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Asymmetric Effects of Inflation Shock on Consumption with the NARDL Approach (Evidence from the Duesenberry Consumption Theory Test in Iran)

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Abstract

In recent years, Iran's economic problems have increased inflation and subsequently affected fluctuations in consumption. Therefore, this research analyzed the impact of positive and negative inflationary shocks on consumption during the monthly period from April 2010 to March 2022 with the NARDL approach. This study considers GDP per capita, nominal interbank interest rate, and unofficial exchange rate variables as control variables. The results, supporting Duesenberry's ratchet effect, show that positive and negative inflation shocks have an asymmetric effect on per capita consumption. One unit of positive inflation shock growth causes a 0.012 decrease in consumption, and one unit of negative inflation shock causes a 0.049 increase in consumption. This means that there is always excess demand in the market; on the one hand, it is an expression of consumerism in Iranian society. Positive changes in real GDP increase real consumption by a coefficient of 0.733, and negative changes in GDP cause a decrease in consumption by a coefficient of 0.314. Empirical results also discovered long-run asymmetric effects between interest rates and consumption, so with one unit increase in interest rate, consumption decreases by about 0.133. With one unit decrease in interest rate, consumption increases by about 0.117. This study suggests policymakers should prioritize low inflation and economic growth goals in implementing monetary policies to increase household consumption and well-being.

Highlights

- Using the non-linear ARDL method to study the effect of positive and negative inflation shocks on the consumption of Iranian households.
- Confirmation of Duesenberry's ratchet effect of consumption in Iran because positive and negative inflationary shocks have an asymmetric effect on consumption.
- Positive changes in real GDP per capita increase real consumption per capita and negative changes in GDP per capita cause a decrease in consumption per capita.
- There are long-run asymmetric effects between interest rates and consumption.

1. Introduction

In recent years, Iran has witnessed increasing inflation. In addition to increasing economic and social costs, inflation disrupts the price allocation system, affecting income distribution and society's welfare. In Iran, inflation reached about 12.4% in 2010 to about 40.2% at the beginning of 2022. In addition, the point-to-point inflation in 2021/4 was approximately 48.82% compared to the same month of the previous year, and in 2022/3, it was about 34.49% compared to the same month of the last year. Therefore, considering the increasing inflation growth in Iran, it is imperative to examine its economic consequences on real variables such as consumption.

Consumption is one of the most important macroeconomic variables because it shows the welfare state of any society. The consumption of Iranian households, with a share of 33.8% of the GDP in 2022, is one of the most critical parts of the total demand. Considering the high share of consumption in GDP, identifying factors affecting consumption provides policy solutions appropriate to each society's specific economic conditions.

In most previous studies, the household consumption function has been considered with life cycle models and a function of wealth and income (Paradiso et al., 2012). Due to the significant and rapid changes in the financial and social structures, remarkable changes have been made in the economic systems of the societies, and consumption is also considered a function of factors such as inflation (Carroll et al., 2011). Therefore, this study considers consumption a function of inflation based on CPI (like some previous studies: Paradiso et al., 2012: Boons et al., 2020). Since inflation based on CPI causes uncertainty about the future for consumers, it significantly changes the consumption pattern (Paradiso et al., 2012). There are many direct and indirect influence channels for the effect of inflation on consumption. According to Fisher's hypothesis, when inflation increases, the real interest rate decreases, which causes a decrease in savings and an increase in current household consumption (Duca-Rua et al., 2021). Ryngaert (2022) also argues that if consumers expect the cost of borrowing to increase, they will reduce their future consumption and increase their current consumption. Although some studies have argued that uncertainty increases in inflationary conditions, consumption from the precautionary savings channel decreases (Binder, 2017: Armantier et al., 2021).

From the indirect channels influencing inflation on consumption, with the increase of inflation, the real value of wealth decreases, affecting consumption. In addition, inflation affects the income distribution of households with fixed and non-fixed incomes and the consumption of households with different jobs (Howard, 1978: Hendry & Ungern-Sternberg, 2011). On the other hand, the increase in inflation from the liquidity channel causes a decrease in the saved profit, which causes a decrease in savings and, subsequently, an increase in current consumption (Mishkin, 1992). On the other hand, extreme and unexpected fluctuations in consumption patterns cause unexpected inflations (Diewert & Fox, 2020). Some studies analyzed the effect of inflation on

consumption in different countries with linear approaches (Obinna, 2020: Batrancea, 2021).

Since the high rate of inflation causes the reduction and distortion of economic activities, which can reduce household consumption, on the other hand, a low inflation rate can lead to the growth of consumption by creating economic stability. On the other hand, according to Duesenberry's consumption theory, consumption has a ratchet effect, which means that households resist reducing their consumption (Duesenberry, 1952). In addition, according to the dynamics of the markets in recent years, the consumption pattern has also changed a lot (Baz et al., 2020). Therefore, investigating the effect of inflation on consumption with the ARDL, VAR, etc. approaches cannot show the asymmetric effect of inflation on consumption. In addition, the non-linear ARDL approach helps to detect non-linear and asymmetric relationships between inflation and consumption in the short and long term. In addition, paying attention to the asymmetric effects in modeling helps the accuracy of the results and the reduction of policy mistakes (Tiryaki et al., 2019). Some studies analyzed the asymmetric effect of economic variables on consumption (Chen et al., 2010: Baz et al., 2020). Few studies investigated asymmetric consumption behavior concerning the shocks of economic variables such as inflation. Therefore, in this study, the relationship between consumption and inflation is analyzed with the NARDL approach. The non-linear ARDL approach can check whether positive inflation shocks affect consumption similarly to negative inflation shocks.

