Research Article

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Reinvestigating the U.S. Consumption Function: A Nonlinear Autoregressive Distributed Lags Approach

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Abstract: This article examines the asymmetric aspect of U.S. consumption using disaggregated quarterly consumption expenditure data, including durables, nondurables, and services from 1994 to 2019. We apply a novel nonlinear autoregressive distributed lag analysis considering a regime-switching mechanism and find that U.S. consumers behave differently during economic upturns and downturns, with asymmetry existing for the consumption of durables (in the long run) and services (in both the short and long-run), but not for nondurables. Since services account for more than 40% of U.S. aggregate output, the slow adjustment toward equilibrium and the elasticity less than unity proves that services are more of a necessity than a luxury for U.S. consumers. The results indicate that the consumption of services is the primary determinant of U.S. consumer behavior, and monetary policy has a limited effect on U.S. consumption.

Keywords: U.S. consumption, durables, services, nondurables, cointegration, asymmetry, nonlinear ARDL

JEL classification: E21, C12, C22

1 Introduction

"Consumption is the sole end and purpose of all production."
Adam Smith

Since the Great Depression and Keynes's description of the consumption function, the concept has played a crucial role in macroeconomic analysis. However, economists still need to reach a consensus regarding the main determinants of households' consumption behavior and its predictability.

To examine U.S. consumer behavior during economic upturns and downturns, this article, for the first time in the literature, employs the novel framework of nonlinear autoregressive distributed lags (NARDL) having the luxury of disaggregated consumption data. We postulate that U.S. consumers behave differently in consuming durables, services, and nondurables and that the behavior differs during economic upturns and downturns. We study aggregate consumer behavior (Jorgenson, 1990) by applying a regime-switching cointegration approach (NARDL).

The key reason behind the mixed results regarding consumption determinants in the literature could be data availability and methodologies applied. For instance, Foster (2021) has argued that "the ratio of consumption to GDP has risen steadily over the past half-century" and that "in 2018, the U.S. consumption to GDP ratio was close to its limit." The study constructed a model to explain the fact using an error correction method, including hypothetical explanatory variables. Although the literature focused on nondurables and services consumption as spending on durables is highly volatile (Campbell & Mankiw, 1990), Foster's (2021) analysis boldly aggregated picture of U.S. consumption ignores disaggregated trends. According to Lucas (1976), using highly aggregated data such as total consumption in macroeconomic analysis is problematic.

As Figure 1 shows, although the consumption-over-GDP ratio has increased over time, only the consumption of durables has followed the same pattern. Nondurables consumption has declined, while consumption of services illustrates an inverted U-shape.

Since services contribute to more than 60% of U.S. consumption, this inverted U-shape should influence the total consumption pattern that aggregate consumption cannot illustrate. The question therefore arises: Which component of U.S. consumption responds more to shocks than others, and whether the response is different during recessions and expansions?

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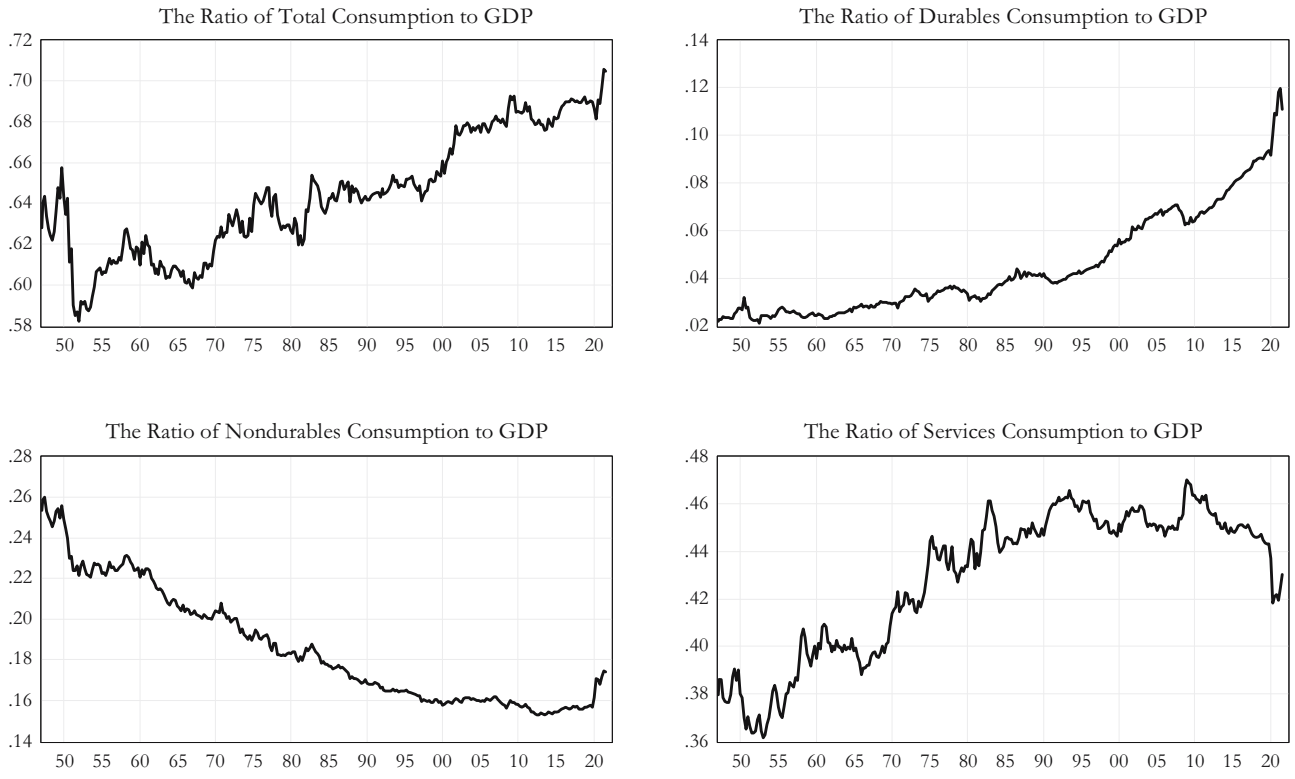


Figure 1: Ratio of Consumption to GDP.

During the recent pandemic, we observed how fragile the essential part of the U.S. economy is: the services sector declined by about 12% in two quarters. This study shows that adequate macroeconomic policies are necessary for the U.S. economy to avoid falling consumption of services for at least 15 quarters. However, service consumption has recovered within seven quarters, with our model providing evidence for a positive shock in services lasting for almost eight quarters (the dynamic multiplier, Figure 10, in Section V, reveals this fact).

The remainder of the article is structured as follows. Sections II and III review the theoretical and empirical background of the consumption function. Section IV provides the model and the method of study. Section V and VI discusses its empirical results and robustness tests. Finally, Section VII concludes the study.

2 Theoretical Background

Not long after the Great Depression, Keynes (1936) defined his "fundamental psychological law that men are disposed of, as a rule, and on the average, to increase their consumption as their income increases, but not by as much as the increase in their income" (Keynes, 1936).

The distinction between the average propensity to consume (APC) and the marginal propensity to consume (MPC) is essential to the debate between economists from the two leading schools of thought, classical and Keynesian. While the former (classical) considers equality, the latter (Keynesian) postulates inequality, resulting in unitary elastic consumption concerning income for the classical school and a nonunitary pattern for Keynesians (Paradiso et al., 2012).

Since Keynes (1936) criticized utility maximization and micro-foundations (Kydland & Prescott, 1977; Lucas, 1976; Sargent, 1987) through calculable pleasure and uncertainty, current consumption plays a crucial role in the consumption function rather than preferences, forward-looking, and backward-looking parameters. However, classical economists who advocate utility maximizing and fully informed economic agents consider a minimal role for current income (Muellbauer, 2016; Woodford, 2009). The falsifiability of the absolute income hypothesis (AIH) challenged economists for decades, some of whom raised concerns that led to certain modifications and adjustments to the concept.

Duesenberry (1949), in his relative income hypothesis (RIH), postulated that current income is not the sole determinant of consumption (consumer behavior depends on the weighted average of the consumption of the other; outward-looking). Despite some empirical success, the RIH has

mysteriously disappeared from the literature (Mason, 2000; McCormick, 2018).

In their life-cycle hypothesis (LCH), Modigliani and Brumberg (1954, 1980) postulated that people spending on goods and services rely more on their lifetime resources than their current income. Hence, they make intelligent choices for the level of consumption at each period of their life, considering the assets they expect to accumulate until retirement (Ando & Modigliani, 1963, 1957; Modigliani, 1986). However, credit constraints and uncertainty are two factors that other economists have adapted to adjust the LCH (Börsch-Supan & Stahl, 1991; Dotsey et al., 2014; Zeldes, 1989).

Friedman's (1957) permanent income hypothesis was another challenge to Keynes's theory of consumption, claiming that "transitory components of income and consumption are uncorrelated," meaning that consumption depends on permanent income (expected lifetime income). Using the Euler equation, Hall (1978) formulated that consumption follows a random walk procedure (i.e., consumption is unpredictable). Consumers smooth and tailor their consumption based on the rational expectations of their lifetime resources through receiving new information.

Although "micro-foundations" become the realistic structure in the literature (Chao, 2007), simulation-based models such as the DSGE model and calibration approach falsifiability become another challenge when realizing consumers' preferences (Foster, 2021).

Therefore, no best consumption function exists to explain and predict consumers' behavior and offer practical policy recommendations to overcome market disequilibria.

