

## Free-Market Exchange Rate and Rigidity of Prices in Iran by Nonlinear ARDL Approach

Shahryar Zaroki<sup>a\*</sup>, Arman Yousefi Barfurushi<sup>b</sup>

### ABSTRACT

The objective of this paper is to investigate the asymmetric effect of free-market exchange rate on consumer price index (CPI) at the aggregate level and the ten subgroups of goods and services using monthly data from 2002:5 to 2018:8 by NARDL. The results of this research show that in the long run, free-market exchange rate appreciation has a direct effect on the CPI at the aggregate level and CPI of all subgroups except for communication, housing and healthcare. In addition, free-market exchange rate depreciation does not have a significant effect on the CPI at the aggregate level and all subgroups except for the education. Accordingly, the asymmetric hypothesis of the effect of the free-market exchange rate on the CPI at the aggregate level and the subgroups (food and tobacco, Apparel and shoe, furniture and appliances, transportation, recreation and culture, education, hotel and restaurant) cannot be rejected. In addition, the hypothesis of the downward price rigidity during free-market exchange rate depreciation cannot be rejected. Furthermore, the money (M1) has a direct effect on the CPI at the aggregate level and most subgroups, which shows inflation is a monetary phenomenon

**Keywords:** Rigidity of Prices, Free-market exchange rate, NARDL, Iran.

### 1. Introduction

Among the 40 countries with the highest GDP, Iran is the only economy in 2019, with inflation above 20 percent. Meanwhile, Iran's economy has been trying to control its chronic inflation by creating discipline in monetary and fiscal policies. One of the main reasons for this inflation is the free-market exchange rate mutations that have been inflicted Iran's economy in recent decades (Mehrabi Boshrahadi et al., 2011; Yazdani and Zare, 2016). Since Iran's revolution in 1979, the system of two exchange rates (official and free-market) has always existed for most years. The

trend of exchange rate in Iran usually accompanies with the increase of the free-market exchange rate while the government tries to keep the official exchange rate invariant. However, these changes make a large gap between free-market exchange rate and official exchange rate. To fill this gap, the government may have to increase the official exchange rate all at once to unify or approximate to the free-market exchange rate<sup>1</sup>. Political-social reasons make Iranian politicians suppress exchange rate in oil-boom periods. However, in periods that the oil prices are decreasing or international sanctions intensify against Iran's economy, the government's control over the exchange rate is seriously undermined. In such periods, a close relationship between free-market exchange rate mutations and price growth may be created. Because of

---

<sup>a</sup> \* Associate Professor of Economics, University of Mazandaran, Babolsar, Iran. ✉sh.zaroki@umz.ac.ir

<sup>b</sup> Economics Science, University of Mazandaran, Babolsar, Iran.  
Received on 22/12/2019 and Accepted for Publication on 10/5/2020.

---

<sup>1</sup> Based on Iran's exchange rate data (official and free market) from 1979 to 2018

dependence Iran's economic and productive structure on imported goods and inputs, exchange rate movements can be considered as one of the important factors of inflation in Iran (Ghafari and Naemi Pajoh, 2012; Mehrara and Ghobadzadeh, 2016). For this reason, it is expected that with exchange rate appreciation, price increases will occur through two directions. First, free-market exchange rate appreciation will increase the prices of imported inputs, and as a result, firms will raise prices to maintain their profit margin. On the other hand, exchange rate appreciation causes an increase in the prices of imported consumer goods, which would inflict inflation on society. Iran also has vast land borders with its neighbors, which the excessive exchange rate appreciation would make Iran's consumer goods and food prices cheaper for Iran's neighbors. For this reason, excessive exports of consumer goods will lead to mendacious demand and intensified inflation.

Inflation has a direct impact on the real income of people in society. In addition, people at different income levels use a different basket of goods and services, for this reason, inflation caused by exchange rate appreciation may have a different effect on individuals in different income groups. For example, it is expected that the main basket of low-income households will consist of food, clothing and housing, and issues such as entertainment, cultural affairs, restaurant and hotel will have little share in the consumer basket of these households.<sup>2</sup> Moreover, we should point out that subgroups like health and treatment generally include certain subsidies in Iran and we expect that the exchange rate movements do not affect the consumer price index of these subgroups. Therefore, only the study of exchange rate movements on the overall inflation rate cannot provide a suitable

view of the effects of this phenomenon on the various strata of society.

Besides, to explain the kind of relationship between the consumer price index and the exchange rate in Iran's economy, the correlation coefficient between the free-market exchange rate shock, in addition to its positive and negative shocks, and the growth of the consumer price index at the general level and 10 relevant subgroups is calculated and reported in Table 1. From the table, we can make some inferences about Iran's economy. Firstly, although there is a direct relationship between the exchange rate shocks and the growth of the consumer price index (in the form of total and subgroups), the correlation through the positive shocks in the exchange rate is positive; and in the case of negative shocks, it is a negative correlation in the exchange rate. Secondly, the size of the correlation coefficient during the positive exchange rate shocks is greater than the negative ones. According to the results, it can be stated that there is an asymmetric relationship between exchange rate and prices in Iran's economy.

Accordingly, the purpose of this paper is to investigate the asymmetric effect of free-market exchange rate on consumer price index (CPI) at the aggregate level and the ten subgroups of goods and services using monthly data from 2002:5 to 2018:8 via the nonlinear autoregressive distributed lag (NARDL). Furthermore, we seek to examine the rigidity of prices in Iran during the exchange rate decreases.

The rest of this paper is organized as follows: We state the theoretical of the asymmetric effect of the exchange rate on inflation and downward price rigidity in section 2 the variables of the model are analyzed statistically in section 3 we describe the research model based on Non-Linear ARDL Approach in section 4. The empirical results are interpreted in Section 5, and then the findings of the study are summarized in the last section.