On the other hand, in a developing country like Iran, with problems such as high monetary inflation, oil rent, an oil-dependent economy, a budget deficit, and international sanctions, there is a possibility of consumerism in society. Therefore, the question can also arise in Iran, with severe economic problems and high inflation: is consumerism in the society? Examining the asymmetric effects of inflation also helps to identify the type of society being consumer-oriented. Therefore, in this study, we seek to answer the following questions:

Is the impact of positive and negative inflation shocks on consumption the same or not?

Is the consumption Duesenberry's theory of consumption understandable in Iran's economy?

Is Iran's economy consumerist?

Do positive and negative inflation shocks have the same impact on consumption?

To answer the above questions, this study aims to investigate the asymmetric effects of inflation on consumption in Iran based on the NARDL approach during the monthly period from April 2010 to September 2022. The non-linear ARDL approach helps to detect non-linear and asymmetric relationships between inflation and consumption in the short and long term. The rest of the article is as follows: In the next section, the literature review is presented. Section 3 discusses the data and methodology. Experimental results

are available in Section 4, and Section 5 (Conclusion and Policy Recommendations) concludes the study.

2. A Review of the Related Literature

This section includes two subsections. First, the inflation and consumption trend of Iran's private sector during the study period is examined. Then theories and studies related to the consumption function and the channels of inflation that influence consumption are discussed.

2.1 An overview of the trend of consumption and inflation in Iran

Inflation is one of the most important economic problems, and it is said that there is a stable increase in the price of goods and services (Anochiwa & Maduka, 2015). Different theories state different reasons for inflation, such as demand pressure, production cost pressure, structural inflation, monetary inflation, etc. (Adaramola & Dada, 2020: Shapiro, 2022). Some studies (Barnichon & Shapiro, 2022) consider supply-side factors such as labor shortages, and some studies (Jorda et al., 2022) also consider demand-side factors such as increasing demand, and some studies (Shapiro, 2022) consider the combination of supply and demand factors as the main factors of inflation. In recent years, factors such as the increase in the price of energy carriers, exchange rate fluctuations, the application of international sanctions, the targeting of subsidies, etc., have caused increasing inflation in Iran. The following trend of inflation and consumption in Iran is shown in Fig. 1.
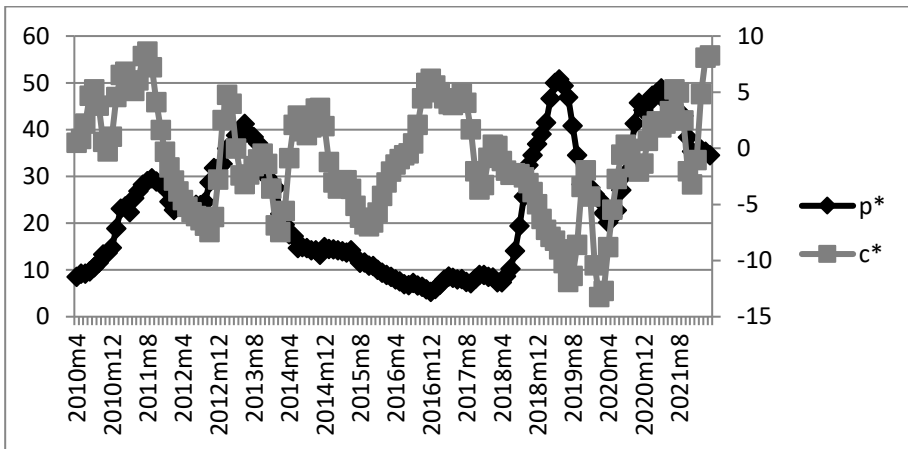
Figure 1. Trend of per capita consumption (billion Rials/thousand people) point by point and inflation point by point from 2010/4 to 2022/3.
Source: *Authors' Compilation.*

Fig. I. shows that the inflation and per capita consumption have not been constant over time. At some times (2011/7, 2013/3, 2020/3, 2021/2, and

2022/2), the fluctuations of inflation and consumption have been in the same direction, and at other times (2016/12, 2017/6, and 2019/4), these fluctuations are observed in the opposite direction. Therefore, the above graph shows no balanced relationship between inflation and consumption in the studied period, but a fluctuating relationship with different directions is observed.