3 Empirical Background

Before releasing the U.S. national account data in 1945, researchers applied household budget and survey data and the linear OLS method to describe consumer behavior. Some of whom rejected Keynes' idea (Brady & Friedman, 1947; Gilboy, 1938, 1939, 1956), considering the importance of regional factors and income distribution effect on consumption patterns, and others confirmed Keynes indicating that the influence of all other factors is practically negligible (or in any case not determinable with any certainty) – even that of the distribution of income, if the distinction between labor and non-labor income is taken into account (Polak, 1939; Stone & Stone, 1938).

Due to limited data availability, most studies applied short-run periods to test the AIH. For instance, Ackley (1961) applied the linear OLS method using consumption and disposable income data for the short period of 1929–1941 and found that the MPC for U.S. consumption was 0.75. However, Kuznets (1946) employed a long-run time series of U.S. GDP and consumption, finding that the APC narrowly fluctuated between 0.83 and 0.89, excluding the depression years (Palley, 2010; Spanos, 1989). In other words, Kuznets consumption function indicated a proportional relationship between GDP and consumption which implies in the long-run APC = MPC. Since the autonomous consumption or the intercept in consumption function is the source of the difference between MPC and APC, the proportional consumption function lacks the intercept (Kuznets consumption function, $c_t = \alpha y_t$).

Kuznets (1946) study shed new light on the long-run characteristics of the consumption function as it released a higher MPC compared to studies using short-run periods (Kockesen, 2008; Palley, 2010).

While micro-foundations surrounded consumption literature as a realistic structure (Chao, 2007), Everaert and Pozzi (2013) found current income as the only variable with predictive power among the other variables (habit formation, intertemporal substitution, private and government consumption) in their econometric model to predict consumption. The study applied the GMM method for a panel of 15 OECD countries from 1972–2007 to estimate a dynamic consumption equation including relevant predictive factors.

Duesenberry's ideas also attracted more economists in recent literature. For instance, Foster (2021) considered peak consumption in his system analysis of consumption. In a theoretical attempt, Alvarez-Cuadrado and Long (2011) propose an overlapping-generation economy where households care about relative consumption. The study built a permanent income version of the RIH. It reframed Keynes' fundamental psychological law "with the principle that men are disposed, as a rule, and on the average, to be not only 'forward-looking' but also "outward-looking animals."

Palley (2010) synthesizes Keynes, Duesenberry, and Frideman's ideas to construct a theoretical model (the relative permanent income theory of consumption; RPI). The study claimed that the model is consistent with all the recognized stylized facts about consumption, including Kuznets (1946), and that the long-run APC is relatively constant. However, the model is silent about consumption components (durables, nondurables, and services).

Some studies included durables, nondurables, and services in their model. For instance, Campbell and Mankiw (1990) reinvestigated the PIH using the OLS method. While the study rejects the PIH in favor of the AIH, Cochrane (1991) raised a concern regarding the results of the article as the R^2 of the consumption growth forecasting regression is low – as low as 0.01 for the United States considering it as

an essential issue. Indeed, Cochrane clarified that very low R^2 supports Hall's (1978) consumption unpredictability hypothesis.

Although Jappelli and Pistaferri (2010), Lusardi (1996), Morley (2007), and Sabelhaus and Groen (2000) rejected the PIH in their studies, Dejuan et al. (2004) and DeJuan and Seater (2006) endorsed PIH (cross-section studies provide more support for the PIH).

Christiano et al. (1991) also reinvestigated the PIH, including durables, nondurables, and services in the model. However, the GMM method estimations resulted in a less pronounced income elasticity of consumption, which contrasts with the facts. The study raised concerns regarding aggregation bias and its effect on the estimation procedure.

Since the LCH considers assets in a household's consumption decision-making process, the literature investigated the housing market and the stock market's effect on consumption. For instance, Mehra (2001) estimated the U.S. aggregate consumption function, including income, wealth, and anticipated future income, in the model using the cointegration and error correction methodology. The results indicated a long-run elasticity of income to be 0.57–0.62. In addition, the wealth effect (the elasticity) is about 0.03. Carroll et al. (2011) investigation of U.S. consumption using the instrumental variables (IV) method indicated a low long-run MPC of 0.60 and a wealth effect (0.04), which is in line with Mehra (2001).

While most of the literature considered a linear consumption function in their analysis, Apergis and Miller (2006) examined the effect of the stock market on U.S. aggregate consumption using the error correction and cointegration approach. The asymmetry is defined as an increase and decrease in the stock market value, and the study found that while the stock market impacts U.S. consumption asymmetrically, the increase or decrease in income has no asymmetric effect. The procedure in Apergis and Miller (2006) applied a two-lag error correction model and the Perron and Vogelsang (1992) methodology, which considers the short-run limited effect of the stock market (it is worth noting that the NARDL that we apply in our study examines short-run and long-run asymmetries which is valuable to test the hypothesis regarding consumption function. We described the procedure in the model and methodology section, which differs from the two-lag error correction model).

Despite Keynes's (1936) criticism about the possibility of measuring uncertainty (calculable uncertainty), economists investigated the uncertainty effect on consumption following the pioneering "uncertainty hypothesis." Romer (1990) argued that stock market uncertainty reduced durables consumption during the Great Depression but not nondurables. However, Ebadi (2022) used the PMG method and illustrated that uncertainty could affect nondurables. The study proposed the VIX (the Chicago Board Options Exchange's CBOE Volatility Index) as an effective measurement of the uncertainty over other proxy variables for uncertainty, such as policy uncertainty (Baker et al., 2016) and cash holding in companies (Sanchez & Yurdagul, 2013) based on the model performance and diagnostic tests.

This quotation may express the reality and nature of the consumption literature:

> "What we call the beginning is often the end.
> And to make an end is to make a beginning.
> The end is where we start from."
> *T.S. Eliot*

While the literature considered a linear relationship and regime-switching models overlooked in the studies, we apply a nonlinear approach (NARDL) with a regime-switching mechanism to examine aggregate consumer behavior during recessions and expansions. The method in this article corrects the consumption function for "Lucas Critique" (1976), as it allows consumers' behavior to differ during recessions and expansions.

4 Model and Methodology

Although Foster (2021) used an error correction model in his estimation, the study avoided the idea of cointegration, which holds that the economy moves toward equilibrium in the long run through short-run adjustments. This reminds us of Carroll (2001), who raised a concern that finding a stable cointegration relationship is implausible due to demographic factors and financial system changes.

However, cointegration is informative about consumers' behavior as it uncovers some stable behaviors in the long run. The problem arises when one applies an assumed invariant model to explain a fact over a very long period (e.g., 1947–2018). As the economy's structure changes, consumers' behavior alters, and the long-run steady point moves toward another equilibrium until consumers are severely distracted by new sets of information. In addition, specific economic changes may convince them to adjust their behavior to survive (optimal decision). We might add habit formation (Fuhrer, 2000) as another reason to believe a long-run equilibrium explains consumers' behavior upon a long-term average.

The cointegration approach neither downgrades history nor upgrades it, as the role of a model is to provide a viable explanation for some historical facts rather than

describing the whole history. Hence, we consider the aggregate consumption function, including some hypothetical explanatory variables, to test the stylized facts regarding the consumption function. We construct the consumption function as follows:

$$c_t = \theta_0 + \theta_1 y_t + \theta_2 e_t + \theta_3 r_t + \theta_4 \text{vix}_t + \varepsilon_t, \quad (1)$$

where c (we estimate the model for durables, nondurables, and services. For the sake of convenience, we employ the same notation) is the logarithm of the real aggregate consumption expenditure (the ARDL model includes lagged consumption (past values) which assists in testing Hall's (1978) hypothesis), and y is the logarithm of the real GDP to test the role of income as a constraint for consumption. We follow Kuznets (1946), the first economist to consider GDP as a proxy to estimate the US APC. Campbell and Mankiw (1990) also used GDP as a proxy for disposable income, but the study claimed GDP as an imperfect proxy because of the weak correlation (0.55). However, we find GDP a perfect proxy as the correlation between GDP and disposable income is about 0.996. Our study's assessment of consumption forecasting confirms that GDP is a well-performed predictor for consumption (Mitruț & Simionescu, 2014). Also, Foster (2021) explained that since taxes and transfers return to households, GDP suits the aggregate consumption function better. In addition, GDP performed better than disposable income in the analysis.

In the model, e represents the logarithm of the real effective exchange rate. Following Davidson et al. (1978), this variable captures the wealth effect. However, the real effective exchange rate captures domestic prices, foreign prices, and the exchange rate considering the path-through inflation mechanism (Alexander, 1952). For open economies, it is reasonable to include the real exchange rate rather than only domestic prices (Iyke & Ho, 2017).

According to micro-foundations (utility maximization) and the Euler equation, the common wisdom is that interest rate impacts consumption. We include the variable (r denotes the logarithm of the interest rate) in our model to test the hypothesis. Recent studies also discussed the role of interest rates on consumption (Cloyne et al., 2020; Navarro & de Frutos, 2015).

We include the uncertainty (the logarithm of vix) to test the pioneering "uncertainty hypothesis" (Romer, 1990). We prefer VIX (the Chicago Board Options Exchange's CBOE Volatility Index) as a proxy for uncertainty over other indexes to represent uncertainty (Ebadi, 2022).

Unlike the literature, we postulate that consumers behave differently during economic upturns (y_t^+) and economic downturns (y_t^-), which means the aggregate consumption function is not a simple log-linear function but a nonlinear one. In other words, instead of Keynes's current income variable, we have partial sums of the positive and negative changes in current income, not current income per se.