---

<sup>2</sup> Based on Social Affairs and Household Welfare- Economic Report & Balance Sheet- Central Bank of the Islamic Republic of Iran (from 2002 to 2016)

**Table 1. Correlation Coefficient between Free-market Exchange Rate Growth and Growth in CPI**

	Positive Shocks in Exchange Rate	Negative Shocks in Exchange Rate	Shocks in Exchange Rate
CPI for the Good and Services at the Aggregate Level	0.362	-0.138	0.251
CPI for Foods, Beverages and Tobacco	0.362	-0.138	0.251
CPI Apparel and Shoe	0.722	-0.331	0.458
CPI for Housing, Water, Gas and Other Fuels	0.111	0.021	0.112
CPI for Furniture and Appliances	0.724	-0.263	0.501
CPI for Healthcare or Medical Care	0.337	-0.449	0.170
CPI for Transportation	0.403	-0.177	0.354
CPI for Communications	0.440	-0.224	0.320
CPI for Recreation and Culture	0.673	-0.219	0.620
CPI for Education	0.063	-0.157	0.065
CPI for Hotel and Restaurant	0.470	-0.344	0.245

## 2. Literature Review

Based on theoretical background, appreciation and depreciation of the domestic currency can have asymmetric effects on prices. First, an appreciation of the domestic currency will reduce the price of imported inputs and a depreciation of the domestic currency will increase the price of imported inputs. The effect of appreciation and depreciation of the domestic currency on inflation depends on the amount of competitive atmosphere in the market. If a firm has monopoly power in the market, an appreciation of the domestic currency cause reduces the firm's production costs (if the firm depends on the imported input). Because of monopoly power, the firm does not offer lower prices for its products and thus increases the profit margin. On the other hand, the firms increase the price of its goods to maintain its profit margin, when depreciation of the domestic currency. But when the market is enough competitive, in the case of appreciation of the domestic currency, firms decrease the price of their product, as much as decreasing their production costs, to make their profit margin stable. In this way, firms are seeking to

maintain and increase their share in the market. At the time of a depreciation of the domestic currency, firms will not increase their prices and will tolerate the reduction of profit margin to maintain their market share (Kataranova, 2010).

A quantitative limitation due to production capacity or distribution network, etc. can also be other factors that cause the asymmetric effect of the exchange rate on inflation (Kataranova, 2010; Delatte and López, 2012). Secondly, according to Bussière (2007), in the case of oligopoly in market of the importing country, an appreciation of the currency of importing country will give foreign firms more competitive than domestic firms in the importing country. Here Bussière (2007) assumes that exporting firms face restriction for increasing the production capacity in the short run and because of their inability to increase their share in the market of the importing country, firms will increase their commodity prices. On the other hand, a depreciation of the currency of the importing country cause imported goods to become more expensive than before. Here Bussière (2007) assumes, that generally the exporters' resistance

to decrease price are high. Therefore, exporting firms do not change their product prices and they will pass on the increase in the price of the goods to the consumer.

Several studies examined the impact of exchange rates on inflation, which can be divided into two general categories. The first category of studies investigated the effect of Exchange-rate pass-through (ERPT) on inflation. These studies indicate that the ERPT initially affects the import price, and then the imported price affects the price of the producer and the consumer (Goldberg and Knetter, 1997; Campa and Goldberg, 2005). In this category, we can point to recent studies by Beirne and Bijsterbosch (2011), An and Wang (2012), Jiang and Kim (2013), Choudhri and Hakura (2015), Cheikh and Rault (2016), Amoah and Aziakpone (2018).

The second category refers to a group of studies that investigated the effect of the exchange rate on inflation (CPI and PPI), that this category can be divided into three groups. The first group refer to studies that considered the producer price index as an indicator of inflation. Feinberg (1989) noted that, after the exchange rate floated since the mid-1970s, the exchange rate entirely affected the price of the industries dependent on the imported input. Nourzad (1997), stated that the depreciation of the US dollar would lead to higher prices in this country and pointed to the long-run relationship between the exchange rate and the prices (producer price index). Kim (2010) also argued that the US exchange rate has a negative impact on inflation and there is a causal relationship between the exchange rate and inflation. The second group refer to studies that investigated the effect of the exchange rate on the consumer price index. Ibrahim (2000) stated that the depreciation of the Malaysian domestic currency will increase inflation and stated that the effect of exchange rate shocks on inflation is negative in Malaysia. Darrat and et al. (2003) also stated that there is a causal relationship between the exchange rate and inflation in the United States. The last group of the second category

refer to studies such as Papell (1994) that investigated the effect of the exchange rate on the consumer price index and producer price index in the G7 countries. He stated that the effect of exchange rate on prices is significant, and this effect is higher on the producer price index.

In Iran, Studies can also be divided into two categories. The first category includes studies that examined the effect of EPRT on various price indices in Iran. In this category, we can refer to Khoshbakht and Akhbari (2007), Asgharpur and Mahdilou (2014), Bahrami et al. (2014), Asgharpour et al. (2015), Asgharpour et al. (2017) and Sadat Hoseyni et al. (2018).

The second category includes studies that examined the effect of exchange rate shocks or exchange rate changes on inflation in Iran. In this category, Pirae and Koroush Pasandide (2002), used a Simultaneous equation system in the period 1959-1999 (monthly and annual data), and found that the effect of the free-market exchange rate<sup>3</sup> on inflation is positive, but the intensity of the effect is according to Different price indexes are different. Kazerooni and Rostami (2007) examined the asymmetric effects of exchange rate shocks on real production and price from 1961 to 2002 by the OLS method. The result of this study shows that the positive and negative shocks of the exchange rate have an asymmetric effect on the price and the effect of the positive shocks is greater than the negative shocks. Mehrabi et al. (2010), used the Johanson test and the ECM for the period 1988: 1-2007: 4, and found that positive shocks of exchange rate have a negative effect, and negative shocks of exchange rate have a positive effect (Symmetrical effect of shocks) on inflation. Ghafari et al. (2014) examined the effects of the depreciation of Iranian Rial on macroeconomic variables from 1976 to 2014. The results indicate that in the case

---

<sup>3</sup> Free-market dollar

of gradual depreciation of Iranian Rial, its effect on macroeconomic variables (including the CPI) is lower than the case of a sudden depreciation. Yazdani and Zare (2016), used the SVAR method for the period 2000: 1-2012: 4, and found that one of the important factors influencing inflation, exchange rate changes and, in general, foreign exchange policies. Aziznejad and Komijani (2017) examined the effect of exchange rate changes on the volatility of selected economic variables using the VAR method from 2001: 1 to 2012: 4. The result of this study shows that the real exchange rate after the short-term profit rate has the greatest impact on producer inflation. In addition, it should be noted that Kordbache and Ahmadi (2018) examined the effects of exchange rate fluctuations on price indices in the health sector in the period 2004:1 to 2014: 3 by using ARCH and ECM models. The results of this study indicate that in the health sector, the effect of exchange rate fluctuations on the consumer price index is higher than the producer price index.

As noted earlier, most studies (in Iran and other countries) have investigated the effect of the exchange rate on inflation (consumer and/or producer price index at the aggregate level). Although, there are studies like Kataranova (2010), that investigated the asymmetric effect of the exchange rate on the consumer price index at the aggregate level and for individual groups of goods and services (food products, Nonfood products and paid services).