2.2 Consumption function and channels of inflation effect on consumption

The consumption function represents the relationship between consumption and different factors. Many theories have investigated the consumption function. Keynes (1936) believed that various factors influence consumption, but disposable income is crucial. In Keynes's theory, unlike classical theories, the interest rate does not affect consumption. Duesenberry (1952) believed that consumption changes were not disposable income but rather a function of relative income. Duesenberry's theory is based on two assumptions: 1) the consumption behavior of people is related to each other and not independent of each other, and 2) the ratchet effect of consumption. Duesenberry's ratchet effect is the concept that after getting used to a level of consumption, a person resists reducing it. Ando & Modigliani's life cycle theory (1963) states that people's consumption is related to the person's lifetime income. Permanent income theory Friedman (1957) also states that consumption is a function of permanent income. According to Friedman's hypothesis, income is divided into two parts: permanent income and temporary income. In Friedman's model, wealth is implicitly included in the consumption function. In addition to income and wealth, studies included various explanatory variables in the consumption function (Mishkin, 1976). Some studies added inflation to the consumption function (Howard, 1978).

Different theories and studies presented several direct and indirect channels for the effect of inflation on consumption. Fisher hypothesizes that the real interest rate decreases as inflation increases. As interest rates decrease, savings decrease, and consumption increases (Ryngaert, 2022). Some studies also report that positive inflation shocks increase consumption and aggregate demand. This argument is based on two assumptions: 1) According to the theory of Fisher, if the nominal interest rate is constant, the real interest rate will decrease with the increase in inflationary expectations. 2) When the real interest rate decreases, saving decreases, and consumption increases according to temporal substitution (Euler's equation effect) (Duca-Rua et al., 2021). On the other hand, when inflation increases, uncertainty about the future increases, which reduces consumer spending through the precautionary savings channel (D'Acunto et al., 2015). On the other hand, since inflation is a kind of hidden tax, in the end, the increase in inflation may cause a decrease in consumption and economic activities (D'Acunto et al., 2015). Empirical studies in different societies and periods have also investigated the effect of inflation on consumption with different linear approaches (Obinna, 2020: Batrancea, 2021).

Coibion et al. (2019) concluded in a study in the Netherlands that when inflation and inflationary expectations increase, consumption of durable goods decreases. In fact, with the increase in inflation, the purchasing power of households decreases, which leads to a decrease in consumption. Some studies also found that when inflation increases sharply, households become highly pessimistic about the future, which causes savings to increase and consumption to decrease (Binder, 2017: Armantier et al., 2021). Batrancea (2021) studied the relation between economic growth and inflation with the consumption of households in 28 European countries from December 2019 to October 2020 with a cross-sectional weighted panel least squares approach. His experimental results showed that in times of crisis, people save more due to uncertainty, which causes a decrease in total consumption. Obinna (2020) examined the effect of inflation on household consumption expenditure in Nigeria using the ordinary least squares approach from 1981-2018 and found that inflation has a negative effect on consumption in the long run.

Some studies analyzed the asymmetric effects of economic variables such as exchange rate, interest rate, and income on consumption (Mumtaz & Ali, 2022: Derindag et al., 2022: Coskun et al., 2022). Mumtaz & Ali (2022) analyzed the effect of the exchange rate on consumption in India and Pakistan with the NARDL approach and found that there is a negative relationship between the nominal exchange rate and consumption in India. However, there is no significant relationship between the exchange rate and consumption in Pakistan. Derindag et al. (2022) analyzed the effect of exchange rates on consumption in BRICS countries with the MATNARDL approach. They found that in the long run, there are asymmetric effects between exchange rates and consumption in all countries except India. Coskun et al. (2022) examined the asymmetric effects of wealth, income, and interest rates on consumption with STAR models in 25 OECD countries with seasonal data from 2000-2016. They found that consumption increases in expansion periods with increasing income, and consumption decreases as the interest rate increases.

As seen above, most studies analyzed the effect of inflation on consumption with linear approaches. In addition, existing studies investigated the effect of other macroeconomic variables, such as exchange rate, income, and interest rate, on consumption with non-linear approaches. On the other hand, positive inflation shocks are expected to decrease consumption, and negative inflation shocks are expected to increase consumption. In addition, according to Duesenberry's theory of consumption, households resist reducing consumption and consider that Tiryaki et al. (2019) argued that not paying attention to asymmetric effects in modeling may cause mistakes in policies related to consumption. This study differs from previous experimental studies in several ways:

1. As far as we know, there has been no research on the effect of inflation on consumption in Iran, which allows for analyzing the asymmetric effects of inflation in a nonlinear way.

2. We provide evidence that households' consumption patterns do not show the same behavior in the face of inflationary shocks.

3. This study analyzes Duesenberry's theory of consumption in Iran's economy and finally analyzes the type of society in terms of consumerism.

3. Data & the study Model

This section includes two subsections: first, data and variables, and second, econometric model.

3.1. Data

This study aims to investigate the effect of inflation on consumption in Iran using the NARDL approach. According to the availability of variables, the investigated period is from April 2010 to September 2022. In this study, like most studies, the variables are expressed as natural logarithms (Tiryaki et al., 2019). Consumption and GDP data are available quarterly. The monthly data for this variable was obtained by Denton's method. Denton's method is the interpolation of a time series (such as seasonal) and applies the restrictions that the interpolated series obeys. Denton's method is robust and suitable for applied studies (Bloem et al., 2001). The following variables and their sources are reported in Table 1.