Therefore, the model can be modified as follows:

$$c_t = \theta_0 + \mu_1 y_t^+ + \mu_2 y_t^- + \theta_2 e_t + \theta_3 r_t + \theta_4 \text{vix}_t + \varepsilon_t, \quad (2)$$

where y_t^+ and y_t^- are partial sums of positive and negative changes in y. The model decomposes negative and positive values defining partial sums of the variable as the cumulative sum of prior positive (negative) values at any given point, considering zero for values other than positive (negative). Econometrics software such as EViews uses a binary format considering one for positive (negative) values and zero for negative (positive) values to calculate partial sums:

$$y_t^+ = \sum_{i=1}^{t} \Delta y_i^+ = \sum_{i=1}^{t} \max(\Delta y_i, 0), \quad (3)$$

and

$$y_t^- = \sum_{i=1}^{t} \Delta y_i^- = \sum_{i=1}^{t} \min(\Delta y_i, 0). \quad (4)$$

The econometrics approach that enables us to estimate the relationship we define above is the NARDL method proposed by Shin et al. (2014):

$$\begin{aligned} \Delta c_t = {} & \alpha + \delta_0 c_{t-1} + \delta_1 y_{t-1}^+ + \delta_2 y_{t-1}^- + \delta_3 e_{t-1} + \delta_4 r_{t-1} \\ & + \delta_5 \text{vix}_{t-1} + \sum_{i=1}^{p} \gamma \Delta c_{t-i} + \sum_{i=0}^{q} (\vartheta_i^+ \Delta y_{t-i}^+ + \vartheta_i^- \Delta y_{t-i}^- \\ & + \vartheta_{e,i} \Delta e_{t-i} + \vartheta_{r,i} \Delta r_{t-i} + \vartheta_{\text{vix},i} \Delta \text{vix}_{t-i}) + \epsilon_t. \end{aligned} \quad (5)$$

In the model, p represents the dependent variable lags selected using the Akaike information criterion (AIC), and q indicates the lag order for explanatory variables. Although q is chosen for the sake of convenience, it could be different for each explanatory variable.

Pesaran and Shin (1999) constructed this equation using the well-known autoregressive distributed lags (ARDL) method. The method applies the past and current values of the explanatory variables (distributed lag) and includes the past values of the dependent variable (autoregressive) in the model. The dynamic mechanism designed for the model allows short-run adjustment toward long-run equilibrium, which requires selecting optimal lags for the model's explanatory variables and the lagged dependent variable.

While conventional cointegration methods such as vector error correction require the explanatory variables of the same order of integration, I(0) or I(1), the ARDL approach permits I(0), I(1), and mixed of I(0) and I(1). One could assume all explanatory variables as endogenous rather than requiring exogenous variables in the model,

which is the main advantage of the ARDL approach and the main shortcoming of the other methods.

However, if cointegrated explanatory variables exist in the model, the endogeneity issue causes serial correlation (the serial correlation issue results in biased estimates, leading to unreliable hypothesis testing). Pesaran and Shin (1999) include lagged dependent variables (past values) as an instrumental variable to resolve serial correlation in the ARDL model.

Despite Spanos's (1989) attempt to justify that there is no systemic bi-causality between consumption and GDP (i.e., GDP is exogenous rather than endogenous) and Foster's (2021) support for the idea, the ARDL method we apply practically resolves the issue and performs well even with endogenous variables (we apply the Lagrange Multiplier (LM) test for serial correlation in our model in the next section). It is also known that the ARDL method has an empirical advantage over methods such as dynamic ordinary least squares, fully modified ordinary least squares, and maximum likelihood estimation as the ARDL provides consistent estimates even in small samples using the OLS estimation method (Panopoulou & Pittis, 2004).

Due to excessive aggregation, sample-specific omitted variables, and/or measurement errors correlated with the regressors, the ARDL occasionally provides economically implausible coefficients for specific groups (Pesaran et al., 1999). We postulate that the nonlinear nature of the relationship may be another reason behind that fact, as our results release some implausible coefficients obtained from the linear ARDL.

When we apply the ARDL approach to estimate the long-run income elasticity of consumption (θ_1 in equation (1)), the system adjusts toward a unique equilibrium (a global attractor), which means an increase in income or a decrease in income has the same effect on consumption.

However, the Nonlinear ARDL approach decomposes negative (decrease in income or a recession) and positive (increase in income or an expansion) changes in income, assuming the asymmetry. The model includes a regime-switching cointegration relationship, and the sign of the decomposed variable plays the regime transition. One would translate that the equilibrium does not need to be unique.

In the model, while $\mu_1 = \frac{\delta_1}{\delta_0}$ and $\mu_2 = \frac{\delta_2}{\delta_0}$ denote the long-run impact of economic upturns (y_t^+) and economic downturns (y_t^-), respectively, $\sum_{i=0}^{p}\vartheta_i^+$ and $\sum_{i=0}^{p}\vartheta_i^-$ capture the short-run dynamics of the effect of income on U.S. consumers.

Although the ARDL model encounters invalidity of the cointegration bound test if there is an I(2) variable in the model, it can be applied if the variables are I(1), I(0), or a mixture of both. Therefore, we apply the Dicky-Fuller (1979) stationary test to ensure no variable is I(2) in the model. To determine the optimal lags for the model's dependent and explanatory variables, we use the AIC, assuming a maximum of eight lags.

Another advantage of the NARDL model is its dynamic multiplier, which enables us to investigate the effect of the positive and negative shocks in the model. The multipliers are defined as follows:

$$m_h^+ = \sum_{i=0}^{h}\frac{\partial c_{t+i}}{y_{t-1}^+},\ m_h^- = \sum_{i=0}^{h}\frac{\partial c_{t+i}}{y_{t-1}^-},\ n = 0, 1, 2, \ldots.$$

Notice that, by construction, $h \to \infty$, $m_h^+ \to \mu_1$, and $m_h^- \to \mu_2$.

We expect to observe $\mu_1 > 0$ and $\mu_2 > 0$ for consumption of durables, nondurables, and services. However, we postulate that μ_1 and μ_2 are pronounced more for durables than nondurables and services (i.e., the income elasticity of consumption is higher for durables and services than nondurables).

While the real effective exchange rate could carry a positive or negative sign, depending on the effect of currency devaluation (in real terms) on consumption, the interest rate coefficient would be negative as consumers replace consumption with increased saving based on the intertemporal choice framework. The real effective exchange rate has another advantage as it increases the degrees of freedom in the model, allowing it to contain foreign and domestic prices simultaneously. In addition, we expect the uncertainty to deter consumption, but the magnitude would be different. Although the core objective of this article is to test the asymmetry of the long-run and short-run effects of economic activity on consumption, we discuss the model's predictive power. In addition, we provide some interpretations of the theories around the consumption function.

5 Empirical Results

We use quarterly disaggregated data for durables, nondurables, and services consumption collected from the Federal Reserve of St. Louis (Economic Research Division, Federal Reserve of St. Louis, 2021) from 1994 to 2019. Since the ARDL and NARDL permit I(0), I(1), and a mix of I(0) and I (1) variables, we apply the Dicky-Fuller (1979) stationary test and confirm that no variable is I(2) in our model. We estimate the model for each component of U.S. consumption using the ARDL specification and then apply the NARDL approach to test the asymmetry of the effect of the income variable.

Table 1: Full-information estimates of the linear and nonlinear models for durables

Linear Model			Nonlinear Model		
Variable	**Coefficient[b]**	***p*-Value[a]**	**Variable**	**Coefficient**	***p*-Value**
Panel A: short-run coefficient estimates					
Δc_{t-1}	−0.35*	(0.00)	Δc_{t-1}	−0.31*	(0.00)
Δc_{t-2}	−0.25*	(0.02)	Δc_{t-2}	−0.22*	(0.02)
Δy_t	1.85*	(0.00)	Δy_t^+	1.33*	(0.00)
Δy_{t-1}	0.84*	(0.02)	Δy_{t-1}^+	0.95*	(0.02)
Δy_{t-2}	0.57**	(0.08)	Δy_t^-	3.28*	(0.02)
Δe_t	−0.08	(0.30)	Δy_{t-1}^-	−0.44	(0.55)
			Δy_{t-2}^-	0.68	(0.35)
			Δy_{t-3}^-	−0.91	(0.18)
			Δy_{t-4}^-	1.46*	(0.02)
			Δy_{t-5}^-	1.22*	(0.02)
			Δe_t	−0.07	(0.34)
			Δe_{t-1}	−0.26*	(0.00)
			Δe_{t-2}	−0.18*	(0.02)
			Δr_t	0.0006	(0.89)
			Δvix_t	−0.004	(0.56)
			Δvix_{t-1}	0.017*	(0.04)
Panel B: long-run coefficient estimates					
Constant	−24.73*	(0.00)	Constant	1.85*	(0.00)
y	2.76*	(0.00)	y^+	2.57*	(0.00)
e	0.70*	(0.00)	y^-	1.50*	(0.00)
r	−0.029*	(0.00)	e	0.59*	(0.00)
vix	−0.095*	(0.00)	r	−0.015*	(0.00)
			vix	−0.07*	(0.00)
Panel C: Diagnostics[c]					
F	5.86*			8.55*	
ECM_{t-1}	−0.22*	(0.00)		−0.42*	(0.00)
LM	0.75	(0.47)		0.48	(0.62)
RESET	4.19*	(0.04)		0.50	(0.48)
$\bar{R}^2$	0.42			0.64	
CUSUM	Stable			Stable	
CUSUMQ	Unstable			Stable	
Asymmetry test				14.75*	(0.00)
LR-Wald test				0.67	(0.41)
SR-Wal test					

Note: a. Numbers inside the parentheses are *p*-values; b. the asterisks indicate that the coefficients are significant at 5 and 10%, respectively. c. upper bound *F*-statistic critical value at 5% significance level is 3.49.