In this paper, we have investigated the asymmetric effect of exchange rate (US dollar) in the free market on the consumer price index at the aggregate level. In addition, the asymmetric effect of exchange rate (US dollar) in the free market on the consumer price index at the ten subgroups of goods and services has been examined in Iran, which is the difference between the present study and previous studies.

### 3. Data Analyses

We use monthly frequency data for the consumer price index for the good and services at the aggregate level (CPI<sup>0</sup>), free-market exchange rate<sup>4</sup> (FERFM) and money<sup>5</sup> (M1). In addition, the consumer price index of the ten subgroups include foods, beverages and tobacco (CPI<sup>1</sup>), Apparel and shoe (CPI<sup>2</sup>), housing, water, gas and other fuels (CPI<sup>3</sup>), furniture and appliances (CPI<sup>4</sup>), healthcare or medical care (CPI<sup>5</sup>), transportation (CPI<sup>6</sup>), communications (CPI<sup>7</sup>), Recreation and culture (CPI<sup>8</sup>), education (CPI<sup>9</sup>), hotel and restaurant (CPI<sup>10</sup>). The sample data covers the period ranging from 2002: M5 to 2018: M8, totaling 196 monthly observations, which are widely sufficient for empirical analysis based on the central limit theorem (CLT). The sample data is dictated by their availability and is sourced from the central bank of Iran. Table 2 presents the descriptive statistics for CPI at the aggregate level and the ten subgroups of good and services, free-market exchange rate and money (M1). As shown in this table, although the monthly value of CPI in the communications subgroup (CPI<sup>7</sup>) is higher than other subgroups, but the standard deviation of CPI in these subgroups is the smallest. This point shows that CPI of the communications subgroup has the least fluctuation among the subgroups. The most significant gap between the maximum and the minimum of CPI is for the foods, beverages, and tobacco subgroup. The standard deviation of CPI in the subgroup of foods, beverages, and tobacco is at the highest level compared to other subgroups. Accordingly, we can state that the prices in this subgroup have the most fluctuation. In addition, the existence of this standard deviation confirms the existence of the greatest gap in the price index of this subgroup compared to other subgroups.

---

4 Based on the US dollar

5 The money (M1) is equal to composed of physical currency and coin, demand deposits, travelers' checks, other checkable deposits, and negotiable order of withdrawal (NOW) accounts.

**Table 2. Descriptive Statistics**

	CPI <sup>0</sup>	CPI <sup>1</sup>	CPI <sup>2</sup>	CPI <sup>3</sup>	CPI <sup>4</sup>	CPI <sup>5</sup>	CPI <sup>6</sup>	CPI <sup>7</sup>	CPI <sup>8</sup>	CPI <sup>9</sup>	CPI <sup>10</sup>	FERFM	M
Mean	48.6	45.6	49.8	50.0	51.6	47.9	50.4	80.4	51.6	56.1	47.2	20069	755579
Median	32.1	24.9	33.1	36.8	35.6	34.4	33.2	73.4	34.2	44.7	32.4	10467	595945
Maximum	128	140	124	122	130	122	124	116	134	120	121	101499	2078500
Minimum	10.8	7.4	15.0	10.3	15.4	11.8	16.8	57.2	18.9	25.3	10.8	7991	139106
Std. Dev.	34.8	38.3	33.4	33.6	33.6	33.0	32.2	14.1	32.6	27.7	34.0	14938	506237
Skewness	0.61	0.66	0.65	0.54	0.60	0.74	0.69	0.47	0.74	0.89	0.67	1.62	0.68
Kurtosis	1.85	1.89	1.81	1.86	1.73	2.06	1.87	2.02	1.99	2.54	1.91	7.24	2.47
Jarque-Bera	22.9	24.2	25.6	19.9	24.8	25.0	25.9	15.1	26.4	27.5	24.6	232.0	17.4
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No. of Obs.	196	196	196	196	196	196	196	196	196	196	196	196	196

**Note:** Data is monthly, ranging from 2002 until 2018. CPI<sup>0-10</sup> is a gauge of consumer price inflation, free-market exchange rate (FERFM) is in riyals. Money (M<sub>1</sub>) is in billion riyals.

First, we establish the unit root properties of the data using the Augmented Dicky-Fuller and Phillips-Perron unit root tests. The results for the ADF and PP unit root tests have been reported in Table 3. According to the results in Table 3, the integrated order of each series in level is one. To check the (non) stationary of time series data, we perform the standard Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) unit root test. Table 3. shows the results of both the ADF and PP unit root tests. According to Table 3., we can observe that the null hypothesis of non-stationary cannot be rejected for the levels of all variables, except for CPI<sup>5</sup>. However, when these tests are applied to first differences of variables, they reject the null of non-stationary for all series, meaning that all variables – except for CPI<sup>5</sup>, are I(1). CPI<sup>5</sup> is found to be I(0) in the level, and hence, CPI<sup>5</sup> has a different order of integration relative to its determinants. The stationary results of variables do not allow for conducting the Johansen cointegration methodology to test for a common long-run relationship among variables, as it requires that all variables should

have the same order of integration. Indeed, the Johansen cointegration test is inappropriate when variables have different orders of integration. Consequently, we employ a NARDL methodology as an adequate test for cointegration because we are not constrained by the normal requirement of cointegrating models that all variables must be I(1).

#### 4. Econometric Model

The asymmetric bound-testing approach (NARDL hereafter) developed by Shin et al. (2014) is used in the current study to examine the presence of asymmetric effects in the short and long-run relationships between exchange rate (FERFM) and consumer price index (CPI) variables in Iran. The NARDL approach is an asymmetric extension of the linear autoregressive distributed lag (ARDL) procedure proposed by Pesaran et al. (2001). Notably, the dynamic error-correction representation of the NARDL approach allows one to capture asymmetry in both the short and long run.