Table 1. Definition and source of study variables

| Variable	Definition	Sources
C	Per capita Consumption (Private sector final consumption Costs/ 1000 people) (constant=2012), Billion Rial/1000 of people	Central Bank of Iran (CBI)
CPI	Consumer price index (the base year 2016)	Statistical Center of Iran (ORG)
P	Inflation	calculated based on CPI
GDP	Per capita Gross domestic product /1000 people (constant= 2012), Billion Rial/ 1000 people	Central Bank of Iran (CBI)
IR	Interbank interest rates (%)	Central Bank of Iran (CBI)
E	Unofficial exchange rate (Rials)	Central Bank of Iran (CBI)
N	Population (1000 people)	Statistical Center of Iran (ORG)

Source: Authors' Compilation.

In the following, some statistical characteristics of the variables are shown in Table 2.

Table 2. Preliminary statistics of variables

Variable	Mean	Median	Max	Min	Std. Dev	JB	Obs
C	8.407	8.538	9.482	6.957	0.586	6.566	144
P	23.371	22.921	50.711	5.302	13.191	10.220	144
GDP	20.266	19.857	23.212	18.393	1.217	11.480	144
IR	19.897	19.525	28.8	9.72	3.984	1.073	144
E	78910.08	35650.5	292437	100044	82979.11	43.240	144

Source: Authors' Compilation.

In the next step, the trend of the variables in the studied time is presented in Figure 2.
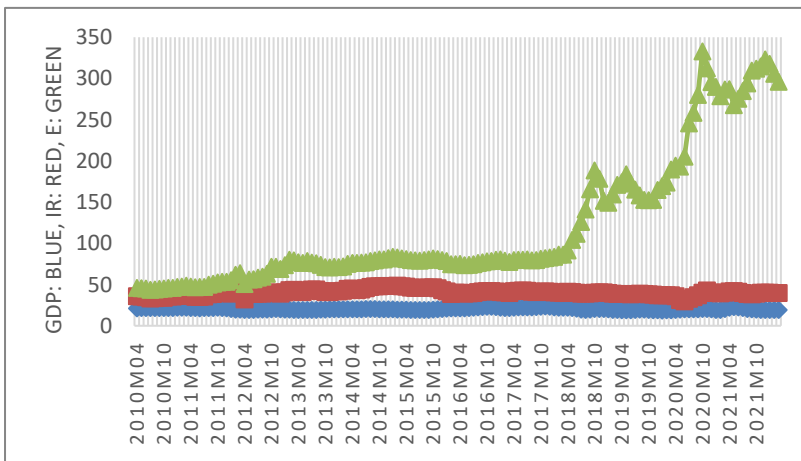
Figure 2. The GDP, IR, and E trend 2010/4 to 2022/3 (GDP per capita in the blue chart is 1000 billion Rials/1000 people, the interest rate in the red chart as a percentage, exchange rate in the green chart, 1000 Rials).
Source: Authors' Compilation.

Fig. 2. shows the trend of independent variables during the studied period. GDP per capita and interest rate during the studied period have a shallow downward slope. The exchange rate initially has a mild upward slope but experiences a sharp rise from 2018/3. In the next step, the box plot of the variables is drawn in Fig. 3.

Figure 3. Box plot of variables.
Source: Authors' Compilation.

3.2. Method (NARDL)

In previous studies, linear approaches (such as ARDL, VAR, and ect.) have investigated the relationship between inflation and consumption (Obinna, 2020: Batrancea, 2021). The mentioned methods cannot show the asymmetric relationship of the influence of independent variables on the dependent variable. Therefore, in this study, the nonlinear ARDL approach is used. The NARDL approach explores the short-term and long-term asymmetric effects of independent variables on the dependent variable. Therefore, the mentioned approach can check whether positive inflation shocks have the same effect as negative inflation shocks on consumption.

The NARDL approach is developed from the linear ARDL model by Shin et al. (2011). The nonlinear ARDL model has several advantages. 1) The mentioned approach is used in variables I(0) and I(1) or a combination of both. 2) The mentioned approach can be used when even the independent variables are endogenous (Alam & Quazi, 2003). In addition, the NARDL approach enables the latent co-integration test to avoid omitting any relationship that cannot be observed in a linear approach. Therefore, this model differentiates the presence of linear and non-linear co- cointegration and the absence of cointegration (Shahzad et al., 2017). Some studies about the effect of inflation on economic variables used the NARDL approach (Tiryaki et al., 2019: Al-Hajj et al., 2018).

