



## The Time-Varying Effect of Inflation on Consumption During the Period of Instability Caused by Sanctions

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### Highlights

- The effect of inflation on consumption varies over time.
- The increase in housing prices during the period of instability caused by sanctions causes a sharp decrease in consumption.
- GDP per capita has a positive but fluctuating effect on consumption over time.

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### Abstract

In recent years, severe international sanctions have been imposed on Iran's economy, which has caused instability and increased inflation. Therefore, this study analyzes the time-varying effect of inflation on Iran's future per capita consumption with the WLS-RW approach using monthly data from April 2010 to March 2022 in the period of instability caused by sanctions. The regression results show that the effect of inflation on consumption varies over time, and in some periods the coefficient of inflation on consumption is positive and in other periods it is negative. In addition, in the period of instability caused by the sanctions, this effect reaches about -0.5. Examining the time-varying effect of inflation on consumption reports accurate results. In this study, the variables of GDP per capita, unofficial exchange rate, real interest rate, housing price, and liquidity are also considered control variables. GDP per capita has a positive but fluctuating effect on consumption over time. Although the increase in housing prices helps to increase consumption, the increase in housing prices during the period of instability caused by sanctions causes a sharp decrease in consumption. Exchange rate and liquidity also have a positive effect on consumption at some times and a negative effect at other times. The rolling-window approach provides useful results with a detailed and fact-based examination of the consumption function, considering internal and external fluctuations, especially inflation. Accurate forecasting of per capita consumption is very necessary and important for government officials and policymakers.

## 1. Introduction

In recent years, inflation and high price growth have become important problems in Iran. Inflation imposes significant economic and social costs on society (Osmani et al., 2023). In addition, the growth of inflation disrupts the price allocation system, which affects the distribution of income in society. In recent years, more severe international sanctions were imposed on Iran's economy in

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2018. One of the most obvious effects of international sanctions on Iran's economy has been severe inflation, so that inflation in Iran rose from 12.4 in 2010 to 40.2 in 2022. Therefore, considering the increasing growth of inflation in Iran, it is very important to examine its economic consequences.

Today, due to the increasing inflation in Iran, the economic, social, and political effects of inflation on macroeconomic variables such as consumption are the subject of the attention of economists. On the other hand, private consumption, with a share of 33.8% of the GDP in 2022, is one of the most important sectors of total demand and one of the main topics of macroeconomics ([Central Bank of Iran, 2022](#)). Since the share of consumption in GDP is very high, examining the consumption function provides comprehensive information to economic policymakers. The identification of factors affecting consumption provides policy solutions that are appropriate to the specific economic conditions of each country.

In most previous studies, household consumption function has been analyzed with life cycle models, in most of which consumption is a function of wealth and income ([Paradiso et al., 2012](#)). But in the new periods under review, there have been significant changes in the economic structures of societies due to changes in the financial, social, and demographic structures ([Carroll et al., 2011](#)). Therefore, in this study, inflation based on CPI (similar to some previous studies ([Paradiso et al., 2012](#); [Boons et al., 2020](#))) is added to the consumption function. Some studies argue that CPI-based inflation causes significant changes in household consumption. For example, inflation creates uncertainty about the future for applicants, which causes an increase in savings. In addition, inflation has significant effects on the distribution of income and the consumption patterns of households ([Paradiso et al., 2012](#)).

There are several direct and indirect channels for the effect of inflation on consumption. Some studies argue that in inflationary conditions, according to the Fisher effect, the real interest rate decreases and the savings incentive decreases, which causes households to postpone future consumption to current consumption, and as a result, consumption and total demand increase in the present ([Duca-Rua et al., 2021](#)). Some studies also reported that with the increase in inflation and inflation expectations, uncertainty increases, which causes an increase in consumer spending through the channel of precautionary savings ([D'Acunto et al., 2015](#); [Binder, 2017](#); [Armantier et al., 2021](#)). If consumers anticipate that the cost of borrowing will increase in the future, they will reduce their future consumption plans. In addition, as debt costs rise in the future, consumers postpone their future consumption to the present. This will reduce the expected consumption growth ([Ryngaert, 2022](#)). In addition to direct effects, there are several indirect channels through which inflation affects consumption. Inflation reduces the real value of wealth, which changes consumer behavior. In addition, inflation changes the distribution of income among households with different jobs and fixed and non-fixed incomes ([Howard, 1978](#); [Hendry & Ungern-Sternberg, 2011](#)). Another indirect channel is the effect of inflation on the consumption of the liquidity mechanism. With the increase in inflation, the nominal interest rate

increases, which causes a decrease in the saved profit, which leads to a decrease in savings and an increase in consumption (Mishkin, 1992). Therefore, today's high inflation rate creates uncertainty about future inflation, and uncertainty about future inflation rates affects the real activities of the economy and the price system (Friedman, 1977). In addition, unexpected changes in consumer spending patterns also lead to unexpected inflation (Diewert & Fox, 2020).