We consider a maximum of 8 lags for dependent and explanatory variables in the model. The ARDL estimation results for consumption of durables (Table 1) reveal a positive effect of the income variable (assuming a symmetrical effect), as the elasticity is about 2.76 (far beyond unity). Since the model is linear, a 1% increase (decrease) in income increases (decreases) durables consumption by 2.76%. While the real effective exchange rate coefficient is positive (increase in the real effective exchange rate makes imports cheaper and therefore U.S. households consume more), the interest rate (increase in interest rate discourages consumption) and the uncertainty (U.S. households consume less under uncertainty) proxy coefficients are negative, as expected.

Furthermore, the model performs well regarding serial correlation based on the L.M. test, and the Ramsey Reset test confirms misspecification in the model. We observe instability in our model, as the CUSUMQ shows, but the CUSUM test confirms the model is stable during the study period. The bounds test (Pesaran et al., 2001) confirms cointegration among the model variables, and the error correction coefficient (−0.22) provides additional evidence for this

(Banerjee et al., 1998). The adjusted *R*-squared reveals that the variables explain 42% of the variation in U.S. durables consumption in the model.

When we apply the NARDL model, we obtain the income elasticity of consumption to be 2.57 during economic upturns and 1.50 during economic downturns (Table 1), which means a 1% increase in income has more impact (2.57%) than a 1% decrease in income (1.5%). In other words, U.S. households behave differently during economic upturns and downturns. The elasticity higher than unity aligns with Kaplan (1938) as consumers become optimistic and create debt during economic upturns. Jappelli and Pistaferri (2010) also discussed that if liquidity constraint has no bearing, we could expect much less response to anticipated income declines.

Neither classical economists, who postulate equality between the APC and MPC $\left(\varepsilon = \frac{\text{MPC}}{\text{APC}} = 1\right)$, nor Keynesians, who hypothesize an inequality $\left(\varepsilon = \frac{\text{MPC}}{\text{APC}} < 1\right)$ between those two factors, can explain the phenomenon as the results indicate the income elasticity of durables are greater than one $\left(\varepsilon = \frac{\text{MPC}}{\text{APC}} > 1\right)$. Interestingly, when we apply the NARDL model, the real effective exchange rate, the interest rate, and the uncertainty coefficients become smaller but carry a correct sign and remain significant. The fact could signal the nonlinearity in the model specification and partial sums contribution. In addition, the negative effect of uncertainty on the consumption of durables is in line with Ebadi (2022) and Romer (1990).

It is worth noting that while an increase in interest rates discourages durables consumption, an increase in the real effective exchange rate makes imports cheaper and encourages durables consumption, which could be the reason behind the limited efficiency of the recent Fed's monetary policy to cool down markets through consumption (when the Fed increases interest rates, it attracts more foreign investors, strengthening the dollar, which means an increase in the real effective exchange rate).

The results denote a better model specification and stable performance, as the Ramey RESET test and CUSUMQ verify. Since we expect a slight change in demographic factors and the financial system from 1994 (Carroll, 2001), the model supports stable consumption.

When we add more data to the estimating model, significant coefficient variation is a strong signal of instability, as dramatic jumps in the coefficient plots indicate that the equation is dealing with a structural break, as recursive residuals provide some evidence of instability in Q4 2002 and Q3 2004 (Figures 2 and 3). Since the Chow breakpoint test supports structural breaks when we include the instability dummies, the coefficients are insignificant (i.e., the impacts are minuscule). The other coefficients in the model experience a slight change. We should add a recursive least squares coefficients plot as more evidence of stability in our model (Figure 4).

There is still no serial correlation in the model. While the bounds test confirms cointegration among variables in the model, the error correction coefficient has increased (about twofold) with the NARDL specification (−0.42), which means a higher speed of adjustment toward equilibrium. The result rejects Caballero's (1993) slow adjustment

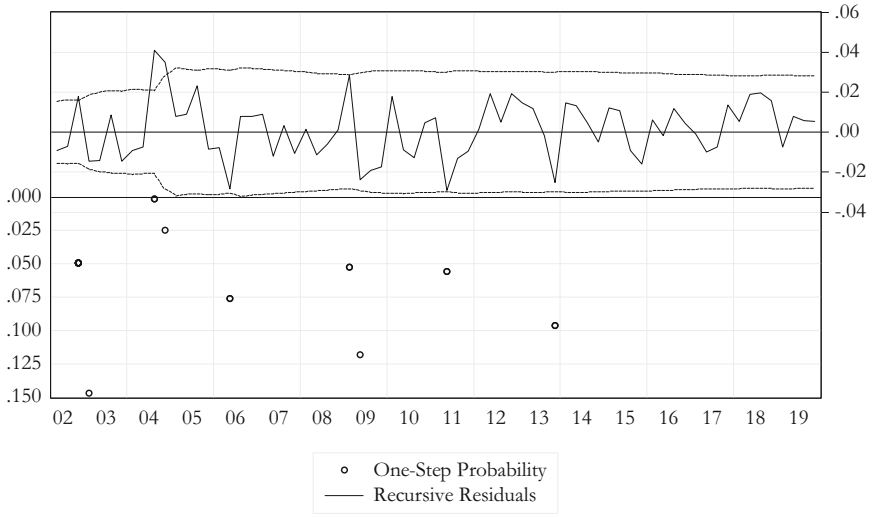


Figure 2: Recursive residuals for durables (One-step probability).

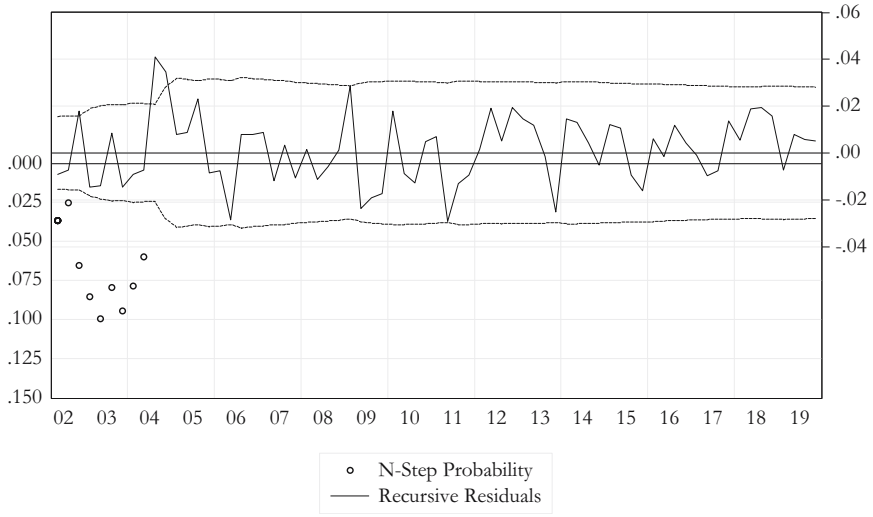


Figure 3: Recursive residuals for durables (N-step probability).