The Non-linear ARDL approach mentions the vector of regressors (Z_t) into its negative and positive partial sums be written as follows:

$$Z_t = Z_0 + Z_t^+ + Z_t^- \tag{1}$$

In Eq. 1, Z_0 is the initial value: Z_t^+ and Z_t^- change as below:

$$Z_t^+ = \sum_{i=1}^{t} \Delta Z_i^+ = \sum_{i=1}^{t} \max(\Delta Z_i, 0)$$
$$Z_t^- = \sum_{i=1}^{t} \Delta Z_i^- = \sum_{i=1}^{t} \min(\Delta Z_i, 0)$$

The asymmetric long-run cointegrating regression in the NARDL model is written as follows:

$$y_t = \alpha^+ Z_t^+ + \alpha^- Z_t^- + \varepsilon_t \tag{2}$$

In Eq. 2, α^+ is the long-run coefficients associated with the positive changes in Z_t: α^- is the long-run coefficients associated with the negative changes in Z_t: ε_t is the deviations from the long-run equilibrium. Then, the asymmetric error correction model is as follows:

$$\Delta y_t = \delta_0 + \rho y_{t-1} + \theta^+ Z_{t-1}^+ + \theta^- z_{t-1}^- + \sum_{i=1}^{p-1} \varphi_i \Delta y_{t-i} + \sum_{i=0}^{q-1} (\pi_i^+ \Delta Z_{t-i}^+ + \pi_i^- \Delta Z_{t-i}^-) + \varepsilon_t \tag{3}$$

In Eq 3, $\theta^+ = \frac{\alpha^+}{\rho y_{t-1}}$ and $\theta^- = \frac{\alpha^-}{\rho y_{t-1}}$

In this study (Shin et al., 2014), to discover the long-term and short-term asymmetric effects of inflation on consumption, we perform the following steps with the non-linear ARDL model. First, for the bunds test model, using F-

statistics (Fpss) (provided by Pesaran et al., 2001), we check the existence of long-term asymmetric relationships among the series y_t, Z_t^+ and Z_t^-. In this test, the null hypothesis is the absence of cointegrating.

$$H_0 = \rho = \theta^+ = \theta^- = 0$$

In the next step, long-term symmetry with the null hypothesis ($\theta = \theta^+ = \theta^-$) and short-term symmetry ($\sum_{i=0}^{q-1} \pi^+ = \sum_{i=0}^{q-1} \pi^-$) is examined by the Wald test.

In the next step, Eq.3, is used to extract the asymmetric cumulative dynamic multipliers effect of y_t, on the positive and negative changes in Z_t^+ and Z_t^- respectively, is written as follows:

$$\text{and } m_k^- = \sum_{i=0}^{k} \frac{\rho y_{t+i}}{\rho z_t^-} \quad m_k^+ = \sum_{i=0}^{k} \frac{\rho y_{t+i}}{\rho z_t^+}$$

$$(4)$$

Where (k= 0, 1, 2 and …). In Eq.4 if k→ ∞, so $m_k^+ \to \alpha^+$ and $m_k^- \to \alpha^-$, where the long run asymmetric are $\alpha^+ = \frac{-\theta^+}{\rho}$ and $\alpha^- = \frac{-\theta^-}{\rho}$.

Dusenberry's theory states that with a decrease in income, a person tries to maintain the previous level of consumption to maintain living standards. Therefore, the Dusenbarry pattern is as follows:

$$c_t = (1 - \alpha_0)y_t - \beta_0 \frac{y_t^2}{y_{pk}} \tag{5}$$

y_{pk}: Maximum income in previous periods. α_0 & β_0 are function coefficients.

If $\frac{y_t}{y_{t-1}}$=1+ν and y_{pk}=y_{t-1}, the Duesenberry Theory is as follows:

$$c_t = [1 - \alpha_0 - \beta_0(1 + \nu)]y_t \tag{6}$$

Since ν is inversely related to the marginal propensity to consume and average propensity to consume, the consumption curve is slower or stickier at lower incomes. Brown (1952) argues that the consumption habits of the past periods put pressure on the psychological system and human physiology, and this causes the stickiness of consumption in lower incomes. Non-continuous consumption habits are in the form of the following equation:

$$c_t = \alpha_0 + \alpha_1 y_t + \alpha_2 c_{pk} \tag{7}$$

c_{pk}: Maximum consumption in previous periods, y_t: current income, c_t: current consumption.

α_2: a coefficient of slowness that expresses the intensity of the impact of past habits on current consumption. Since c_{t-1} includes past experiences. So, the following mathematical form shows the total consumption pattern:

$$c_t = \alpha_0 + \alpha_1 y_t + \alpha_2 c_{t-1} \tag{8}$$

In this research, to investigate the asymmetric effect of inflation on consumption in the short and long term, equation 9 has been estimated with the NARDL approach in the framework of Dusenberri's consumption theory:

$$\Delta c_t = \delta_0 + \rho c_{t-1} + \theta_1^+ p_{t-1}^+ + \theta_1^- p_{t-1}^- + \theta_2^+ gdp_{t-1}^+ + \theta_2^- gdp_{t-1}^- + \theta_3^+ ir_{t-1}^+ +$$
$$\theta_3^- ir_{t-1}^- + \theta_4^+ e_{t-1}^+ + \theta_4^- e_{t-1}^- + \sum_{i=1}^{\rho-1} \varphi_i \Delta c_{t-i} + \sum_{i=0}^{q} \theta_{1,i}^+ \Delta p_{t-i}^+ +$$
$$\sum_{i=0}^{q} \theta_{1,i}^- \Delta p_{t-i}^- + \sum_{i=0}^{q} \theta_{2,i}^+ \Delta gdp_{t-i}^+ + \sum_{i=0}^{q} \theta_{2,i}^- \Delta gdp_{t-i}^- + \sum_{i=0}^{q} \theta_{3,i}^+ \Delta ir_{t-i}^+ +$$
$$\sum_{i=0}^{q} \theta_{3,i}^- \Delta ir_{t-i}^- + \sum_{i=0}^{q} \theta_{4,i}^+ \Delta e_{t-i}^+ + \sum_{i=0}^{q} \theta_{4,i}^- \Delta e_{t-i}^- + \varepsilon_t \qquad (9)$$

In Eq. 5, C: real consumption per capita, GDP: real gross domestic product per capita, IR: nominal interbank interest rate, E: unofficial exchange rate.