This means that positive inflation shocks can contain bad news about consumption in the next period. Bad news about inflation in the sense that an unexpected increase in inflation causes a temporary increase in total risk aversion due to the increase in consumers' concern about inflation (Brandt & Wang, 2003; Osmani et al., 2023). On the other hand, negative inflation shocks can contain good news about future consumption (Boons et al., 2020). The good news about inflation is that it temporarily reduces aggregate risk aversion (Brandt & Wang, 2003). Inflation gives different signals to consumers (Binder, 2015). Therefore, considering that different inflation signals have variable effects on consumption growth, it is not realistic to use models with constant parameters over time to calculate the effects of inflation on consumption. In fact, sometimes in the estimation of time series data, it is not reasonable to assume that the coefficients are stable over time. To solve this problem, the use of regressions with time-varying parameters based on a specific stochastic process is presented (Boons et al., 2017). Some studies used time-varying models in the field of inflation (Barnett et al., 2014; Dergunov et al., 2019; Macaulay, 2022). Using time-varying parameters instead of fixed parameters provides great and important achievements in the accurate prediction of results (Barnett et al., 2014).

In recent years, international sanctions have been imposed on Iran's economy. International sanctions and the ban on oil sales have two effects on Iran's economy. On the one hand, sanctions affect nominal variables such as inflation and exchange rate and cause them to increase, and on the other hand, sanctions affect real economic variables such as gross domestic product and consumption. The sum of these effects leads to instability that causes irreparable losses to the economy. Therefore, this study analyzes the relationship between inflation and consumption during the sanctions. Given the increasing inflation rate, the high share of consumption in Iran's GDP, and the existence of international sanctions, the present study seeks to answer the following questions:

- Does rising inflation reduce consumption during periods of instability caused by sanctions?
- Does the effect of inflation on consumption vary over time?
- What is the response of Iranian households to positive and negative inflationary shocks?

An accurate and dynamic understanding of the consumption function provides important economic consequences regarding the time-varying effect of inflation on consumption. Despite the central importance of this issue, no comprehensive study has examined the time-varying effect of inflation on private sector consumption in Iran. Therefore, to answer the above questions, this study,

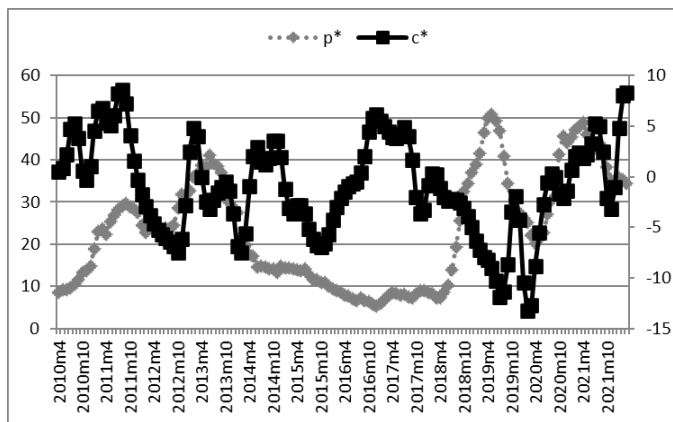
for the first time, examines the time-varying effect of inflation on private sector consumption in Iran using the WLS-Rolling Window model. For this purpose, monthly data were used during the period from April 2010 to March 2022. This study aims to extend the idea of the time-varying effects of inflation to better describe future consumption. The rest of the article is as follows: In the next section, the literature review is presented. Section 3 discusses the data and methodology. Empirical results are available in Section 4, and Section 5 (Conclusions and Policy Recommendations) concludes the study.

## 2. Literature Review

This section contains several subsections. First, the trend of inflation and consumption in Iran during the periods of the application of international sanctions is examined. Then theories and studies related to the consumption function and the channels through which inflation influences consumption are discussed. Finally, according to various studies, the importance of investigating the time-varying effect of inflation on household consumption is mentioned.

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

Inflation is one of the most important economic problems; maintaining single-digit inflation causes rapid economic growth (Anochiwa & Maduka, 2015). Inflation refers to a situation in which the prices of goods and services continuously increase. In the literature, there are different theories for inflation (such as demand pressure inflation, production cost pressure inflation, structural inflation, monetary inflation, etc.) (Adaramola & Dada, 2020; Shapiro, 2022). Some studies consider supply-side factors such as labor shortages to be the cause of inflation (Barnichon & Shapiro, 2022). Some studies also consider demand-side factors, such as increasing demand, to be the main factors causing inflation



**Figure 1.** Trend of per capita consumption each month compared to the same month last year (billion rials/thousand people) and inflation each month compared to the same month the previous year from 4/2010 to 3/2022

Source: Authors' Compilations

(Jorda et al., 2022). Some studies consider both supply and demand factors to be factors of high inflation (Shapiro, 2022).