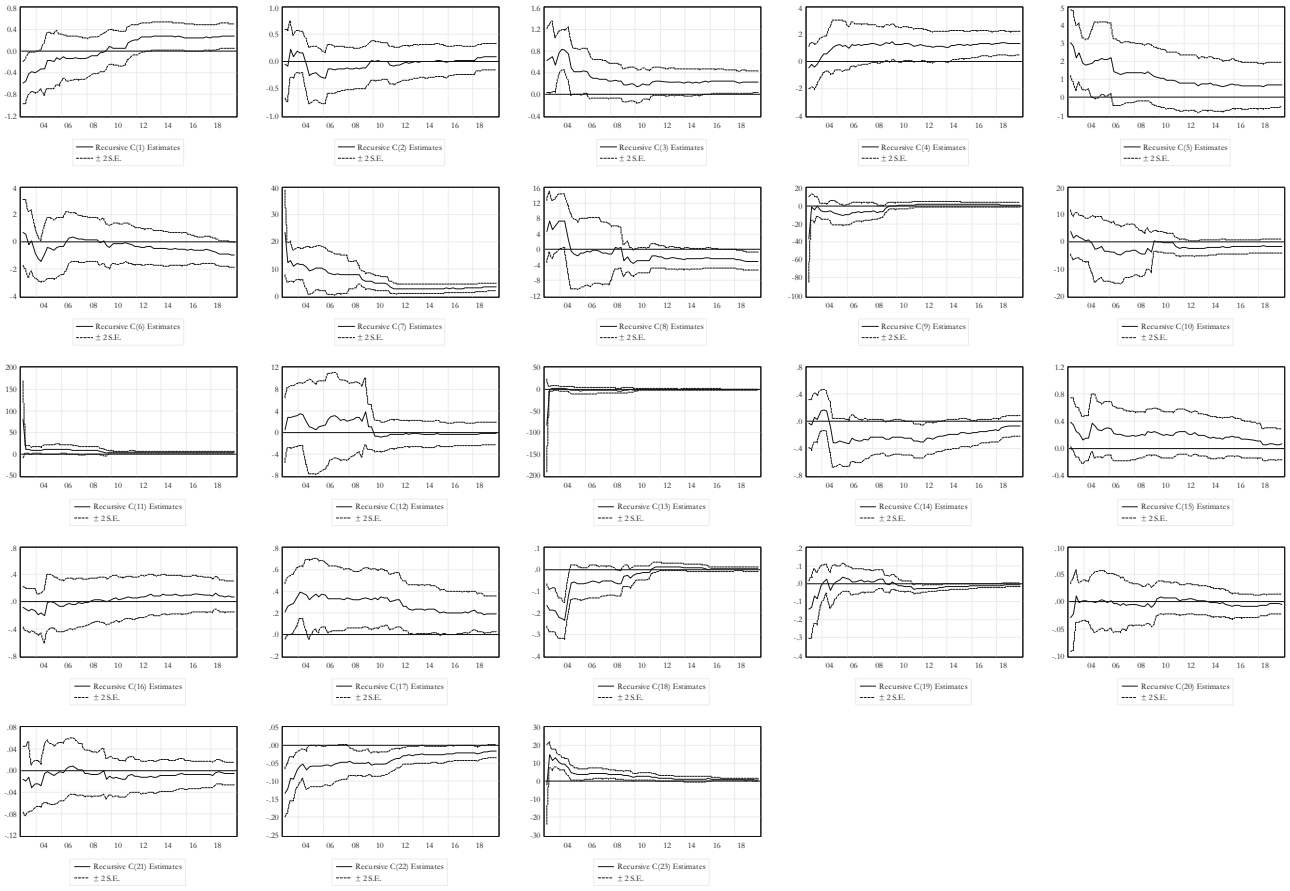


Figure 4: Recursive least squares coefficients plot for durables.

hypothesis for durables. The dynamic multiplier shows that a one percent positive shock to the income variable boosts durables consumption for almost seven quarters. However, a negative shock lasts about 11 quarters (Figure 5). It is worth mentioning that during 2007–2008 the decline in durables consumption lasted for almost eight quarters, and it took approximately the same time to return to pre-recession levels (the fact is observable using the Federal Reserve of

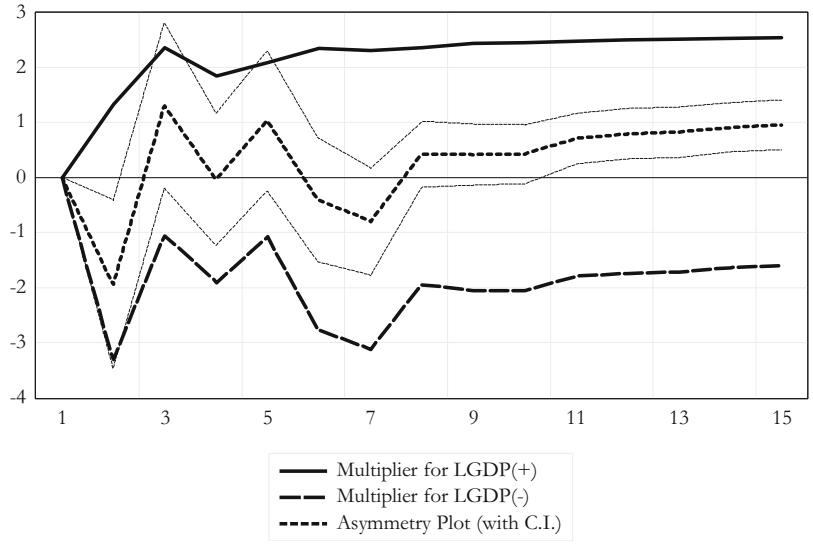


Figure 5: Cumulative multiplier effect of economic activity on durables consumption.

St. Louis website: https://fred.stlouisfed.org/series/PCEDGC96#0).

The impact of stimulus packages during the pandemic lasted almost seven quarters. The lesson from the Great Depression was that we should avoid waiting to see further deterioration in economic activities. The data naturally reveals the fact that we have learned this lesson.

The dynamic multiplier reveals another exciting aspect of consumption of durables, as we observe more confusion among consumers during recessions than in expansionary periods. Kaplan (1938) found that "Americans are certainly not a regimented people." This fact might be another reason behind their confusion during economic downturns.

According to the "rational expectation" hypothesis, consumers adjust their behavior as soon as they receive new information. By contrast, the adjustment process reveals that U.S. consumers receive mixed information (both positive and negative), and so optimism tends to be mixed with pessimism for some time.

We conduct an asymmetry test using the Wald test to investigate if the effect of income on U.S. durables is symmetric in the short and long run. The Wald test indicates the existence of a long-run asymmetry but short-run symmetry.

Our model is used to forecast durables consumption beyond the period of this study (Figure 6). As the proportions of bias, variance, and covariance illustrate, the model performs well in forecasting (Pindyck & Rubinfeld, 1998). We present our forecasting method here to challenge the unpredictability of consumption and confirm the predictive power of the hypothetical variables in the model.

For services consumption, using the ARDL model, we obtain a positive and less than unity (0.89) elasticity of consumption concerning economic activity (Table 2), which means a 1% rise (decline) in income increases (decreases) consumption by 0.89%, which provides support for the Keynesian consumption function $\left(\varepsilon = \frac{\text{MPC}}{\text{APC}} < 1\right)$.

While the real effective exchange rate carries a positive sign, it is not significant. The reason should be that most services are non-tradable, and the exchange rate should be irrelevant. The same applies to uncertainty, as its coefficient is insignificant (i.e., negligible impact). This fact can be translated to the importance of services in the U.S. consumption basket, as consumers are reluctant to reduce their consumption of services significantly, even under conditions of uncertainty. However, in the linear model, the interest rates carry a negative and significant coefficient.

According to diagnostic tests, there is no serial correlation or misspecification issue in the model, and both the CUSUM and CUSUMQ tests confirm that the model is stable. The bound test verifies the cointegration relationship in the model as the error correction term is about −0.15, which defines a slower adjustment toward equilibrium when we compare it with durables. In addition, the variables in the model explain about 42% of the variation in service consumption.

When we apply the NARDL approach, services consumption responds differently to economic upturns and downturns in the short and long run (Table 2). The model reveals the income elasticity of services consumption to be 0.86 during economic upturns and 0.72 during economic downturns (i.e., the APC is greater than the MPC). The results indicate that a 1% increase in income has more

impact (0.86%) than a 1% decrease in income (0.72%), which means U.S. households respond more to expansions than recessions. These coefficients are far below the coefficients of the income variable for durables consumption, which translates as services being more of a necessity than a luxury.

Unlike the linear model, the interest rates coefficient is negative and insignificant. We observe that income is the primary determinant in the consumer decision-making process for services. In addition, monetary policies which employ interest rates as an adjustment tool to correct a market disequilibrium has a limited real effect on services consumption.

According to diagnostic tests, there is no evidence of serial correlation and misspecification. While the model seems stable based on the CUSUM and CUSUMQ tests, recursive residuals provide some evidence of instability. Since the Chow test denotes a breakpoint in Q3 2008, we add a dummy for stability. However, the coefficient of the dummy is insignificant and has a minor effect on other coefficients in the model (Figures 7 and 8). Our recursive least squares coefficients plot is additional evidence for the stability of coefficients in the model (Figure 9).

Although the asymmetry test can convincingly distinguish between economic upturns and downturns, the results are slightly different for other variables in the model. Likewise, the NARDL performs well, as diagnostic tests verify no serial correlation, misspecification, and instability. However, the speed of adjustment toward equilibrium has risen in the model to −0.24, which is far less than the speed of adjustment for durables (−0.42). The deterministic power of the variables to explain the variation in service consumption has considerably increased, from 42% to 76%. Furthermore, consumers seem more confused during economic downturns than in upturns.

The dynamic multiplier proves that consumer behavior is more stable for service consumption than durables. However, the downward shocks to this behavior are more severe, which is reasonable as services remain at the core of the U.S. household's basket (Figure 10). The coronavirus pandemic provided evidence that service consumption is more fragile during economic downturns, regardless of the reason for the decline in economic activity.

We provide our forecast for service consumption (Figure 11). The model predicts service consumption within a reasonable range, so there is no point in claiming that consumption is unpredictable or a random walk.

The ARDL results for nondurables are highly similar to services consumption in terms of the income elasticity of consumption, with a coefficient of about 0.83 (Table 3). Although this coefficient is slightly below the income elasticity of services consumption, it reveals the essential nature of nondurables compared with durables. In addition, like services, the results support the Keynesian consumption function $\left(\varepsilon = \frac{\text{MPC}}{\text{APC}} < 1\right)$.

While the real effective exchange rate is positive and significant (and smaller for nondurables than durables),

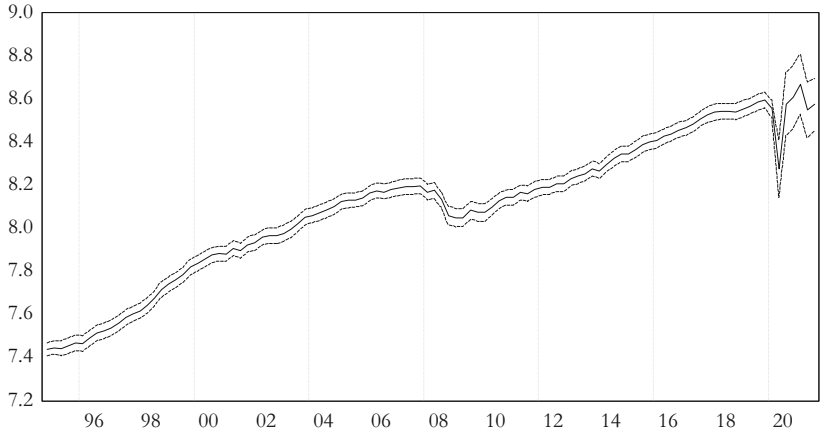


Figure 6: Dynamic forecasting for durables.