4. Empirical Results

Before estimating any econometric model, some tests should be done to ensure the results. Therefore, in this study, first, the pre-estimation is examined. First, the unit root test is analyzed. In this study, the generalized Dickey-Fuller and Phillips-Peron tests were applied to check the stationary of the variables. The results of these tests are presented in Table 3.

Table 3. Result of Unit Root (stationary) Test

Variables	Augmented Dickey-Fuller (ADF)	PhilipsPerron (PP)	Variables	Augmented Dickey-Fuller (ADF)	PhilipsPerron (PP)
C	-2.116	-2.112	LC	-3.612	-3.614
P	-2.896	-2.380	LP	-4.312	-3.785
GDP	-2.797	-2.855	LGDP	-3.576	-3.785
IR	-2.734	-2.615	LIR	-3.678	-3.624
E	-0.918	-0.521	LE	-3.045	-2.915

Source: *The authors created this table. Critical values (-3.496, -2.887, -2.577) at the level (1%, 5%, 10%) respectively. Authors' Compilation.*

The stationary test results of both generalized Dickey-Fuller and Phillips-Perron tests in Table III show that P and GDP variables are significant at the statistical level of 5%. However, other variables are insignificant at the levels of 5 and 1%. However, all the variables are stationary by logarithm. Considering that all variables are stationary at the level of I (0), I (1) and no I (2) variable is found among the studied variables. Therefore, the unit root test results strongly justify using the nonlinear ARDL approach. In the next step, the bounds test results are presented in Table 4.

Table 4. Bounds test for cointegration

Dependent Variable	F-statistics (Fpss)	Bounds critical value		Outcome
C	10.3195	10%	2.73	Cointegration
		5%	3.23	
		1%	4.39	

Source: *Authors' Compilation.*

The bounds test results in Table IV show that the statistic (Fpss) is higher than the critical values at all significance levels. Therefore, the null hypothesis

of no cointegration is rejected in this study. The test results show a long-term cointegration relationship between independent variables and real per capita consumption. The Wald test is performed to discover the relation of long-term symmetry between the dependent and independent variables in the NARDL model. The results of the Wald test are reported in Table 5.

Table 5. The Wald test results (Long-run asymmetry)

Variables	F-Statistics	P- value
LP	5.080	0.026
LGDP	19.640	0.000
LIR	0.830	0.364
LE	8.745	0.004

Source: Authors' Compilation.

The results of the Wald test in Table 5 show that the null hypothesis of long-term symmetry can be rejected at the 5% level for P, GDP, and E variables. We can conclude that P, GDP, and E have asymmetric effects on per capita consumption in Iran during the studied period. In this study, the non-linear ARDL approach has been used to investigate long-term and short-term asymmetric relationships between the per capita consumption of Iranian households and explanatory variables. The results of the NARDL test are reported in Table 6.

Table 6. The NARDL estimation results.

Variables	Coefficient	t-Statistics	P- value
LC (-1)	-0.456	-8.94	0.000
LP_P (-1)	-0.005	-2.97	0.003
LP_N (-1)	0.022	4.40	0.000
LGDP_P (-1)	0.336	5.36	0.000
LGDP_N (-1)	0.143	2.33	0.022
LIR_P (-1)	0.060	5.16	0.0000
LIR_N (-1)	0.053	3.11	0.002
LE_P (-1)	-0.019	-1.71	0.091
LE_N (-1)	0.058	1.86	0.086
DC (-1)	0.830	11.86	0.000
DLP_P	0.045	2.18	0.032
DLGDP_P (-1)	-0.434	-2.53	0.013
DLIR_P	0.053	2.63	0.010
DLIR_P (-2)	-0.036	-1.81	0.073
DLIR_N	0.033	2.29	0.024
DLE_P	-0.048	-1.98	0.050
DLE_P (-3)	0.068	2.70	0.008
Cons	0.999	9.00	0.000
Long-run asymmetric effects on C			
LP_P	-0.012	-3.988	0.043
LP_N	0.049	24.29	0.000
LGDP_P	0.737	36.63	0.000
LGDP_N	-0.314	-6.256	0.014
LIR_P	-0.133	34.63	0.000

LIR_N	0.117	-10.15	0.002
LE_P	-0.043	-3.067	0.083
LE_N	-0.129	-3.433	0.067
Adj. R^2		0.6990	
Breusch–Godfrey LM test for autocorrelation		0.004	0.948
Breusch/ Pagan heteroskedasticity		150.55	0.159