Fig. 1. shows that the trend of inflation and per capita consumption has not been constant over time. At some times (7/2011, 3/2013, 3/2020, 2/2021, and 2/2022), the fluctuations of inflation and consumption were in the same direction, and at other times (12/2016, 6/2017, and 4/2019), these fluctuations were seen in the opposite direction. Therefore, Fig. 1 shows that there is no fixed relationship between inflation and consumption in the studied period, but a fluctuating relationship with different directions is observed between inflation and consumption. The relationship between inflation and consumption has changed a lot over time. In addition, the figure above shows that inflation has risen during the period of sanctions on Iran's economy. Consumption has also experienced a downward trend during the period of international sanctions.

## 2.2 Consumption theories

The consumption function shows the relationship between consumption and different factors. There are several theories about the consumption function. Keynes (1936) believed that various factors influence consumption, but the most important influencing factor is disposable income. In Keynes's theory, unlike classical theories, the interest rate does not affect consumption. Duesenberry (1952) believed that consumption changes were not a function of disposable income but rather a function of relative income. Dosenbari'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. The ratchet effect means that after getting used to a level of consumption, a person resists reducing it. The life cycle hypothesis of Ando & Modigliani (1963) states that people's consumption is related to their lifetime income. The consumption life cycle model argues that real consumption is influenced by the income from work and the net real wealth of households. Permanent Income Hypothesis 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, different studies have included different explanatory variables in the consumption function (Taylor et al., 1971; Mishkin, 1976). Some studies also added inflation to the consumption function (Howard, 1978). Following the theory (Howard, 1978), the present study adds the inflation to the consumption function in addition to the income (the GDP is considered as a proxy for income) and wealth (the housing price is considered as wealth).

## 2.3 Channels of influencing inflation on consumption

Today, one of the important questions facing economists is how changes in inflation affect consumption and the real economy in a society. Different theories and studies have reported different channels for the effect of inflation on

consumption. Some studies discuss direct channels and some indirect channels. When inflation and inflationary expectations increase, according to the Fisher effect, the real interest rate decreases. Due to the decrease in the real interest rate, consumers show a greater desire to increase current consumption than future consumption (Ryngaert, 2022). In fact, with an increase in inflation, uncertainty increases, which causes an increase in consumer spending through the channel of precautionary savings (D'Acunto et al., 2015). In other words, the increase in inflation reduces the cost of loans, and as a result, it causes an increase in consumer spending for large and durable goods (D'Acunto et al., 2015). According to the relationship between inflation and the nominal interest rate according to Fisher's equation, it can be argued that inflation in the consumption function provides important information about liquidity. The interest rate through the liquidity channel can affect consumption in the short term (Paradiso et al., 2012). On the other hand, considering that inflation is a kind of hidden tax, it may ultimately reduce economic activities (D'Acunto et al., 2015).

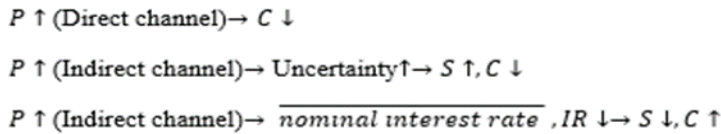
Some studies also argue that the increase in inflation causes an increase in consumption and total demand, which greatly contributes to economic growth. This argument is based on two assumptions. 1) According to the Fisher equation, if the nominal interest rate is constant, the real interest rate will decrease with the increase in inflationary expectations. 2) When the real interest rate decreases according to time substitution (Euler equation effect), saving decreases and consumption increases (Duca-Rua et al., 2021). Some experimental studies also analyzed the effect of inflation on consumption. Coibion et al. (2019) found in a study in the Netherlands that when inflation expectations increase, household consumption expenditure on durable goods decreases. Some studies focused on total expenditure and argued that consumption expenditure should also include the cost of non-durable goods because the depreciation rates of different durable goods are different. In addition, changes in technology change the depreciation rate of durable goods (Rudd & Whelan, 2002). Some studies also argue that households are extremely pessimistic about the future under severe inflationary conditions. Uncertainty about the future increases the savings of the present (Binder, 2017; Armantier et al., 2021). Inflationary expectations hurt consumer spending on durable goods because, with the increase in inflationary expectations and inflation, households become pessimistic about future income conditions and reduce their consumption (Coibion et al., 2019). An increase in inflation means a decrease in the purchasing power of households, which causes a decrease in their consumption costs. But this is realized in a situation where prices increase slowly. In conditions of increasing inflation, the cost of essential items increases, which leads to a decrease in the real income of households. Bachmann et al. (2015) found that at the lower bound of inflation, an increase in inflationary expectations leads to a decrease in current consumption. In addition, their further analysis showed that households that have more precise expectations increase their consumption as their expectations increase.