Table 2: Full-information estimates of the linear and nonlinear models for services

Linear Model			Nonlinear Model		
Variable	**Coefficient[b]**	***p*-value[a]**	**Variable**	**Coefficient**	***p*-value**
Panel A: short-run coefficient estimates					
Δc_{t-1}	−0.20*	(0.02)	Δc_{t-1}	0.23*	(0.00)
Δe_t	0.004	(0.69)	Δc_{t-2}	0.008	(0.92)
Δe_{t-1}	−0.018**	(0.06)	Δc_{t-3}	0.18*	(0.01)
Δe_{t-2}	−0.009	(0.35)	Δy_t^+	0.05	(0.31)
Δe_{t-3}	−0.031*	(0.00)	Δy_t^-	0.06	(0.41)
Δr_t	0.001*	(0.05)	Δy_{t-1}^-	−0.11	(0.22)
			Δy_{t-2}^-	0.005	(0.94)
			Δy_{t-3}^-	−0.35*	(0.00)
			Δy_{t-4}^-	0.05	(0.52)
			Δy_{t-5}^-	−0.11	(0.18)
			Δy_{t-6}^-	−0.06	(0.42)
			Δy_{t-7}^-	−0.17*	(0.02)
			Δe_t	−0.005	(0.54)
			Δe_{t-1}	−0.02*	(0.02)
			Δe_{t-2}	−0.02*	(0.03)
			Δe_{t-3}	−0.05	(0.00)
			Δr_t	0.001*	(0.02)
Panel B: long-run coefficient estimates					
Constant	0.31	(0.11)	Constant	8.76*	(0.00)
y	0.89*	(0.00)	y^+	0.86*	(0.00)
e	0.03	(0.27)	y^-	0.72*	(0.00)
r	−0.002*	(0.03)	e	0.03	(0.16)
vix	0.007	(0.11)	r	−0.001	(0.19)
			vix	0.006	(0.18)
Panel C: Diagnostics[c]					
F	13.72*			9.95*	
ECM_{t-1}	−0.15*	(0.00)		−0.24*	(0.00)
LM	0.13	(0.87)		2.21	(0.11)
RESET	0.12	(0.73)		1.4	(0.24)
$\bar{R}^2$	0.42			0.76	
CUSUM	Stable			Stable	
CUSUMQ	Stable			Stable	
Asymmetry test				4.03*	(0.05)
LR-Wald test				8.55*	(0.00)
SR-Wal test					

Note: a. Numbers inside the parentheses are *p*-values; b. the asterisks indicate that the coefficients are significant at 5 and 10%, respectively; c. upper bound *F*-Statistic critical value at a 5% significance level is 3.49.

the interest rate is insignificant. Interestingly, U.S. consumers respond to economic uncertainty regarding a decline in nondurable consumption. It seems reasonable to postulate that U.S. consumers today depend more heavily on services than during the Great Recession when the considerable decline in nondurables could have happened to offset the negative effect of services (Romer, 1990).

Since the interest rate coefficient is insignificant, and a stronger dollar (increase in the real effective exchange rate) encourages consumption through cheaper imports, we postulate that also, for nondurables, monetary policy has a limited real effect.

If we consider a rise in the interest rates, which strengthens the dollar, the monetary policy encourages nondurables consumption rather than hinders it.

According to diagnostic tests, we observe no serial correlation in the model, as the L.M. test confirms, and the Ramsey RESET test provides no evidence of misspecification. The model is stable, according to the CUSUM and CUSUMQ tests. In addition, cointegration exists in the

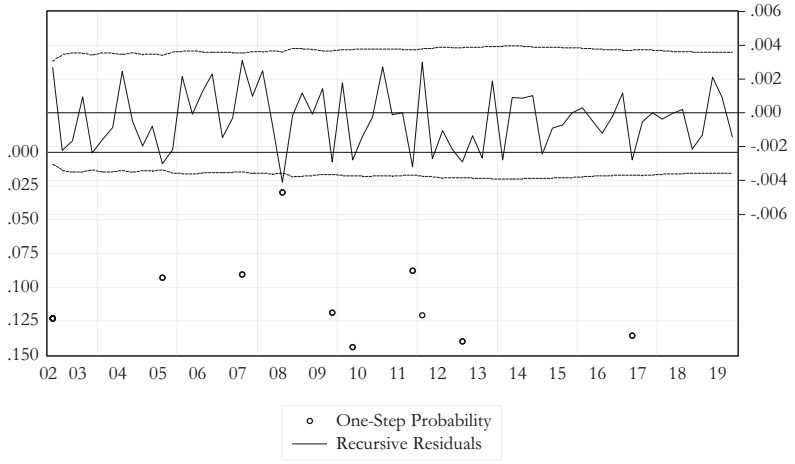


Figure 7: Recursive residuals for services (One-step probability).

model, and the speed of adjustment is about −0.14, while the deterministic power of the variables in the model is approximately 52%.

We apply the NARDL approach to estimate the coefficients of the variables in the model, thereby finding a long-run and short-run symmetrical effect of economic activity on nondurable consumption (Table 3). The speed of adjustment has slightly changed (−0.15), and so has the deterministic power of the variables in the model (54%). The diagnostic tests for serial correlation and specification attest to the model performing well in these respects; however, the recursive residuals plot (Figures 12 and 13) shows a breakpoint in Q4 2005, as confirmed by the Chow test. After including a stability dummy, we find the coefficient insignificant, with only a minor effect on the other coefficients. The recursive least squares coefficients plot is further proof of the stability of coefficients in the model (Figure 14).

According to the dynamic multiplier plot, we observe the immediate impact of a positive shock of economic activity on nondurable consumption, while the effect lasts longer for a negative shock (Figure 15).

It is worth noting that during the COVID-19 pandemic, we observed an interesting fact regarding nondurable consumption, as a shortage of ketchup packets appeared in the market due to U.S. households' accelerated demand for delivery and takeout. We notice two dramatic upsurges in consumption of nondurables (May 2020, 8.4% and March 2021, 7%), which occurred after U.S. households received the first and second stimulus checks. As the model confirms, the fact signals a windfall effect on nondurables (BBC News, April 7, 2021: U.S. restaurants face ketchup

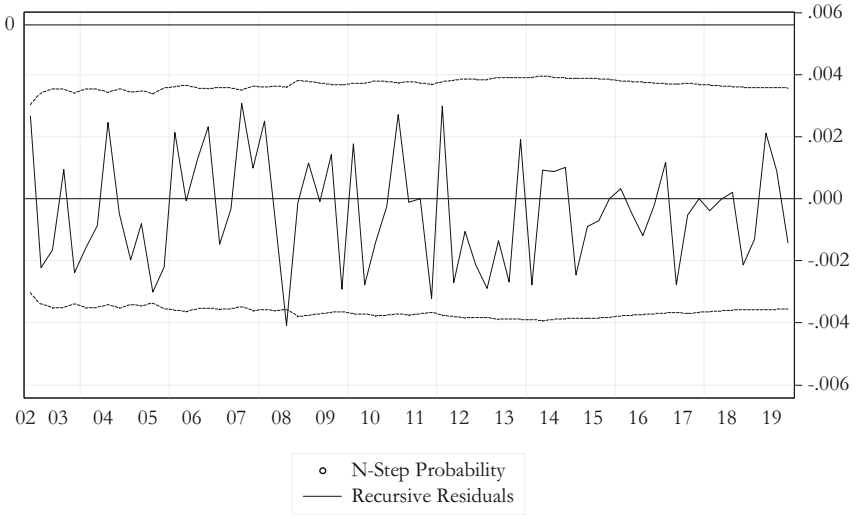


Figure 8: Recursive residuals for services (N-step probability).