Source: *Authors' Compilation.*

Table 6 shows the test results of independent variables' short-term and long-term effects on real per capita consumption with the NARDL approach. In addition, the variables' autocorrelation has been analyzed with the Breusch-Godfrey LM test. In this test, the null hypothesis is that there is no autocorrelation. The results of the autocorrelation test show no autocorrelation in the corresponding model. In addition, the Breusch/Pagan heteroskedasticity test has been performed to check the homogeneity of variance. In this test, the null hypothesis is based on the equality of variance. The Breusch/Pagan heteroskedasticity test results show that the null hypothesis is accepted. Since there is no serial correlation and heterogeneity of variance in the model variables, the non-linear ARDL approach utilized in the article is well specified.

The results of Table 6 show that inflationary shocks have asymmetric effects on per capita consumption. Positive inflationary shocks have a negative and statistically significant effect on per capita consumption. As Tsiaplias (2020) has argued, extreme price fluctuations are directly related to economic uncertainties. Therefore, inflation creates pessimism and uncertainty about the future for households, which causes a decrease in consumption and an increase in savings through the precautionary savings channel (Binder, 2017: Armantier et al., 2021). Dergunov et al. (2019) also showed that high expected inflation causes a decrease in consumption growth. In addition, an increase in inflation means a decrease in the purchasing power of households, which causes a decrease in consumption costs. Batrancea (2021) found a negative relationship between consumption and inflation in European countries. Table 6 also implies that negative inflation shocks have a positive and significant rellation with per capita consumption. In addition, the results indicate that with one unit increase in inflation, per capita consumption decreases by about 0.012.

Nevertheless, with one unit of inflation reduction, per capita consumption of Iranian households increases by about 0.049. Suppose we consider a positive inflation shock as a decrease in purchasing power and a negative inflation shock as an increase in purchasing power and household income. Reducing inflation (increasing purchasing power) affects consumption much more than increasing inflation (decreasing purchasing power). Therefore, we consider this result to be correct in supporting the hypothesis of consumption of Duesenberry in Iran, in the sense that, after getting used to a certain level of consumption, people (households) show more resistance to reducing the level of consumption. The results of Khan (2014), with a sample of 3244 Pakistani farmer households, also support the theory of consumption of Duesenberry in Pakistan. We provide new

evidence on the impact of inflation on household consumption decisions. Our empirical results support the hypothesis that household consumption is asymmetric in response to different inflation shocks. Binder (2015) also argued that inflation in different conditions sends different signals to consumers that change their consumption direction. Some studies showed that the effect of inflation on consumption changes over time (Dergunov et al., 2019: Boons et al., 2020). Obinna (2020), by examining the effect of inflation on consumption in Nigeria with the OLS approach, found that inflation has a positive and statistically significant effect on consumption in the long run.

As can be seen in Table 6, fluctuations in GDP per capita have significant asymmetric effects on consumption. As GDP per capita increases, household consumption increases, and as GDP per capita decreases, consumption decreases. Therefore, the results show that positive changes in GDP cause an increase in consumption, and negative changes cause a decrease in consumption. In addition, increasing GDP has a much greater effect on consumption than decreasing it. In this sense, when the per capita income increases by one percent, household consumption increases by 0.733 percent. When the per capita income decreases by one percent, consumption decreases by 0.314 percent. These results strongly support the theory of Dusenberry consumption in Iran. Coskun et al. (2022) also discovered significant asymmetric effects between household income and consumption in OECD countries. In addition, they found that income has a positive effect on consumption in periods of expansion. Some studies found that economic growth positively affects European household consumption (Telega & Telega, 2020: Batrancea, 2021).

The results of Table 6 show that there are significant asymmetric effects between the interest rate and consumption in the long term, so positive changes in the interest rate cause a decrease in consumption and negative changes in it cause an increase in consumption. In addition, the effect of positive interest rate changes is slightly greater than negative interest rate changes on consumption. Coskun et al. (2022) found that in recessionary periods, there is a negative relationship between interest rates and consumption in OECD countries. Adjei & Kajurová (2022) found a negative relationship between monetary policy through interest rates and consumption in sub-Saharan African countries. Lehrer & Light (2018) also discovered a negative relationship between consumption and interest rate.

The results of the exchange rate effect in Table 6 show that the increase and decrease of the exchange rate cause a decrease in consumption. However, the impact of negative exchange rate shocks is greater than the positive ones. These results mean passing inflation in Iran. In addition, the results show that consumption is strongly affected by external shocks. Mumtaz & Ali (2022) found a negative relationship between the nominal exchange rate and consumption in India. Derindag et al. (2022) found that in the long run, there are significant asymmetric effects in all BRICS countries except India. In total, the

