Import relative price	1.68	0. 97	3.65	< 0.001	I (1)

[a] Statistic in trend and intercept.

Table 3. The Heteroscedasticity Variance

	Heteroscedasticity Variance	Significance Level
F-statistics	0.14	0.703
χ^2 statistics	0.15	0.694

Table 4. The Estimations of the ARMA Model

Variable	T-Statistic	Coefficient	Significance Level
AR (1)	599.91	1.00	< 0.001
MA (1)	36.62	0.99	< 0.001

The results in Table 3 indicated F = 0.14 and χ^2 = 0.15, so they were not in the critical area. Moreover, the P-value is greater than 0.05, so the hypothesis of ARCH is rejected and the hypothesis of residuals homoscedasticity is accepted. Therefore, the ARCH model was not suitable for exchange rate fluctuations and instead, we used the ARIMA model.

The next stage was to determine the appropriate ARIMA model. For this purpose, after determining the stationary rank according to the Akaike & Schwarz Bayesian

Criterion, the numbers of autoregressive sentences and moving average sentences were identified to estimate the exchange rate fluctuations. According to these criteria, the behavioral equation describing the real exchange rate is ARMA (1, 1, and 0). The estimation of the above-mentioned equation is showing in Table 4.

3.1. Results of Short-Term and Long-Term Estimations

In order to show whether there is a long-term relationship between variables, the Engle and Granger cointegration test was used. The Engle and Granger cointegration test indicated the unit root test for the residuals of estimated equations through OLS at the significance level of P < 0.05. The obtained results implied that it is not possible to reject the hypothesis of the relationship between the variables in long-term periods. Table 5 shows such estimations.

After revealing the short-term and long-term relationships among the hypothesis variables, we used the ARIMA model to investigate these relationships by the use of exchange rate fluctuations.

The effects of exchange rate fluctuations on medicine import are as follows.

The results of the current study revealed that the coefficient of oil revenues is statistically significant. The coefficient of Oil revenues variable shows that a 1% increase in oil revenues will lead to a 0.13% increase in medicine import in the short-term run.

The long-term model revealed that the coefficient of GDP is statistically significant at the level of 0.001 (P < 0.001). The coefficient of GDP indicates that a 1% increase in GDP will averagely lead to a 1.61% increase in medicine imports in the long-term run. Moreover, the exchange rate fluctuations and medicine import have a negative relationship in both short and long-term runs, but it was not statistically significant.

The effects of exchange rate on medicine export are as follows.

In Table 7, the results indicate that the coefficient of exchange rate fluctuation is negative at the significance level of 0.99 (P < 0.01) while the coefficients of GDP, oil revenues, and the relative price of medicine export are not statistically significant. The coefficient of exchange rate fluctuations indicates that a 1% increase in the exchange rate fluctuation will moderately result in a 0.17% decrease in medicine export in short-term. The results of the long-term model reveal that the increase of exchange rate fluctuations has a negative impact on medicine export but it is not statistically significant.

Finally, for the model's autocorrelation testing, the Durbin-Watson method was used. If the amount of this test is between 1.5 and 2.5, there will be no autocorrelation in the model. The results indicated that the amount of this test in all tables was between 1.5 and 2.5; therefore, there is no other correlation between the variables.

4. Discussion

In the present study, the effects of exchange rate fluctuations and some other variables on the import and export of medicine were investigated during 2001 - 2014.

The positive relationship between the medicine import and oil revenues indicates that an increase in oil revenues will lead to the increase of medicine products import. Since the majority of the investments in the health section is made by the government, the medicine products are known as non-elastic ones, and the country's revenues are highly dependent on oil revenues, the positive relationship between medicine import and oil revenues seems completely logical. In addition, the results of estimating the function of import demand for various products indicate that oil revenues in Iran have a positive significant effect on the majority of the products being investigated (26).

Moreover, the coefficient of GDP is also positive and statistically significant, which means that an increase in GDP will increase the import of medicinal products. This finding shows that enhancing the country's revenues and productive capacity can increase the growth and demand for medicines and health products. Since Iran's economy has a controlled and floating exchange system and entering or exiting the capital to this system is limited, revenues increase will lead to increased demand and therefore increased import, especially regarding medicines that are non-elastic goods. That is to say, by the improvement and enhancement of GDP, the increase of medicine import seems logical. These results are in line with the findings of Sharifi's study that investigated the effects of exchange rate fluctuations on the foreign direct investment in Iran, indicating that GDP has a positive relationship with foreign direct investment and the world oil price and exchange rate fluctuations have negative effects on foreign direct investment (27). GDP is a significant index of a country's economy and its big volume or value will attract the other countries and foreign investors to invest in such countries.