**Table 3. ADF and PP unit root test results**

Variables	Augmented Dicky-Fuller unit root test				Phillips-Perron unit root test			
	Level		First order difference		Level		First order difference	
	t-statistic	P-value	t-statistic	P-value	t-statistic	P-value	t-statistic	P-value
<i>CPI</i> <sup>0</sup>	-2.64	0.26	-3.03	0.13	-1.68	0.76	-11.3	0.00
<i>CPI</i> <sup>1</sup>	-1.61	0.78	-10.8	0.00	-1.78	0.71	-11.3	0.00
<i>CPI</i> <sup>2</sup>	-2.32	0.42	-3.87	0.00	-1.81	0.70	-3.75	0.02
<i>CPI</i> <sup>3</sup>	-1.47	0.84	-5.84	0.00	-1.24	0.90	-14.8	0.00
<i>CPI</i> <sup>4</sup>	-2.90	0.17	-2.12	0.03	-1.99	0.60	-3.32	0.06
<i>CPI</i> <sup>5</sup>	-3.78	0.02	-	-	-1.61	0.79	-8.40	0.00
<i>CPI</i> <sup>6</sup>	-1.66	0.76	-11.5	0.00	-1.69	0.75	-11.7	0.00
<i>CPI</i> <sup>7</sup>	-1.10	0.93	-6.88	0.00	-1.11	0.92	-10.4	0.00
<i>CPI</i> <sup>8</sup>	-1.66	0.76	-3.57	0.03	-1.63	0.78	-10.3	0.00
<i>CPI</i> <sup>9</sup>	-1.21	0.90	-2.70	0.07	-1.75	0.73	-12.8	0.00
<i>CPI</i> <sup>10</sup>	-2.26	0.46	-3.72	0.02	-1.43	0.85	-6.92	0.00
<i>FExR</i>	-0.80	0.96	-3.43	0.05	-0.80	0.96	-7.79	0.00
<i>FERFM</i> <sup>+</sup>	-0.53	0.98	-6.66	0.00	-0.80	0.96	-7.30	0.00
<i>FERFM</i> <sup>-</sup>	-1.81	0.69	-3.39	0.05	-1.78	0.71	-12.4	0.00
<i>M</i>	-2.92	0.16	-2.69	0.07	-2.74	0.22	-20.2	0.00

The NARDL is also flexible as it provides valid results regardless of the integration order of the variables, i.e., I(0), I(1) or a combination of both (Nusair, 2017). Following Shin et al. (2014), the NARDL model built around the following asymmetric long-run equilibrium relationship<sup>6</sup>:

$$y_t = \beta^+ x_t^+ + \beta^- x_t^- + \gamma z_t + u_t \quad (1)$$

Where  $u_t$  is a stationary zero-mean error process that represents deviations from the long-run equilibrium,  $z_t$  is a vector of regressors entering symmetrically,  $\beta^+$  and  $\beta^-$  are the associated asymmetric long-run parameters and  $x_t$  is the vector of regressors decomposed as:

$$x_t = x_0 + x_t^+ + x_t^- \quad (2)$$

Where  $x_0$  is an arbitrary initial value and  $x_t^+$  and  $x_t^-$  denote the partial sum processes which accumulate positive and negative changes in  $x_t$ , respectively, and are defined as follows:

$$x_t^+ = \sum_{j=1}^t \Delta x_j^+ = \sum_{j=1}^t \max(\Delta x_j, 0) \quad (3)$$

$$x_t^- = \sum_{j=1}^t \Delta x_j^- = \sum_{j=1}^t \min(\Delta x_j, 0) \quad (4)$$

According to Shin et al (2014), the following asymmetric error correction model can be obtained:

$$\Delta y_t = \mu + \rho y_{t-1} + \theta^+ x_{t-1}^+ + \theta^- x_{t-1}^- + \theta_z z_{t-1} + \sum_{j=1}^{p-1} \alpha_j \Delta y_{t-j} + \sum_{j=0}^{q-1} (\pi_j^+ \Delta x_{t-j}^+ + \pi_j^- \Delta x_{t-j}^- + \pi_{z,j} \Delta z_{t-j}) + \varepsilon_t \quad (5)$$

Where all variables are as defined above,  $\theta^+ = -\rho\beta^+$  and  $\theta^- = -\rho\beta^-$ , and the short-run adjustments to positive and negative changes in the explanatory variables  $x_t$  are captured by  $\pi_j^+$  and  $\pi_j^-$ , respectively.

<sup>6</sup> See Shin et al. (2014) for a more detailed derivation of the NARDL model.

The empirical implementation of the NARDL method entails the same steps as in the linear ARDL model. In the first step, the error-correction model in Eq. (5) is estimated by the standard OLS. The second step involves testing for the presence of an asymmetric long-run relationship among the levels of the variables using the bounds testing approach. This can be done using either of the following two statistics (Shin et al., 2014). The first is the F-statistic, introduced by Pesaran et al. (2001) and denoted by  $F_{PSS}$ , which tests the null hypothesis of no cointegration ( $\rho = \theta^+ = \theta^- = 0$ ) against the alternative of cointegration ( $\rho \neq \theta^+ \neq \theta^- \neq 0$ ). The second one is the t-statistic, proposed by Banerjee et al. (1998) and denoted by  $t_{BDM}$ , which is suitable for testing the null hypothesis of no cointegration against the alternative of cointegration. Since these two statistics have non-standard distributions that depend on the order of integration of the underlying variables, the pragmatic bounds-testing procedure advanced by Pesaran et al. (2001) is also utilized in the NARDL approach. The third step consists of testing for long-run symmetry ( $\theta^+ = \theta^-$ ) and short-run symmetry ( $\sum_{j=0}^{q-1} \pi_j^+ \Delta x_{k,j}^+ = \sum_{j=0}^{q-1} \pi_j^- \Delta x_{k,j}^-$ ) by means of the standard Wald tests. We have reported the results of bound testing in Table 4. The results of  $F_{PSS}$  statistics confirm the long-run relationship among the variables in our final model. In order to analyses of the asymmetric effect of free-market exchange rate on the consumer price index of goods and services, respect to Eq. (5), Eq. (6) is defined as follows:

$$\Delta CPI_t^h = \mu + \rho CPI_{t-1}^h + \theta^+ FERFM_{t-1}^+ + \theta^- FERFM_{t-1}^- + \gamma M_{t-1} + \sum_{j=1}^{p-1} \alpha_j \Delta CPI_{t-j}^h + \sum_{j=0}^{q-1} \pi_j^+ \Delta FERFM_{t-j}^+ + \sum_{j=0}^{q-1} \pi_j^- \Delta FERFM_{t-j}^- + \sum_{j=0}^{r-1} \delta_j \Delta M_{t-j} + \varepsilon_t \quad j = 0, 1, 2, \dots, 10 \quad (6)$$

Where  $CPI^h$  and  $M$  stands for the consumer price index (at the aggregate level and in each of the ten subgroups of goods and services) and money (M1), respectively and  $\varepsilon_t$  refers to the error term. In turn,  $FERFM^+$  and  $FERFM^-$  are the partial sums of exchange rate appreciation and depreciation in the free market. It should be noted that Eq. 5 has been estimated eleven times based on CPI at the aggregate level and each of the ten subgroups of goods and services.