results of Table 6 show the presence of asymmetric effects of changes in independent factors on consumption.
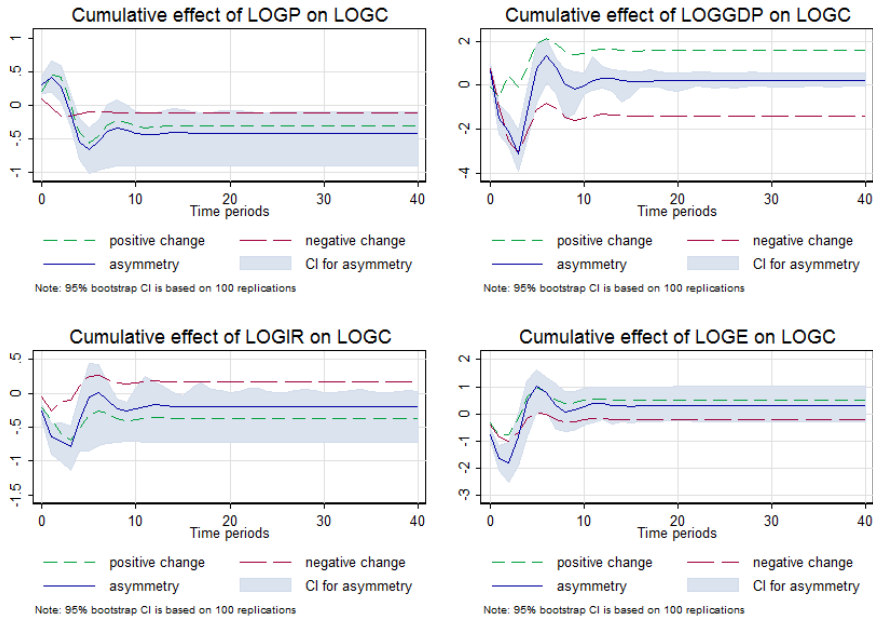
Figure 4. The Cumulative effect of P, GDP, IR, and E on C.
Source: Authors' Compilation.

Fig. 4 shows that an increase in inflation has a negative effect (red line) on consumption and a decrease in inflation has a positive effect on consumption (green line). The blue line shows the slope of the asymmetric effects.

5. Concluding Remarks

In recent years, the inflation rate in Iran has been increasing. On the other hand, inflation is one of the critical economic problems that significantly affects the real variables of the economy, like consumption. Coskun et al. (2022) concluded that households do not immediately change their consumption patterns in crises, but macroeconomic factors and psychological factors in unstable economic environments can affect households' consumption. On the other hand, according to the dynamics of the markets, the consumption pattern has also changed a lot (Baz et al., 2020). Therefore, the emergence of the non-linear and cyclical behavior of consumption is not far from expected (Elliot, 1980).

On the other hand, according to Dusenbery's theory, people resist reducing it after getting used to a level of consumption (Duesenberry, 1952). Therefore, the effects of positive and negative inflation shocks on consumption are

expected to be asymmetric. So, this study aims to investigate the asymmetric effects of inflation on the real per capita consumption of Iranian households during the monthly period from April 2010 to September 2022 with the NARDL approach. Without considering the non-linearity of consumption, the differences in inflation and inflationary shocks may be ignored, the point which is the main novelty of this research.

This study shows that there is an asymmetric relationship between consumption and inflation in the long term in Iran. So positive inflation shocks have a negative effect on consumption, and negative inflation shocks have a positive effect on consumption. In addition, the results show that the effect of negative inflation shocks on consumption is greater than positive inflation shocks. The empirical results of this study also showed that the positive effects of increasing income on consumption are greater than the negative effects of decreasing income on consumption. Therefore, the results strongly support the theory of Duesenberry consumption in Iran. The experimental results of Khan (2014) were also valid for the theory of dual consumption in Pakistan. Coskun et al. (2022) also found an asymmetric relationship between income and consumption in OECD countries. In addition, the results show that there is always a residual demand in the market, which can be the concept of consumerism in Iranian society, which was not far from expected considering Iran's economic problems (including inflation, oil rent, budget deficit, etc.). We provide new evidence on the impact of inflation on household consumption decisions. Our empirical results support the hypothesis that household consumption is asymmetric in response to different inflation shocks. Therefore, this study suggests that policymakers and monetary authorities should prioritize low inflation goals in the implementation of monetary policies to increase household consumption and well-being. In addition, they should pay more attention to the effects of inflationary shocks on the consumption and consumption status of Iranian households. This is because consumption is one of the most important macroeconomic variables and shows the well-being of households. In addition, this study recommends that the Iranian government always ensure low and stable prices to reduce the adverse effects of inflation on consumption. In addition, the results of this study indicate that positive changes in real GDP lead to an increase in consumption, and negative changes in GDP lead to a decrease in consumption. This result shows that economic growth significantly impacts household consumption patterns. This study also finds an asymmetric link between interest rates and consumption in Iran. Positive interest rate changes cause a decrease in consumption, and negative interest rate changes cause an increase in consumption. Such findings have implications for policymakers and country officials. Positive developments in economic activity, which increasing GDP shows, have positive effects on consumption. In addition, policymakers who manage interest rates should consider that monetary policies affect household consumption through interest rates. Therefore, they should pay enough attention to this point in applying policies. The findings of this study

show that exchange rate fluctuations have a significant effect on consumption. So, stabilizing the exchange rate helps a lot in the stability of the consumption of Iranian households.

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