There is a negative relationship between exchange rate fluctuations and medicine import, which is not statistically significant. One of the limitations of the current study was the shortage of relevant studies on the effect of exchange rate fluctuations on health and treatment section. However, a study entitled "the impact of exchange rate fluctuations on the import of medical equipment in Iran" was carried out by Jalaei and Jafari who reported that GDP and oil revenues have positive impacts on the import of medical equipment while exchange rate fluctuations had a negative effect on the same variable (28). Moreover, in another study conducted by Yusefzadeh et al. (10) on the business inside the medicine industry in Iran, it

Table 5. Estimating Augmented Dicky-Fuller Test to Investigate the Existence of Unit Root in Equations' ResidualsResiduals

	T-Statistic	Prob.*	T-Statistic	Prob.*
Augmented Dicky Fuller test	-3.06	0.003	-3.42	0.001
Test critical values				
1% level	-2.61		-2.61	
5% level	-1.94		-1.94	
10% level	-1.61		-1.61	

Table 6. The Results of the Model's Estimation of Medicine Import

Variable	Short-Term Model			Long-Term Model		
	T-Statistic	Coefficient	Significance Level	T-Statistic	Coefficient	Significance Level
Intercept	7.28	0.04	< 0.001	-0.13	-6.38	0.892
Import relative price	-0.40	-0.01	0.684	-0.002	-0.0001	0.998
Oil revenues	2.12	0.13	0.039	1.75	0.11	0.086
Exchange rate fluctuation	-1	-0.01	0.230	-1.65	-0.007	0.105
GDP	1.23	0.67	0..223	2.26	1.61	0.028

Table 7. The Results of the Model's Estimation of Medicine Export

Variable	Short-Term Model			Long-Term Model		
	T-Statistic	Coefficient	Significance Level	T-Statistic	Coefficient	Significance Level
Intercept	1.31	0.04	0.197	4.11	24.52	< 0.001
GDP	1.16	2..13	0.249	0.65	0.89	0.518
Oil revenues	0.17	0.02	0.864	1.19	0.21	0.238
Export relative price	1.42	0.98	0.173	0.95	0.49	0.347
Exchange rate fluctuation	-2.40	-0.17	0.020	-0.41	-0.01	0.683

was reported that the business volume inside the pharmaceutical industry in Iran and its huge business partners are very low and because of the value of medicines, the countries' import from Iran was less than the value of exported medicine to Iran. These factors show that the Iran medicine industry is highly dependent on the import from other countries and it is known as a dependent industry; therefore, exchange rate fluctuations will not have any significant effect on it.

In the scope of medicine export, the exchange rate coefficient has a negative and statistically significant effect on medicine export. That is to say, with an increase in exchange rate fluctuations, the amount of medicine export decreases. In the long-term run, the lack of safety resulted from fluctuations in the exchange rate will create an inappropriate context and situation for export, which will remove the exporters from the export sections and finally, there will be a decrease in the export section. This is also due to the dependence of medicine primary materials on other countries and lower technology for medicine pro-

duction inside Iran. Since the increased exchange rate will decrease the capacity of domestic production, a decrease in exports rate is observed. From the experimental perspective, it is not possible to discover a clear and significant relationship between exchange rate fluctuations and exports in developing countries. In this regard, Kazerooni and Feshari conducted a study to shed light on the effect of exchange rate fluctuations on the country's economic activities. Their findings indicated that fluctuations in the exchange rate had a negative impact on non-oil exports (29). Moreover, investigating the effects of exchange rate fluctuations on the exports of some Asian countries showed that the fluctuations in the exchange rate had negative effects on the exports of the investigated countries (30-33). However in some other countries, the exchange rate is just a variable and in these countries, exports depend on factors such as specialty, high technology, and marketing; therefore, after investigating the supply and demand, it will become possible to recognize the results of exchange rate fluctuations in a country's economic realm.