## 5. Empirical Results

Due to the existence of asymmetries in the short and long run, we confirm the long-run relationship among underlying variables. For this purpose, we apply the nonlinear bound testing approach proposed by Shin et al. (2014). Table 4. contains the results of bound testing for asymmetric cointegration. We investigate the presence of nonlinearity by employing the F-statistic (FPSS) from Pesaran et al. (2001). According to results, we reject the null of no asymmetric cointegration, as the calculated F-statistics of Pesaran et al. (2001) is greater than the upper critical bounds. The empirical results confirm the long-run asymmetric relationship between  $CPI^h$  and FEEFM.

**Table 4. Testing for Asymmetric Cointegration**

Bound testing	$CPI^0$	$CPI^1$	$CPI^2$	$CPI^3$	$CPI^4$	$CPI^5$	$CPI^6$	$CPI^7$	$CPI^8$	$CPI^9$	$CPI^{10}$
$F_{PSS}$	5.33	5.41	9.29	10.9	4.10	9.67	10.3	5.49	5.03	7.41	5.33
Significance level	LCB I(0)					UCB I(1)					
1%	3.65					4.66					
5%	2.79					3.67					
10%	2.37					3.2					

Note:  $F_{PSS}$  show the calculated value of the F-statistics that test the null hypothesis of no asymmetric cointegration. We adopt the conservative approach to the selection of critical values as recommended by Shin et al. (2014). The values of lower and upper critical bound are calculated from Pesaran et al. (2001) by using the conservative approach (K=3).

Table 4. shows that the existence of long-run relationships between  $CPI^h$  and its determinants confirms in Iran. According to Eq. 6, we estimate the corresponding NARDL models in the short and long run to examine the asymmetric impact of exchange rate on consumer price index (at the aggregate level and the ten subgroups). Table 5. shows the results of NARDL estimation based on consumer price index at the

aggregate level of goods and services ( $CPI^0$ ) and each of the ten subgroups of goods and services ( $CPI^1$  to  $CPI^{10}$ ). In other words, we have eleven estimates. In the first estimation, we consider the exchange rate and money (M1) as potential determinants of the consumer price index at the aggregate level of goods and services ( $CPI^0$ ). Then, in the following estimation, we replace  $CPI^0$  with  $CPI^1$  to  $CPI^{10}$ .

**Table 5. Dynamic Non-linear Estimation (Asymmetric Model)**

	$CPI^0$	$CPI^1$	$CPI^2$	$CPI^3$	$CPI^4$	$CPI^5$	$CPI^6$	$CPI^7$	$CPI^8$	$CPI^9$	$CPI^{10}$
$CPI_{t-1}^h$	-0.02 (0.00)	-0.02 (0.04)	-0.01 (0.08)	-0.06 (0.00)	-0.02 (0.01)	-0.02 (0.19)	-0.05 (0.04)	-0.03 (0.13)	-0.04 (0.03)	-0.10 (0.00)	-0.01 (0.06)
$FERFM_{t-1}^+$	0.01 (0.01)	0.02 (0.04)	0.02 (0.00)	-0.004 (0.48)	0.01 (0.02)	0.04 (0.00)	0.03 (0.00)	0.00 (0.98)	0.03 (0.00)	-0.01 (0.11)	0.01 (0.00)
$FERFM_{t-1}^-$	0.03 (0.07)	0.06 (0.03)	0.04 (0.00)	-0.02 (0.35)	0.02 (0.13)	0.10 (0.00)	0.04 (0.17)	-0.02 (0.16)	0.04 (0.06)	-0.11 (0.00)	0.03 (0.00)
$M_{t-1}$	0.02 (0.00)	0.03 (0.01)	0.005 (0.08)	0.06 (0.00)	0.01 (0.04)	0.01 (0.40)	0.02 (0.04)	-0.01 (0.02)	0.01 (0.04)	0.03 (0.00)	0.01 (0.03)
$\Delta CPI_{t-1}^h$	0.21 (0.00)	0.12 (0.10)	0.35 (0.0)	0.15 (0.03)	0.73 (0.00)	0.32 (0.00)			0.06 (0.35)	0.17 (0.01)	0.30 (0.00)
$\Delta CPI_{t-2}^h$	-0.11 (0.09)			-0.18 (0.00)	-0.25 (0.00)	-0.15 (0.06)			0.14 (0.03)		
$\Delta CPI_{t-3}^h$	0.38 (0.00)			0.50 (0.00)	0.23 (0.01)	0.19 (0.01)			0.07 (0.32)		
$\Delta CPI_{t-4}^h$	-0.11 (0.09)			-0.26 (0.00)	-0.13 (0.04)	-0.24 (0.00)			-0.13 (0.03)		
$\Delta CPI_{t-5}^h$						-0.13 (0.07)					
$\Delta FERFM_t^+$	0.07 (0.00)	0.08 (0.03)	0.05 (0.00)	0.04 (0.06)	0.09 (0.00)	0.08 (0.00)	0.13 (0.00)	0.09 (0.00)	0.14 (0.00)	0.07 (0.07)	0.05 (0.00)
$\Delta FERFM_{t-1}^+$		0.07 (0.09)	0.06 (0.00)		0.06 (0.00)	-0.07 (0.00)		0.01 (0.59)	-0.00 (0.91)		
$\Delta FERFM_{t-2}^+$			0.01 (0.34)		-0.04 (0.03)	-0.03 (0.32)		0.08 (0.00)	-0.12 (0.00)		
$\Delta FERFM_{t-3}^+$			-0.03 (0.01)			-0.04 (0.08)			0.16 (0.00)		
$\Delta FERFM_{t-4}^+$			0.02 (0.03)			-0.07 (0.01)					
$\Delta FERFM_t^-$		-0.09 (0.41)	-0.01 (0.77)		-0.07 (0.05)	-0.09 (0.14)		-0.08 (0.14)	0.17 (0.01)	-0.11 (0.36)	-0.06 (0.14)