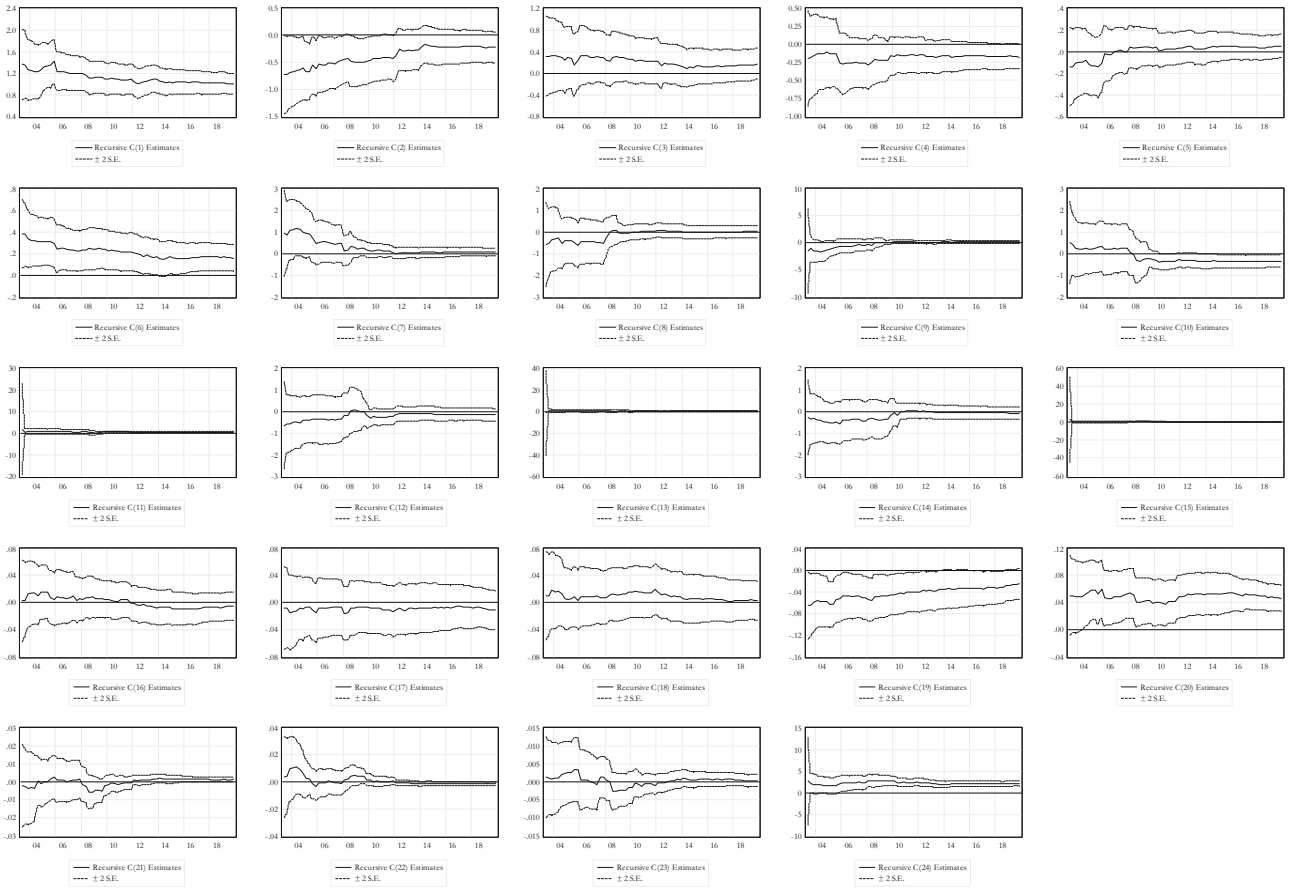


Figure 9: Recursive least squares coefficients plot for services.

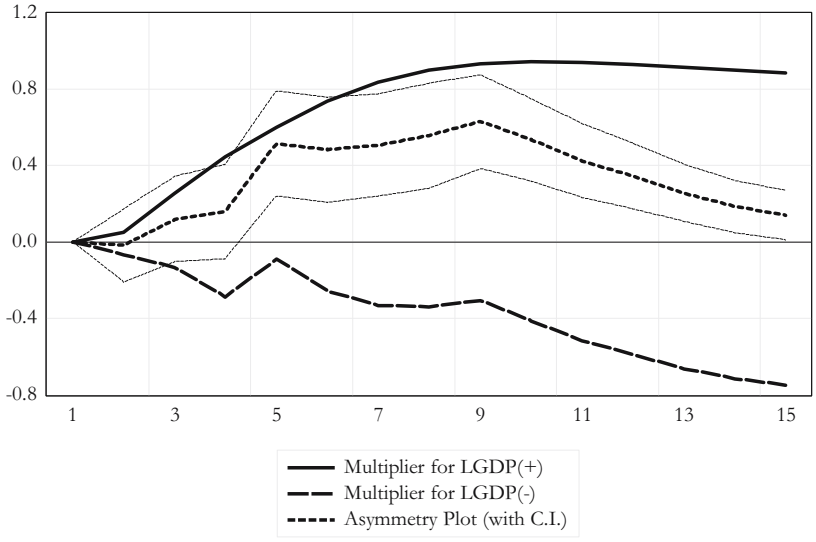
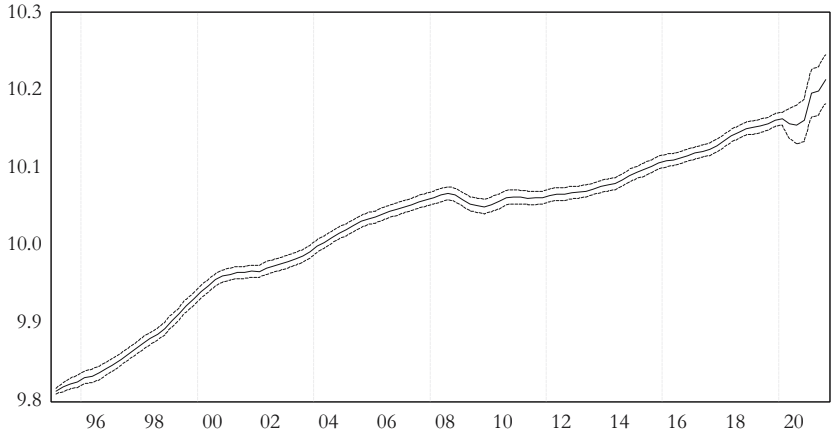


Figure 10: Cumulative multiplier effect of economic activity on services consumption.



Forecast sample: 1947Q1 2022Q2
Adjusted sample: 1995Q1 2021Q3
Included observations: 107

Bias Proportion	0.054949
Variance Proportion	0.059364
Covariance Proportion	0.885690

Figure 11: Dynamic forecasting for services.

Table 3: Full-information estimates of the linear and nonlinear models for nondurables

Linear Model			Nonlinear Model		
Variable	**Coefficient[b]**	***p*-Value[a]**	**Variable**	**Coefficient**	***p*-Value**
Panel A: short-run coefficient estimates					
Δc_{t-1}	−0.16*	(0.03)	Δy_t^+	0.67*	(0.00)
Δy_t	0.56*	(0.00)	Δy_t^-	0.35*	(0.04)
	—		Δy_{t-1}^-	−0.42*	(0.03)
			Δy_{t-2}^-	0.34*	(0.04)
			Δe_t	0.007	(0.75)
			Δe_{t-1}	−0.04*	(0.05)
			Δe_{t-2}	0.03	(0.18)
Panel B: long-run coefficient estimates					
Constant	−0.82*	(0.03)	Constant	7.15*	(0.00)
y	0.83*	(0.00)	y^+	0.83*	(0.00)
e	0.20*	(0.02)	y^-	0.74*	(0.00)
r	0.0005	(0.85)	e	0.18*	(0.02)
vix	−0.04*	(0.02)	r	0.0008	(0.79)
			vix	−0.03*	(0.02)
Panel C: diagnostics[c]					
F	5.53*			3.24**	
ECM_{t-1}	−0.14*	(0.00)		−0.15*	(0.00)
LM	0.62	(0.54)		1.68	(0.19)
RESET	0.33	(0.57)		0.14	(0.71)
$\bar{R}^2$	0.52			0.54	
CUSUM	Stable			Stable	
CUSUMQ	Stable			Stable	
Asymmetry test				0.33	(0.57)
LR-Wald test				1.67	(0.20)
SR-Wal test					

Note: a. Numbers inside the parentheses are *p*-values; b. the asterisks indicate that the coefficients are significant at 5 and 10%, respectively; c. upper bound *F*-Statistic critical value at a 5% significance level is 3.49.

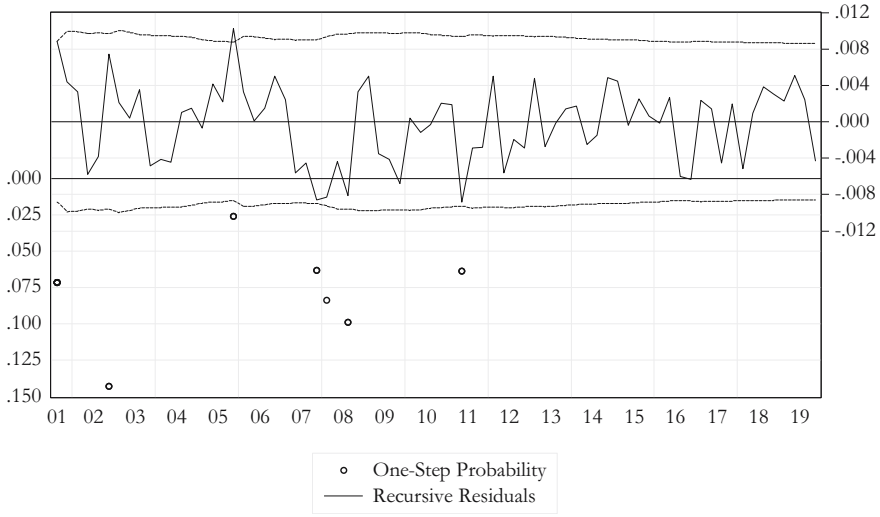


Figure 12: Recursive residuals for nondurables (One-step probability).

packet shortage amid the COVID pandemic. https://www.bbc.com/news/world-us-canada-56657822).

When we use the model to forecast nondurable consumption, we find strong forecasting power, revealing the deterministic power of the variables included in the model (Figure 16).

We have five exciting facts to discuss. First, although previous consumption (backward-looking factor) is not the only determinant of consumption (Hall, 1978), it reduces the consumption of durables, increases services consumption, and has no impact on nondurables. Second, while the intercept in the durables and services consumption is positive (in line with the Keynesian consumption function), the linear model for nondurables provides a negative intercept. Although the asymmetry test reveals that the income variable in the model has a symmetric effect on consumption, the nonlinear model corrects the intercept econometrically.

Third, since the income elasticity of consumption during recessions is less than during expansions, we suggest that consumers save more during recessions.