Some studies analyzed the relationship between inflation and consumption

with micro-survey data (Ichiue & Nishiguchi, 2015; Drager & Nghiem, 2021; Duca-Radu et al., 2021). Duca-Radu et al. (2021) analyzed the relationship between consumption and inflation with monthly survey data in 17 Eurozone countries from May 2013 to December 2016 with about 26,440 household representatives. D'Acunto et al. (2015) analyzed the cross-sectional relationship between inflation expectations and durable goods consumption in Germany from January 2000 to December 2013 for 2000 German households and found that the consumption expenditures of households with higher inflation expectations were 8% higher than those of other households. In addition, this effect is greater for households with higher education and income and urban households. According to the reviewed theories and studies, the consumption function in this study is as follows:

$$C = f(P, GDP, E, IR, H, M) \quad (1)$$

In Eq. 1, P is monthly inflation. GDP: gross domestic product per capita. E: unofficial exchange rate. IR: real interbank interest rate. H: housing price, and M: liquidity. Fig. 2. Shows the different channels of inflation's impact on consumption.



**Figure 2. Channels of influencing P on C**

*Source: Authors' Compilations*

## 2.4 The importance of studying the time-varying effect of inflation on consumption

Some studies have shown that aggregate risk aversion varies in response to inflation news (Brandt & Wang, 2003). In other words, during the recession, the total risk aversion decreases, and during the boom, the total risk aversion increases (Brandt & Wang, 2003). Inflation in different conditions sends different signals to consumers, which changes the consumption direction of households (Binder, 2015). Macroeconomic shocks create many positive and negative signals (Ermolov, 2022). In addition, Bekaert & Wang (2010) and Campbell et al. (2015) also discovered that regression with constant parameters (unconditional regression) to investigate the effect of inflation on consumption does not show significant changes over time. Therefore, it can be said that the effect of inflation on consumption during different business periods is not constant and changes over time. Limited studies have examined the time-varying relationship between consumption and its influencing factors (Dergunov et al., 2019; Boons et al., 2020). Dergunov et al. (2019) analyzed the time-varying effect of money on consumption and found that expected consumption growth changes over time. Boons et al. (2020) used the time-varying relationship between consumption and inflation to examine the relationship between inflation and stock returns. For this



purpose, they examined the relationship between inflation and consumption with the monthly data of the United States using WLS-RW regression and found that inflation provides different signals in different conditions.

While previous studies have mainly focused on developed countries, we work with data from a developing country (the case study of Iran) and try to determine what the relationship is between consumption and inflation. Are these time-varying parameter models useful for investigating the time-varying effect of inflation on consumption or not? This question is very important for the monetary policy of Iran because Iran has experienced many economic problems in recent years due to international sanctions. In addition, Iran has had the highest inflation rate in recent years. Supporting previous findings, we study evidence of a time-varying relationship between inflation and consumption.

This study contributes to the literature in several ways. First, the main purpose of this study is to test whether inflation has a significant effect on private-sector consumption in Iran or not. Second, this study examines whether the effect of inflation on consumption changes over time or not. Does the time-varying study provide us with different results? Third) According to our knowledge, this study is the first case that provides insights into the time-varying effect of inflation on consumption during the period of instability caused by international sanctions on the country of Iran. The use of time-varying parameters instead of fixed parameters provides great and important achievements in the field of accurate prediction of results (Barnett et al., 2014). Therefore, we provide new evidence on the time-varying impact of inflation on household consumption decisions.

### 3. Methodology

This section includes two subsections. First, the data and variables are introduced, and then the econometric models used are described.

#### 3.1 Data

This section shows the data used in this study. The period under study is monthly, from 4/2010 to 3/2022. Consumption and GDP data are available quarterly. The monthly data for this variable was obtained by Denton's method. Denton's method involves the interpolation of a time series (such as seasonal) and applying the restrictions that the interpolated series obeys. Denton's method is a powerful and suitable method for applied studies (Bloem et al., 2001). The variables used in this study and their sources are presented in Table 1. After describing the variables and their sources, the statistical characteristics of the variables are presented in Table 2.

A boxplot diagram is a standard way to display data distribution and provides information about outliers and data symmetry. It provides information about the variability or dispersion of the data and shows how the data values are spread out. Next, the boxplot diagram of the variables is drawn in Fig. 3.