	$CPI^0$	$CPI^1$	$CPI^2$	$CPI^3$	$CPI^4$	$CPI^5$	$CPI^6$	$CPI^7$	$CPI^8$	$CPI^9$	$CPI^{10}$
$\Delta FERFM_{t-1}^-$			-0.04 (0.08)		0.04 (0.27)	0.06 (0.34)		-0.08 (0.10)		0.25 (0.02)	-0.02 (0.64)
$\Delta FERFM_{t-2}^-$			-0.03 (0.15)		-0.05 (0.13)	-0.11 (0.05)		-0.10 (0.04)			-0.10 (0.00)
$\Delta FERFM_{t-3}^-$			-0.01 (0.60)		0.03 (0.32)						
$\Delta FERFM_{t-4}^-$			0.004 (0.85)		-0.01 (0.66)						
$\Delta FERFM_{t-5}^-$			-0.09 (0.00)		-0.13 (0.00)						
$\Delta M_t$	-0.05 (0.00)	-0.04 (0.17)	0.03 (0.00)	-0.06 (0.01)	-0.01 (0.33)	-0.05 (0.00)	-0.05 (0.08)	-0.04 (0.00)		-0.05 (0.12)	-0.04 (0.00)
$\Delta M_{t-1}$	0.04 (0.01)	0.15 (0.00)		-0.07 (0.01)	-0.01 (0.28)	-0.06 (0.00)					
$\Delta M_{t-2}$	-0.02 (0.14)			-0.08 (0.00)	-0.00 (0.89)	-0.03 (0.07)					
$\Delta M_{t-3}$				-0.08 (0.00)	0.02 (0.05)	-0.01 (0.53)					
$\Delta M_{t-4}$						0.03 (0.06)					
$\Delta M_{t-5}$						0.02 (0.18)					
<i>Cons.</i>	-0.18 (0.00)	-0.29 (0.01)	-0.03 (0.17)	-0.51 (0.00)	-0.04 (0.15)	-0.03 (0.66)	-0.09 (0.14)	0.18 (0.00)	-0.02 (0.45)	-0.07 (0.24)	-0.08 (0.04)

Note: This table reports the results of the estimation of NARDL model for the adjustment of the CPI<sup>h</sup>. Adj. R<sup>2</sup> and adjusted R<sup>2</sup> are 99 percentages in all estimated models. The P-Value are in parentheses, respectively.

As seen in Table 5, in the short run, a positive shock of exchange rate has an immediate effect on inflation in the commodity subgroup. This effect has been lasting for several months in some subgroups such as Apparel and shoe and medical care. However, the negative shocks of the exchange rate do not have a significant effect on inflation, and only in the transport subgroup with immediate effect is accompanied.

Sensitivity analysis can be done for authentication of estimated models. The results of sensitivity analysis displayed in Table 6. The LM test confirms that the residuals of estimated models do not show any serial

correlation but the heteroscedasticity (ARCH) test just shows the absence of conditional heteroscedasticity in four estimations. Using the squares of the fitted values, the F-statistic of the Ramsey RESET test is not statistically significant, thus the hypothesis that the models are correctly specified is accepted.

After analyzing the short and long-run impacts of free-market exchange rate and money (M1) on consumer price index in Iran, NARDL also provides the long-run asymmetric reaction of consumer price index (CPI<sup>0</sup> to CPI<sup>10</sup>) to positive and negative variations of exchange rate. Table 7. reports the long-run asymmetric

parameters for the eleven estimations. The results in Table 7 show that free-market exchange rate appreciation has a direct impact on the CPI at the aggregate level, in a way that, if the exchange rate increases by 1%, CPI at the aggregate level will be increased by 0.49%. On the other hand, free-market exchange rate depreciation does not have a significant

effect on the CPI at the aggregate level, which shows the downward price rigidity in Iran. Overall, this result shows the asymmetric effect of free-market exchange rate on inflation, which is in line with the results of studies such as Kazerooni and Rostami (2007), and Kataranova (2010).

**Table6. Sensitivity analysis**

	<i>CPI</i> <sup>0</sup>	<i>CPI</i> <sup>1</sup>	<i>CPI</i> <sup>2</sup>	<i>CPI</i> <sup>3</sup>	<i>CPI</i> <sup>4</sup>	<i>CPI</i> <sup>5</sup>	<i>CPI</i> <sup>6</sup>	<i>CPI</i> <sup>7</sup>	<i>CPI</i> <sup>8</sup>	<i>CPI</i> <sup>9</sup>	<i>CPI</i> <sup>10</sup>
<i>χ</i> <sup>2</sup> Arch	14.2 (0.29)	16.3 (0.18)	15.3 (0.23)	16.4 (0.17)	16.2 (0.18)	13.0 (0.37)	5.21 (0.52)	16.6 (0.16)	21.1 (0.13)	4.4 (0.95)	5.3 (0.91)
<i>χ</i> <sup>2</sup> Serial	12.9 (0.17)	15.8 (0.20)	12.7 (0.17)	7.6 (0.18)	11.5 (0.49)	0.16 (0.69)	4.8 (0.96)	8.6 (0.13)	6.5 (0.84)	15.1 (0.18)	7.94 (0.24)
Ramsey Reset	0.64 (0.43)	0.62 (0.43)	0.10 (0.74)	0.71 (0.40)	0.19 (0.67)	1.74 (0.14)	1.77 (0.14)	0.97 (0.32)	1.79 (0.17)	0.29 (0.13)	0.12 (0.29)

Note: Serial, Arch and Reset denote LM test for serial correlation, autoregressive conditional heteroscedasticity test for conditional heteroscedasticity and Ramsey Regression Equation Specification Error Test (RESET) test for model misspecification (functional form).

For detailed understanding the effects of free-market exchange rate appreciation and depreciation on prices in Iran’s Economy, we examined the long-run effects of free-market exchange rate appreciation and depreciation on the consumer price index in the ten subgroups of goods and services. Free-market exchange rate appreciation has a direct and significant effect on CPI of subgroups such as *CPI*<sup>1</sup> (food and tobacco), *CPI*<sup>2</sup> (Apparel and shoe), *CPI*<sup>4</sup> (furniture and appliances), *CPI*<sup>6</sup> (transportation), *CPI*<sup>8</sup> (Recreation and culture), and *CPI*<sup>10</sup> (hotel and restaurant). In comparison, Free-market exchange rate appreciation has not a significant effect on the CPI of subgroups like *CPI*<sup>7</sup> (communications), *CPI*<sup>3</sup> (housing, water, gas and other fuels) and *CPI*<sup>5</sup> (healthcare). Similarly, free-market exchange rate depreciation does not have a significant effect on the *CPI*<sup>3</sup>, *CPI*<sup>5</sup>, and *CPI*<sup>7</sup>.

In addition, free-market exchange rate depreciation does not have a significant effect on the *CPI*<sup>1</sup>, *CPI*<sup>2</sup>, *CPI*<sup>3</sup>, *CPI*<sup>4</sup>, *CPI*<sup>5</sup>, *CPI*<sup>6</sup>, *CPI*<sup>7</sup>, *CPI*<sup>8</sup>, and *CPI*<sup>10</sup>.

Moreover, regarding the long-run results, the asymmetric effect of free-market exchange rate on consumer price index at the aggregate level and CPI of the subgroups (food and tobacco, Apparel and shoe, furniture and appliances, transportation, recreation and culture, education, hotel and restaurant) cannot be rejected. According to what said Bussière (2007) and Kataranova (2010), because of monopoly of firms in market or production capacity and distribution network, the asymmetric effect of the exchange rate on the consumer price index occurs.