4.1. Conclusions

The results indicated the negative effect of exchange rate fluctuations on the import of medicines. These results confirm that the lack of support for the pharmaceutical industry and the import of pharmaceutical products against the exchange rate fluctuations will lead to the reduced import of medicines, which can threaten the survival of the pharmaceutical industry and the health of the community. Regarding the medicine export, the results showed that exchange rate fluctuations have a reverse relationship with medicine export in short-term. This instability and fluctuation in prices will increase the investment risk so that it will be difficult for investors in medicine economic realm to predict the situations; therefore, the medicine market will be negatively influenced by such conditions. This is while the exports of medicine should be seen as an essential principle and considered in future improvement projects. Therefore, policy-makers should try to manage a flexible real exchange rate to achieve stability in the real exchange rate, leading to less affected export and import of pharmaceutical products. GDP also indicated a positive effect on the exports of medicines. This result reveals that increasing the production capacity of the country leads to the growth of production in various industries, including the export sectors. Therefore, increasing production, in addition to responding to the domestic demand, will increase the export supply. Therefore, economic policies should primarily increase the country's gross domestic product. This, in turn, will lead to the development of non-oil exporters such as pharmaceutical industries.

Acknowledgments

Footnote

References

1. Cheung YW, Sengupta R. Impact of exchange rate movements on exports: an analysis of Indian non-financial sector firms. *J Int Money Finance*. 2013;**39**:231–45. doi: 10.1016/j.jimonfin.2013.06.026.
2. Manalo J, Perera D, Rees DM. Exchange rate movements and the Australian economy. *Econom Model*. 2015;**47**:53–62. doi: 10.1016/j.econmod.2015.02.013.
3. Sheets N, Marazzi M, Vigfusson RJ, Faust J, Gagnon JE, Martin RF, et al. Exchange rate pass-through to u.s. import prices: some new evidence. *SSRN Electron J*. 2005. doi: 10.2139/ssrn.715121.
4. Eichengreen B, Gupta P. The real exchange rate and export growth: are services different? *SSRN Electron J*. 2013. doi: 10.2139/ssrn.2579533.
5. Kazerooni A, Hassan Nezhad Daneshmand E, Maniei O. The effect of exchange rate fluctuations on exports pattens of Iran. *Quart J Stud Appl Econom*. 2014;**3**(10):219–46.
6. Bank NI. *Iranian pharmaceuticals industry analysis report*. Geneva: WHO; 2016.
7. Khosravi B, Soltani S, Javan-Noughabi J, Faramarzi A. Health care expenditure in the Islamic Republic of Iran versus other high spending countries. *Med J Islam Republ Iran*. 2017;**31**(1):410–3. doi: 10.14196/mjiri.31.71.
8. Barry M, Usher C, Tilson L. Public drug expenditure in the Republic of Ireland. *Expert Rev Pharmacoeconom Outcom Res*. 2014;**10**(3):239–45. doi: 10.1586/erp.10.23.
9. Nixon J, Ulmann P. The relationship between health care expenditure and health outcomes. *Eur J Health Econom*. 2006;**7**(1):7–18. doi: 10.1007/s10198-005-0336-8.
10. Yusefzadeh H, Rezapour A, Lotfi F, Ebadifard Azar F, Nabilo B, Abolghasem Gorji H, et al. A study of comparative advantage and intra-industry trade in the pharmaceutical industry of Iran. *Glob J Health Sci*. 2015;**7**(6). doi: 10.5539/gjhs.v7n6p295.
11. Kebriaeezadeh A, Koopaei N, Abdollahiasl A, Nikfar S, Mohamadi N. Trend analysis of the pharmaceutical market in Iran; 1997–2010; policy implications for developing countries. *DARU J Pharmaceut Sci*. 2013;**21**(1):52. doi: 10.1186/2008-2231-21-52.
12. Barouni M, Ghaderi H, Banouei A. The Effects of Trade Liberalization on key variables play Darvdrayran: an analysis in computable general equilibrium model. *The Second Seminar on Health Economics*. Tehran. Armed Forces Medical Services Insurance; 2013. p. 283–93.
13. Alam S, Ahmad QM. Exchange rate volatility and Pakistan's bilateral imports from major sources: an application of ardl approach. *Int J Econom Finance*. 2011;**3**(2). doi: 10.5539/ijef.v3n2p245.
14. Hall S, Hondroyiannis G, Swamy PAVB, Tavlas G, Ulan M. Exchange-rate volatility and export performance: do emerging market economies resemble industrial countries or other developing countries? *Econom Model*. 2010;**27**(6):1514–21. doi: 10.1016/j.econmod.2010.01.014.
15. Hericourt J, Poncet S. Exchange rate volatility, financial constraints, and trade: empirical evidence from Chinese firms. *World Bank Econom Rev*. 2015;**29**(3):550–78. doi: 10.1093/wber/lht035.
16. Bahmani-Oskooee M, Harvey H, Hegerty SW. The effects of exchange-rate volatility on commodity trade between the U.S. and Brazil. *North Am J Econom Financ*. 2013;**25**:70–93. doi: 10.1016/j.najef.2013.03.002.
17. Mohagheghzadeh F, Nasiri P, Mohagheghzadeh F. Effect of exchange rate fluctuations on foreign direct investment in Iran. *J Appl Environ Biolog Sci*. 1980;**4**(9):31–41.
18. Asteriou D, Masatci K, Pılbeam K. Exchange rate volatility and international trade: international evidence from the MINT countries. *Econom Model*. 2016;**58**:133–40. doi: 10.1016/j.econmod.2016.05.006.
19. Newbold P, Granger CWJ. Experience with forecasting univariate time series and the combination of forecasts. *J Royal Statist Societ. Seri A (General)*. 1974;**137**(2):131. doi: 10.2307/2344546.
20. Murthy VNR, Ketenci N. Is technology still a major driver of health expenditure in the United States? evidence from cointegration analysis with multiple structural breaks. *Int J Health Econom Manag*. 2016;**17**(1):29–50. doi: 10.1007/s10754-016-9196-2.
21. Basakha M, Yavari K, Sadeghi H, Naseri A. Health care cost disease as a threat to Iranian aging society. *J Res Health Sci*. 2014;**14**(2):152–6. [PubMed: 24728752].
22. Dickey DA, Fuller WA. Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: J Economet Societ*. 1981:1057–72.