**Table 1. Variables, definition, and sources**

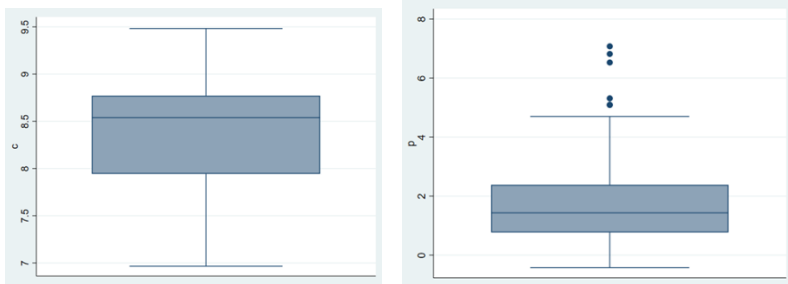
Variable	Definition	Sources
C	Per capita Consumption (Private sector final consumption Costs/ 1000 people) (constant=2012), Billion Rial/1000 of people	Central Bank of Iran (CBI)
CPI	Consumer price index (the base year 2016)	Amar Center of Iran (ORG)
P	Monthly inflation	Calculated based on the Consumer Price Index
GDP	Per capita Gross domestic product /1000 pepole (constant= 2012), Billion Rial/ 1000 pepole	Central Bank of Iran (CBI)
E	Unofficial exchange rate (Rials)	Central Bank of Iran (CBI)
IR	Real Interbank interest rates (%)	Central Bank of Iran (CBI)
H	Price per square meter of housing (Rials)	Central Bank of Iran (CBI)
M	Liquidity	Central Bank of Iran (CBI)
N	Population (1000 pepole)	Amar Center of Iran (ORG)

**Source:** Authors' Compilations. All of the data are monthly over the period from April 2010 to March 2022. C and GDP data are available quarterly. The monthly data for this variable was obtained by Denton's method.

**Table 2. Summary of descriptive statistics**

Variable	Mean	Std. dev	Min	Max	Obs
C	8.400152	0.5946668	6.965954	9.482387	144
CPI	126.1513	90.9792	31.60801	396.5952	144
P	1.784	1.398	0.424	7.075	144
GDP	20.24814	1.223097	18.40252	23.21269	144
E	78910.08	82979.11	10044	292437	144
IR	-3.474459	13.73223	-30.94148	16.29405	144
H	87325205	92718804.5	17185700	351200000	144
M	1.37e+07	1.16e+07	1211900	4.83e+07	144

**Source:** Authors' Compilations. Obs. denotes the number of observations in the model; Std.-dev denotes the standard deviation; and Min and Max denote minimum and maximum, respectively.

**Figure 3. Box plot of variables**

**Source:** Authors' Compilations

### 3.2 Methods

In this study, we first show the effect of inflation on consumption with an unconditional regression (WLS) from inflation during month  $t$  on future consumption from month  $t+1$ . In this study, weighted regression with exponential weights (weighting the inflation variable) has been used because exponential weights give the most weight to the most recent information. In addition, since inflation in Iran is highly increasing and fluctuating and has been significant in recent years. Hence, weighted regression has been used.

$$LC_{t+1} = \alpha_0 + \beta_1 LP_t + \beta_2 LGDP_t + \beta_3 LE_t + \beta_4 IR_t + \beta_5 LH_t + \beta_6 LM_t + \varepsilon_{t+1} \quad (2)$$

In Eq 2.  $C_{t+1}$ : future per capita consumption,  $P_t$ : inflation,  $GDP_t$ : GDP per capita,  $E_t$ : unofficial exchange rate,  $IR_t$ : real interbank interest rate,  $H_t$ : price per square meter of housing, and  $M_t$ : liquidity at time  $t$ . Unconditional regression (regression with constant parameters over time) cannot show important changes over time well (Bekaert & Wang, 2010; Campbell et al., 2015). Therefore, to show time-varying important changes and effects of inflation on consumption (similar to Boons et al., 2020), we perform the following test

$$LC_{t+1} = \alpha_t + \beta_t LP_t + \beta_t LGDP_t + \beta_t LE_t + \beta_t IR_t + \beta_t LH_t + \beta_t LM_t + \varepsilon_{t+1} \quad (3)$$

At this stage, the effect of inflation on future consumption is implemented with the weighted least squares method (WLS-WR). Rolling regression executes a command in each of a series of observation windows and stores the results. Rolling regression helps to estimate the observations in several sub-samples instead of estimating one sample. A rolling regression (with a rolling time window) means repeatedly performing the regression with sub-samples from the main sample. Additionally, rolling regression helps to plot time-varying betas to see how betas change over time (Zivot & Wand, 2006). Rolling regression enables analysis over time cycles and volatility conditions like sanctions. In addition, it allows the model to change over time due to changes (such as political and economic instabilities) (Racicot et al., 2017). Using rolling regression, this study aims to provide a model that accurately predicts future consumption with observed changes in inflation and provides information on time dependence.

The regression with time-varying betas (WLS-RW) has significant advantages over regressions with constant betas over time): First, the window of expansion (RW) in the (WLS-RW) approach ensures that data and information are used to the maximum extent possible. Second, this approach provides time-varying coefficients instead of fixed coefficients, which consequently helps to provide more robust and realistic results, especially in a country with increasing and fluctuating inflation, because the effect of inflation on consumption in stable periods is different from that in unstable periods caused by political and economic shocks. Therefore, this study uses the (WLS-RW) approach, which provides time-varying betas. Third, various studies in other countries also showed that unconditional regressions (i.e., regressions with constant betas over time) do not capture the effect of inflation on consumption well (Campbell et al., 2015; Boons

et al., 2020). Therefore, the effect of inflation on consumption changes over time in different business cycles, meaning that household consumption responds differently to different inflation news. Therefore, approaches with constant betas over time are not suitable for examining the effects of inflation on consumption. Finally, many studies in other countries used the WLS-RW approach to examine the effect of inflation on real economic variables. The expansion window makes us use the information as much as possible (Boons et al., 2020). Fama & MacBeth (1973) state that the OLS-RW model should be used to estimate time-varying betas. Grek & Jimaale (2016), in a study, compared different econometric models, including DCC-MGARCH, OLS, and OLS-RW, by mean squared error (MSE), for CCAPM with time-varying beta, and found that the OLS-RW method gives more accurate results than other studied models.