In addition, these asymmetric effects of exchange rate on CPI at the aggregate level and subgroups are in the line with study results of Kataranova (2010).

In addition, the money (M1) has a direct and significant effect on CPI at the aggregate level and CPI of all subgroups except for the communications. Given this result, we can say that inflation is a monetary phenomenon.

Table 7. Long-Run Parameters

	$CPI^0$	$CPI^1$	$CPI^2$	$CPI^3$	$CPI^4$	$CPI^5$	$CPI^6$	$CPI^7$	$CPI^8$	$CPI^9$	$CPI^{10}$
$L_{FERFM^+}$	0.49 (0.03)	0.85 (0.07)	1.69 (0.05)	-0.07 (0.47)	0.68 (0.02)	2.37 (0.22)	0.63 (0.04)	0.004 (0.98)	0.81 (0.01)	-0.16 (0.10)	1.03 (0.09)
$L_{FERFM^-}$	1.05 (0.16)	2.34 (0.16)	4.34 (0.12)	-0.29 (0.32)	1.15 (0.19)	5.78 (0.28)	0.83 (0.36)	-0.79 (0.32)	1.12 (0.21)	-1.18 (0.00)	2.71 (0.19)
$L_M$	0.82 (0.00)	1.12 (0.00)	0.48 (0.00)	0.93 (0.00)	0.42 (0.00)	0.44 (0.04)	0.41 (0.00)	-0.22 (0.31)	0.30 (0.00)	0.34 (0.00)	0.76 (0.00)

Note: The P-Value are in parentheses, respectively.

## 6. Concluding Remarks

Among the 40 countries that had the highest gross domestic product in 2019, Iran is the only country with inflation above 20%. Due to the dependence of Iran's economic and production structure on imported goods and inputs, exchange rate movements can be considered as one of the important factors of inflation in Iran. On the other hand, inflation has a direct impact on the real income of people in society; therefore, inflation movements are important for people. Also in different groups of income, people use a different basket of goods and services, which causes the people of the community to take a different impact from the inflation (Due to the depreciation of the domestic currency). In addition, monopoly power in the market and constraint on the production capacity of firms can be factors that lead to downward price rigidity, and as a result, cause the asymmetric effect of the exchange rate (US dollar) on prices. For this reason, the present study investigated the asymmetric effect of the exchange rate on the consumer price index at the aggregate level and the ten subgroups. To do this, we used Iran's economic data from 2002: 5 to 2018: 8, and through the NARDL approach, we made the desired estimate. The results show that free-market exchange rate appreciation has a significant and direct effect on the consumer price index. Free-market exchange rate depreciation does not have a significant effect on the CPI at the aggregate level, which this result refers to the downward price rigidity in Iran. Free-market

exchange rate appreciation also has a significant and direct effect on the CPI of all subgroups, except for communications, housing, and healthcare. In addition, free-market exchange rate depreciation does not have any significant effect on the CPI of other subgroups except for the education. According to the results, free-market exchange rate depreciation and appreciation did not affect the consumer price index of housing and fuels, healthcare and communication subgroups. Regarding the long-run results, the hypothesis of the asymmetric effect of exchange rate on the consumer price index at the aggregate level and subgroups (food and tobacco, Apparel and shoe, furniture and appliances, transportation, recreation and culture, education, hotel and restaurant) cannot be rejected. The impact of money (M1) on the CPI at the aggregate level and most subgroups is direct and significant, which shows inflation is a monetary phenomenon.

It is expected that the economic policymakers in Iran and other countries with a similar economic structure to Iran can benefit from the results of this study. In addition, the results suggest that economic policymakers should prevent increasing exchange rates if they are considering anti-inflationary policies. Moreover, due to the presence of rigidity in most subgroups of price indices during the exchange rate decreases, it is recommended that economic policymakers use other policies to reduce the inflation.

## REFERENCES

- Amoah, L., & Aziakpono, M. J. (2018). Exchange rate pass-through to consumer prices in Ghana: is there asymmetry? *International Journal of Emerging Markets*, 13(1), 162-184.
- An, L., & Wang, J. (2012). Exchange rate pass-through: Evidence based on vector autoregression with sign restrictions. *Open Economies Review*, 23(2), 359-380.
- Asgharpour, H., & Mehdiloo, A. (2014). The Impact of Inflationary Environment on Exchange Rate Pass-Through on Import Prices in Iran: Markov-Switching Approach. *Journal of Economic Research and Policies*, 22 (70), 75-102.
- Asgharpur, H., Kazerooni, A., Mirani, N. (2015). The Impact of Inflationary Environment on Exchange Rate Pass-Through to the Import Price Index in Iran. *Quarterly Journal of Applied Theories of Economics*, 2(2), 155-178.
- Asgharpour, H., Vafaei, E., Abdolmaleki, H. (2017). The Exchange Rate Asymmetric Pass-Through to Import Price Index: The Case Study of Iran. *Iranian Journal of Economic Studies*, 6(1), 47-64.
- Aziznejad S, Komijani A. (2017). The Effects of Exchange Rate Volatility on the Selected Macroeconomic Variables: Case Study of IRAN. *Quarterly Journal of Economic Research*, 17 (1), 121-143
- Bahrami, J., Mohammadi, T., Bozorg, S. (2014). Asymmetric Exchange Rate Pass-Through to Domestic Price Indexes with the Approach of SVAR. *Iranian Journal of Economic research*, 19(60), 37-65.
- Banerjee, A., Dolado, J., & Mestre, R. (1998). Error-correction mechanism tests for cointegration in a single-equation framework. *Journal of time series analysis*, 19(3), 267-283.
- Beirne, J., & Bijsterbosch, M. (2011). Exchange rate pass-through in central and eastern European EU Member States. *Journal of Policy Modeling*, 33(2), 241-254.
- Bussière, M. (2007). *Exchange rate pass-through to trade prices: the role of non-linearities and asymmetries* (No. 822). ECB Working Paper.
- Campa, J. M., & Goldberg, L. S. (2005). Exchange rate pass-through into import prices. *Review of Economics and Statistics*, 87(4), 679-690.
- Cheikh, N. B., & Rault, C. (2016). Recent estimates of exchange rate pass-through to import prices in the euro area. *Review of World Economics*, 152(1), 69-105.
- Choudhri, E. U., & Hakura, D. S. (2015). The exchange rate pass-through to import and export prices: The role of nominal rigidities and currency choice. *Journal of International Money and Finance*, 51, 1-25.
- Darrat, A. F., Chopin, M. C., & Topuz, C. (2003). Is US inflation low because the dollar value is high? Some short-and long run evidence. *Applied Financial Economics*, 13(4), 237-243.
- Delatte, A. L., & López-Villavicencio, A. (2012). Asymmetric exchange rate pass-through: Evidence from major countries. *Journal of Macroeconomics*, 34(3), 833-844.
- Deravi, K., Gregorowicz, P., & Hegji, C. E. (1995). Exchange rates and the inflation rate. *Quarterly Journal of Business and Economics*, 34(1), 42-54.
- Feinberg, R. M. (1989). The effects of foreign exchange movements on US domestic prices. *The Review of Economics and Statistics*, 71(3), 505-511.
- Ghafari, H., Changi Ashtiyani, A., Jaloli, M. (2014). Investigation and Forecasting of the Effects of Exchange Rate Increase on Major Macroeconomic Variables of Iran (1976-2014). *Journal of Applied Economics Studies in Iran*, 2(8), 91-113.
- Ghafari F, Naemy Pajoh H. (2012). An Investigation into the Impacts of Internal and External Shocks on Inflation in Iran. *Journal of Economic Research and Policies*, 20 (62), 117-142.
- Goldberg, P. K., & Knetter, M. M. (1997). Goods Prices and Exchange Rates: What Have We Learned? *Journal of Economic Literature*, 35(3), 1243-1272.
- Ibrahim, M. H. (2000). Malaysian inflation and the ringgit