23. Arize AC, Ndubizu G. Cointegration, error correction representation and the import demand function with implications in International Finance and Accounting Research. *Rev Quantit Finance Account*. 1992;**2**(4):359–76. doi: 10.1007/bf00939017.

24. Cote A. *Exchange rate volatility and trade. bank of Canada*. Working Paper 94–5; 1994.

25. Qonita A, Pertiwi AG, Widiyaningtyas T. Prediction of rupiah against US dollar by using ARIMA. *Proceeding of the Electrical Engineering Computer Science and Informatics*. 2017. p. 1–5.

26. Shahbazi K, Asadi F. Effect of increasing exchange rate on imports of medicines and medical equipment. *J Econom Polic Res*. 2014;**6**:35–54.

27. Sharifi-Renani H, Mirfatah M. The impact of exchange rate volatility on foreign direct investment in Iran. *Procedia Econom Finance*. 2012;**1**:365–73. doi: 10.1016/s2212-5671(12)00042-1.

28. Jalaei SA, Jafari S. The effect of exchange rate uncertainty on import of medical and pharmaceutical products in Iran. *J Health Dev*. 2016;**5**(1):13–23.

29. Kazerooni A, Feshari M. The impact of the real exchange rate volatility on non-oil exports: the case of Iran. *J int econom stud*. 2010;**36**:9–18.

30. Chit MM, Rizov M, Willenbockel D. Exchange rate volatility and exports: new empirical evidence from the emerging East Asian economies. *World Econom*. 2010;**33**(2):239–63. doi: 10.1111/j.1467-9701.2009.01230.x.

31. Doganlar M. Estimating the impact of exchange rate volatility on exports: evidence from Asian countries. *Appl Econom Lett*. 2002;**9**(13):859–63. doi: 10.1080/13504850210150906.

32. Altintas H, Cetin R, Oz B. The impact of exchange rate volatility on Turkish exports: 1993-2009. *South East Eur J Econom Bus*. 2011;**6**(2). doi: 10.2478/v10033-011-0017-8.

33. Pino G, Tas D, Sharma SC. An investigation of the effects of exchange rate volatility on exports in East Asia. *Appl Econom*. 2015;**48**(26):2397–411. doi: 10.1080/00036846.2015.1122730.