#### 4. Empirical Results

In this section, first the pre-tests are examined, and then the effect of inflation on consumption is estimated with unconditional regression with the WLS approach and conditional regression with the WLS-Rolling Window approach.

##### 4.1 Pre- estimation

In the first step, the unit root tests are checked. The results of this tests are presented in Table 3. The results of the tests show that the variables are not at the stationary level, and with the first-order difference, the variables are stationary. In the next step, the variance inflation factor (VIF) test was used to check the multicollinearity (Belsley et al., 2005). The results of the VIF test are presented in Table 4.

In the next step, the heteroskedasticity test is performed to check the variance heteroskedasticity. The results of Table 5 show that the null hypothesis is accepted, that is, there is no variance heterogeneity problem in the estimated model. In the next step, the autocorrelation of the variables is examined. For this purpose, the Breusch-Godfrey LM test for autocorrelation is performed.

**Table 3. Unit root tests**

Variables	Dickey-Fuller test		Phillips-Perron test	
	I (0)	I (1)	I (0)	I (1)
C	-2.116	-12.207***	-1.681	-12.952***
P	-7.715***	-16.972***	-7.805***	-20.630***
GDP	-2.797**	-9.987***	-2.925**	-9.833***
E	-0.918	-11.472***	-0.538	-11.704***
IR	-3.475**	-13.888***	-3.260**	-14.401***
H	0.507	-11.127***	0.964	-11.150***
M	0.543	-13.798***	1.505	-14.285***

**Source:** Authors' Compilations. critical values (-3.496, -2.887, -2.577) at the level (1%, 5%, 10%), respectively.

**Table 4. VIF test**

Variables	VIF	Mean VIF
C	n.a.	2.191
P	2.45	
GDP	1.05	
E	2.24	
IR	4.25	
H	2.13	
M	1.03	

*Source:* Authors' Compilations. n.a. denotes not available

**Table 5. Breusch- Pagan and LM tests**

Breusch- Pagan/ Cook- Weisberg test for heteroskedasticity		Breusch- Godfrey LM test for autocorrelation	
t-statistic	Prob.	t-statistic	Prob.
2.55	0.129	0.004	0.988

*Source:* Authors' Compilations.

In this test, the null hypothesis is that there is no autocorrelation. The results of the autocorrelation test in Table 6 show that the null hypothesis is accepted, which means that there is no autocorrelation in the corresponding model. After examining the preliminary tests, Eq. 2 is estimated using the WLS approach.

#### 4.2 Model estimation

In this section, first, the relationship between inflation and consumption is examined with a regression from inflation at month t on future real per capita consumption from month t+1. The results of unconditional regression (WLS) are presented in Table 6.

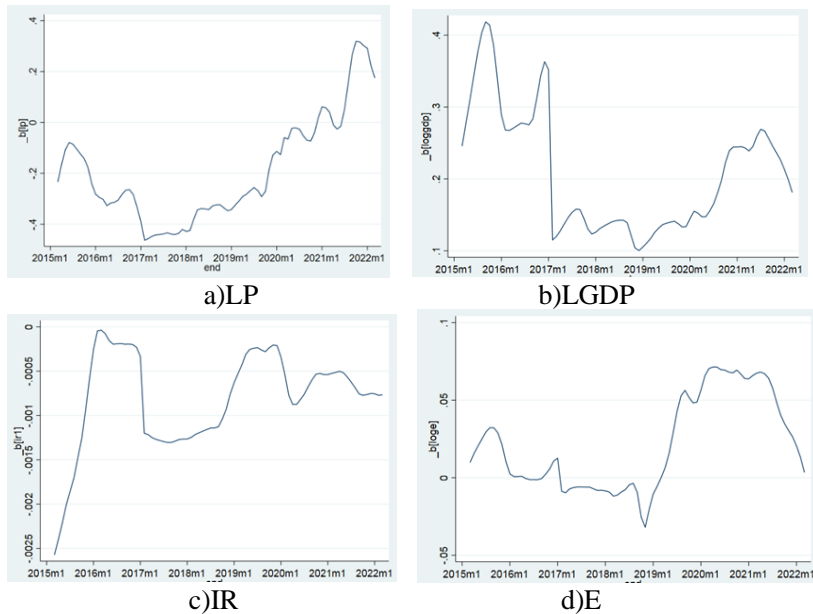
**Table 6. WLS estimation results**

Variables	Coefficient	t	P> t
LP	-0.080	-4.74	0.000
LGDP	0.089	3.38	0.001
LE	-0.008	-0.99	0.324
IR	-0.0009	-5.07	0.000
LH	0.089	2.45	0.011
LM	-0.022	-3.66	0.000
CONS	0.983	2.65	0.008

*Source:* Authors' Compilations.