- effective exchange rates: A vector error correction analysis. *Savings and Development*, 24(4), 459-478.
- Jiang, J., & Kim, D. (2013). Exchange rate pass-through to inflation in China. *Economic Modelling*, Vol. 33, 900-912.
- Kataranova, M. (2010). The Relationship between the Exchange Rate and Inflation in Russia. *Problems of Economic Transition*, 53(3), 45-68.
- Kazerooni, A., & Rostami, N. (2007). The Non-Symmetric Effects of Exchange Rate Fluctuations on the Real Output and Price in Iran (1961-2002). *Economics Research*, 7(25), 177-196.
- Khoshbakht, A., & Akhbari, M. (2007). A Survey of the Effect of Exchange Rate Changes on Inflation of Consumer Price Indices and Imports in Iran. *Economics Research*, 7(27), 51-82.
- Kim, K. H. (1998). US inflation and the dollar exchange rate: A vector error correction model. *Applied Economics*, 30(5), 613-619.
- Kordbache, H., Ahmadi, Z. (2018). Evaluation the Effect of Exchange Rate Fluctuations on Medical Care Price Indexes in Iran. *Journal of healthcare management*, 8(4), 17-27.
- Mehrara M, Ghobadzadeh R. (2016). The Determinants of Inflation in Iran Based on Bayesian Model Averaging (BA) and Weighted-Average Least Squares (WALS). *The Journal of Planning and Budgeting*. 21 (1), 57-82.
- Mehrabi, B. H., Sherafatmand, H., & Baghestny, A. A. (2011). Study on the Impacts of Exchange Rate Shocks and Gap of GDP on Inflation in Iran. *Knowledge and Development*, 17(33), 294-312.
- Nourzad, F. (1997). The Short-and Long-Run Relationships Between the Exchange Rate of the Dollar and Producer Prices in the US. *International Economic Journal*, 11(2), 59-71.
- Nusair, S.A. (2017). The J-Curve Phenomenon in European Transition Economies: A Nonlinear ARDL Approach. *International Review of Applied Economics*, 31(1), 1-27.
- Papell, D. H. (1994). Exchange rates and prices: An empirical analysis. *International Economic Review*, 35(2), 397-410.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships, *Journal of Applied Econometrics*, 16(3), 289-326.
- Pirae, K., & Koroush Pasandide, H. (2002). Empirical study of the relationship between exchange rate and inflation in Iran. *Journal of Macroeconomics*, 2(4), 61-80.
- Sadat Hoseyni, N., Asgharpur, H., Haghghat, J. (2018). Effect of Exchange Rate Pass-through on Import Price Index: Smooth Transition Regression Approach. *Journal of Economic Research (Tahghihat- E-Eghtesadi)*, 53(2), 57-75.
- Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDL framework. In *Festschrift in Honor of Peter Schmidt* (pp. 281-314). Springer, New York, NY.
- Yazdani, M., Zare, S. (2016). Investigating Effect of Exchange Rate Shocks on Inflation in Iranian Economy during Seasonal Period 2000-2012. *Journal of Applied Economics Studies in Iran*, 5(17), 171-197.

## سعر الصرف غير الرسمي، وثبات الأسعار في إيران بإتباع نهج (ARDL) غير خطي

شهریار زروکی<sup>أ</sup> وأرمان یوسفی بارفروشی<sup>ب</sup>

### ملخص

تهدف هذه الدراسة إلى التحقق من التأثير غير المتماثل لسعر الصرف غير الرسمي على مؤشر أسعار المستهلك وفق المستوى العام، وعشر مجموعات فرعية من السلع، والخدمات في الفترة الزمنية 2002:5 الى 2018:8 باستخدام طريقة (NARDL). تظهر نتائج هذه الدراسة أنه على المدى الطويل، فإن الزيادة في سعر الصرف غير الرسمي لها تأثير مباشر على مؤشر أسعار المستهلك وفق المستوى العام، وجميع المجموعات الفرعية باستثناء الاتصالات، والبناء، والعلاج، وإن تخفيض سعر الصرف غير الرسمي ليس له تأثير كبير على مؤشر أسعار المستهلك على المستوى العام، وجميع المجموعات الفرعية باستثناء التعليم. وبناء على ذلك، فإن الافتراض غير المتماثل لتأثير سعر الصرف غير الرسمي على مؤشر أسعار المستهلكين وفق المستوى العام والمجموعات الفرعية: (الغذاء، والتبغ، والملابس والأحذية، والأثاث والملحقات، والنقل، والترفيه والشؤون الثقافية، والتعليم، والفنادق والمطاعم) لا يمكن إنكاره. إضافة إلى ذلك، لا يمكن استبعاد افتراض ثبات السعر المنخفض عند تخفيض سعر الصرف غير الرسمي. وإن حجم النقود له تأثير مباشر على مؤشر أسعار المستهلك وفق المستوى العام، ومعظم المجموعات الفرعية، مما يدل على أن التضخم ظاهرة نقدية.

الكلمات الدالة: ثبات الأسعار، سعر الصرف، إيران.

<sup>أ</sup>، ب جامعة مازاندران، إيران sh.zaroki@umz.ac.ir

تاريخ استلام البحث 2019/12/22 وتاريخ قبوله 2020/5/10.