The results of Table 6 show that there is a negative and significant relationship between inflation and consumption. In addition, with a one percent increase in inflation, consumption decreases by about 0.080 percent. Inflation creates pessimism and uncertainty about the future for households, which reduces consumption and increases savings through the precautionary savings channel (Katona, 1975; Binder, 2017; Armantiev et al., 2021). An increase in inflation

means a decrease in the purchasing power of households, which causes a decrease in their consumption costs, but this is realized in a situation where prices increase slowly. In conditions of severe inflation, with the increase in inflation, the cost of essential items increases, which leads to a decrease in the real income of households. Households with negative beliefs about inflation get more information and news about inflation. Getting more information about inflation is expensive, which hurts the real income of households (Macaulay, 2022). Therefore, as Piazzesi and Schneider (2006) also discovered, unconditional regression results show that an increase in inflation can contain bad news about consumption. Inflation gives negative signals to households (Binder, 2015). In addition, Bekaert & Wang (2010) and Campbell et al. (2015) also discovered that unconditional regression to investigate the effect of inflation on consumption does not show significant changes over time. Therefore, it can be said that the effect of inflation on consumption during different business periods is not constant and changes over time. Therefore, since the unconditional regression does not reflect well the relationships between consumption, inflation, and other independent variables, in the next step, Eq. 3 is analyzed with the WLS-RW approach. The time-varying coefficients of independent variables on consumption are presented in Fig. 4.





**Figure 4. Time-varying coefficients of independent variables on future consumption with the WLS-RW**

*Source: Authors' Compilations*

#### - The time-varying effect of inflation on consumption

In this study, the WLS-RW approach has been used to investigate the time-varying effect of inflation on real per capita consumption. This regression is estimated using weighted least squares (WLS). The expansion window in this study is considered 60, following previous studies (Boons et al., 2020). The results of the WLS-RW estimation show that the effect of inflation on consumption changes over time, and this effect is different in different conditions. Inflation in different conditions sends different signals to consumers, which changes the consumption direction of households (Binder, 2015). The effect of inflation on consumption in the period of instability caused by sanctions also decreases to about -0.5. Some studies show that high inflation reduces future consumption growth (Dergunov et al., 2019). In addition, Tsiaplias (2020) also found that the increase in inflation causes uncertainty in society, which affects the growth of future consumption. Therefore, as the above results show, the effect of inflation on consumption changes over time during different business periods. Some studies showed that the effect of inflation on consumption changes over time (Dergunov et al., 2019; Boons et al., 2020). Boons et al. (2020) also investigated the relationship between inflation and consumption using US monthly data and WLS-RW regression and found that inflation provides different signals in different conditions. We provide new evidence on the impact of inflation on household consumption decisions; indeed, our empirical results support the hypothesis that household consumption varies in response to inflation news.

#### - The time-varying effect of GDP on consumption

As can be seen in Part B of Fig. 3, the effect of GDP per capita on future per capita consumption is positive, but it fluctuates a lot. The coefficient of influence of gross domestic product on consumption shows what share of income is consumed. During the sanctions period, the final desire to consume decreases. So that during the period of sanctions, the final desire to consume is around 0.1%, which means that each unit of people's income is consumed by ten percent, and after that, it starts to increase. Instability and the severity of sanctions cause a decrease in the income of households, but despite the decrease in income,

according to the hypothesis of the ratchet effect of Dosenbari's consumption theory, the level of consumption is maintained to some extent. An increase in real GDP increases household income, which contributes to the growth of consumption. [Batrancea \(2021\)](#) studied the effect of GDP on household consumption with monthly data from 28 countries in the European Union from December 2019 to October 2020 and found that economic growth has a positive and significant effect on household consumption.

**- The time-varying effect of the exchange rate on consumption**

The exchange rate in Iran is one of the measures of instability, but this measure of instability, in a situation where the measure of instability of inflation in a society is more severe, plays the role of an asset and can be a store of value or wealth for Iranian households. The exchange rate has a positive effect on consumption in most periods, but this effect in 2018 (that is, the imposition of sanctions) has reached about -0.03. This shows that the exchange rate severely damages the purchasing power of the import channel but improves the export, so there is a direct relationship between the exchange rate and consumption, but this relationship fully shows itself in the period of instability caused by sanctions, and its effectiveness has decreased. [Mumtaz & Ali \(2022\)](#) also found a positive relationship between the exchange rate and consumption in India.

**- The time-varying effect of the interest rate on consumption**

As can be seen in Fig. 3, there is a negative relationship between the real interest rate and consumption. With an increase in the real interest rate, consumption decreases. In addition, in times of severe instability, such as the sanctions of 2018, the coefficient of this effect has been greatly reduced. In fact, the interest rate hurts consumption through the lenders' loss channel. The real interest rate shows the relative price of consumption ([Coibion et al., 2019](#)).

**- The time-varying effect of housing prices on consumption**

According to Part E in Fig. 3, the effect of housing prices on consumption is different in different periods. Housing, as an asset in the portfolio of Iranian households, increases consumption. Therefore, with the increase in housing prices as a result of real wealth, household consumption from the wealth channel increases. [Xu et al. \(2018\)](#) also found that there is a positive relationship between housing prices and consumption. Some studies also found that with the increase in housing prices, household savings increased and consumption decreased ([Waxman et al., 2020](#)). With the severity of sanctions in the middle of 2018, an increase in housing prices will reduce consumption in the next period, so the effect coefficient of housing prices on consumption during the sanctions period and the deterioration of the economic conditions of Iranian households will be negative. Because the worse the economic conditions are, the more pessimistic expectations consumers have about the future state of the economy ([Zaremba et al., 2020](#)). Therefore, considering the bad conditions of Iran's economy due to international sanctions, despite the increase in housing prices, Iranian households refrain from increasing consumption due to a pessimistic view of the economic situation and save the increase in cash wealth caused by the increase in housing prices so that



in case of the continuation of bad economic conditions, they can deal with financial problems.

- **The time-varying effect of liquidity on consumption**

As seen in Fig. 3, the effect of liquidity on consumption varies over time. The effect coefficient of liquidity on consumption is positive in some periods and negative in other periods. On the one hand, it can be said that the increase in liquidity from the wealth channel causes an increase in consumption, and on the other hand, the excessive increase in liquidity in society intensifies instability, which causes uncertainty. Therefore, consumption decreases with the increase in volatility in the precautionary savings channel. [Algaed \(2016\)](#) for Saudi Arabia found that as liquidity increases, household consumption increases. [Orphanides & Solow \(1990\)](#) also argued that different liquidity growth rates emerge with different inflation rates.

## 5. Conclusion

In recent years, more severe international sanctions have been imposed on Iran's economy, especially in 2018, and one of the effects of these international sanctions on Iran's economy is increasing inflation. Inflation in Iran has reached 40.2% at the beginning of 2022, up from 12.4% in 2010, and the average inflation rate in the last 5 years has been 29%. The per capita consumption of Iranian households has also experienced extreme fluctuations and has been influenced by important factors such as the inflation rate. Since the share of consumption in the GDP is very high—about 33.8%—investigating the effects of increasing inflation on household consumption is of great importance. Therefore, in this study, using the monthly data of Iran's economy during the period (April 2010 to March 2022), the time-varying effect of inflation on the future consumption of Iranian households in the period of instability caused by international sanctions was investigated using WLS-RW approach. Unconditional regression (WLS) results showed that the increase in inflation has a negative and statistically significant effect on consumption, but conditional regression (WLS-RW) results showed that the effect of inflation on consumption changes over time. The coefficient of inflation on consumption is positive in some periods and negative in others. Inflation gives different signals to households, which causes different effects on consumption over time. In addition, the effect of inflation on consumption in unstable conditions caused by international sanctions is greatly reduced and reaches about -0.5. Because extreme price fluctuations increase uncertainty in society, so, this study suggests that monetary policymakers should pay more attention to inflation and its effects on the real variables of the economy, such as consumption, which is related to the well-being of households, in the implementation of monetary policies. Therefore, policymakers should consider the changes in household consumption patterns when adopting monetary policies. Therefore, it requires the special attention of the monetary policymakers and the central bank for sensitivity in the implementation and application of policies to increase the credibility of the monetary policymakers and the credibility of the

government, in addition to reducing the pressure and costs of people's lives. The conditional regression results of the effect of other variables on the future per capita consumption of households also report interesting results. Although economic growth always has a positive effect on the consumption of Iranian households, this effect has many fluctuations over time. In fact, with the increase in purchasing power of Iranian households through GDP growth, consumption (according to Pigou's wealth effect) has increased. An increase in the real interest rate always causes a decrease in the consumption of Iranian households. The effect of exchange rate and liquidity is different over time.

### Author Contributions

Conceptualization, all authors; methodology, F. O.; validation, N.S. and A.CH.; formal analysis, all authors; resources, F.O and M.CH.; writing—original draft preparation, F.O and N.S.; writing—review and editing, all authors; supervision, M.T.A.SH. All authors have read and agreed to the published version of the manuscript.

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### Conflicts of Interest

The authors declare no conflict of interest.

### Data Availability Statement

The data used to support the findings of this study are available from the corresponding author upon request.

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