Fourth, in the case of services, the inverted U-shape of the services consumption-over-GDP ratio raises the question of whether the U.S. economy is saturated with services. Pagel (2017) also discussed that risk aversion and preferences generate a hump-shaped consumption profile.

Fifth, a closer look at the personal saving rate (Figure 17) and the services consumption-over-GDP ratio (Figure 18) reveals a potential connection between saving and service consumption. Since services contribute to more than 40% of United States GDP, a model would have to include services in

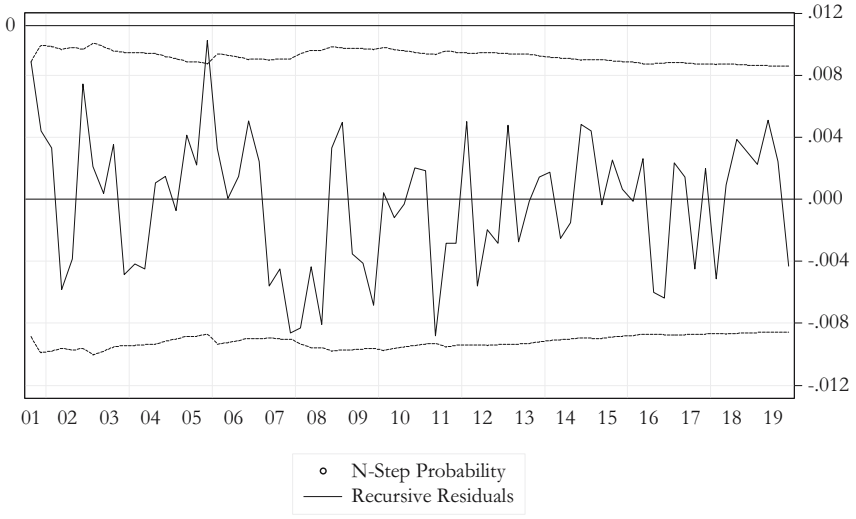


Figure 13: Recursive residuals for nondurables (N-step probability).

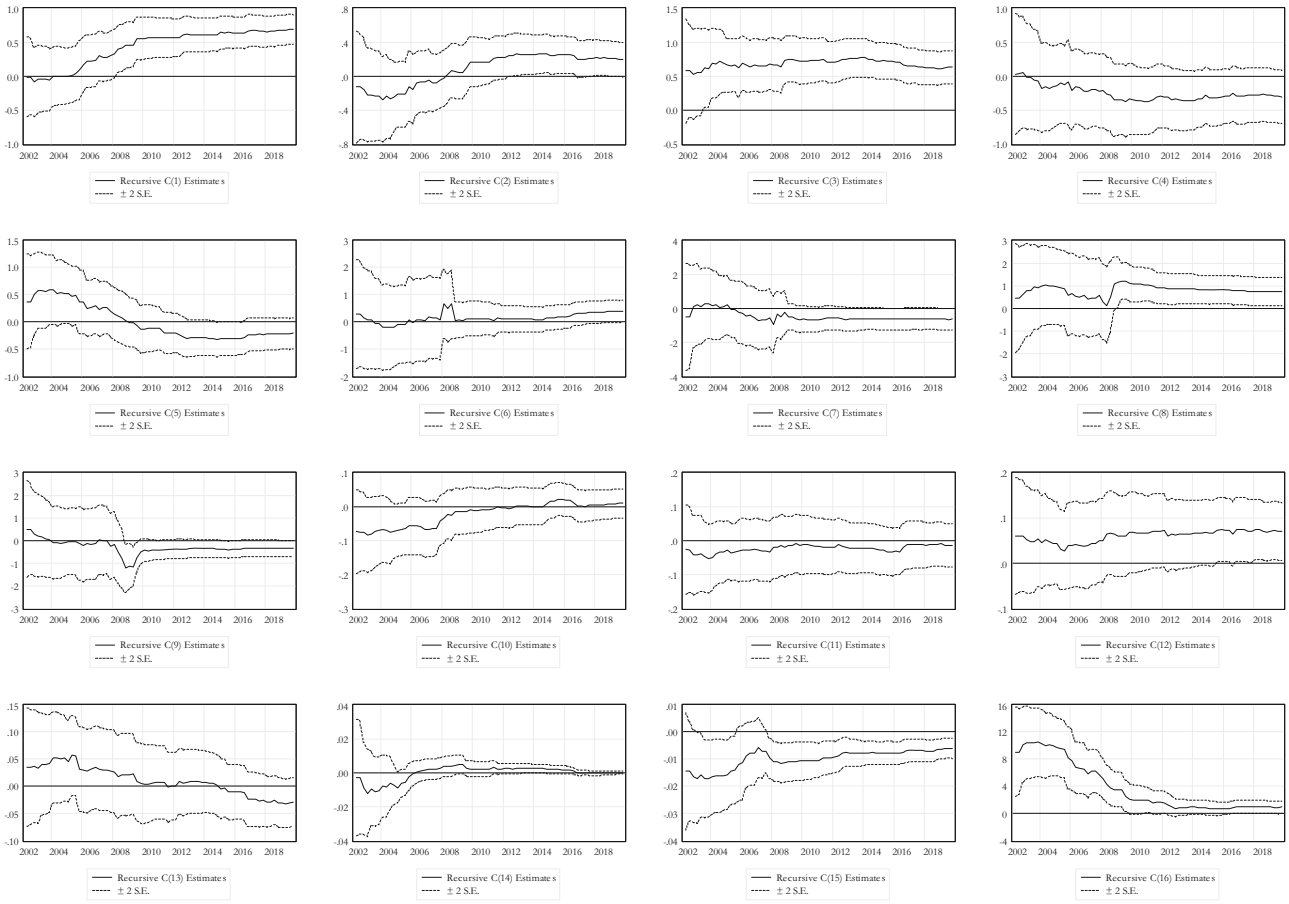


Figure 14: Recursive least squares coefficients plot for nondurables.

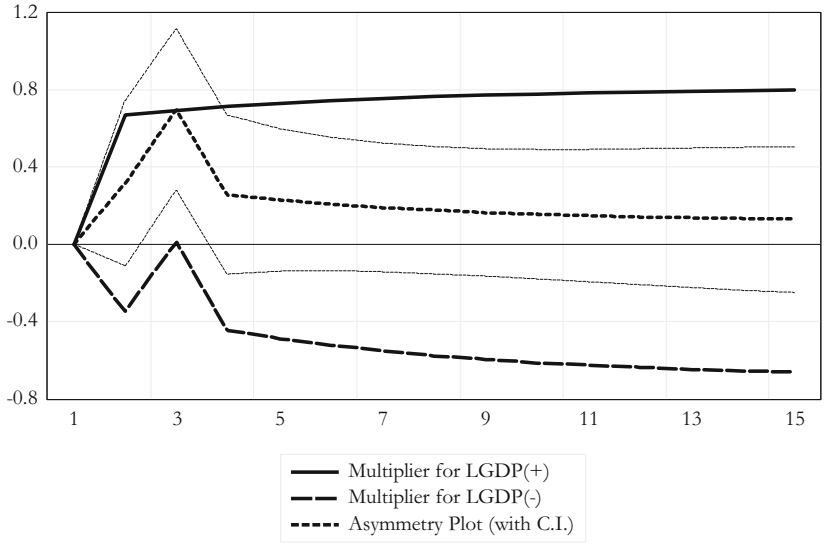


Figure 15: Cumulative multiplier effect of economic activity on nondurables consumption.

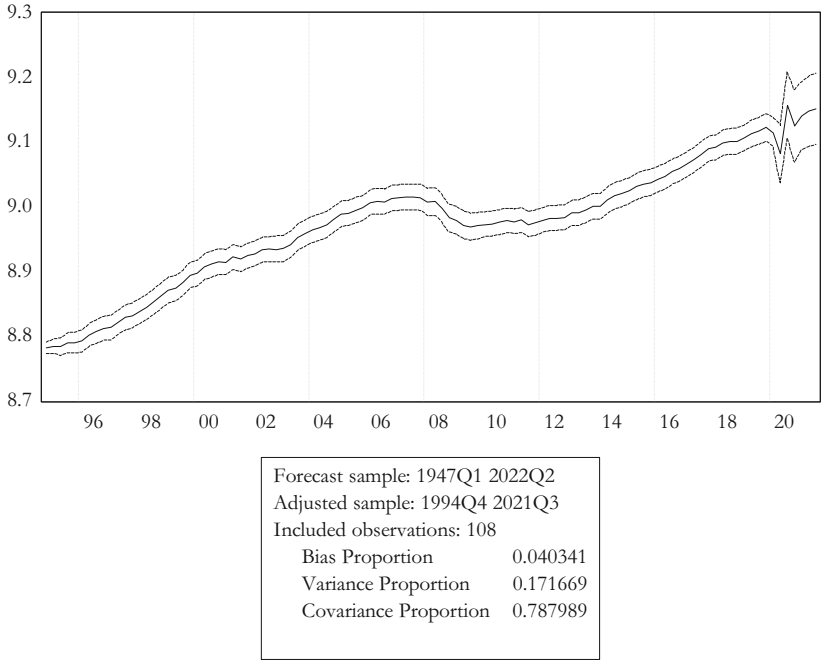


Figure 16: Dynamic forecasting for nondurables.

its analysis to explain the saving behavior of U.S. households. Do U.S. households save to smooth their patterns of service consumption? Although Dynan et al. (2004) found a strong positive relationship between saving rates and lifetime income, our findings postulate the relationship between saving rates and service consumption.

The importance and, in some cases, the necessity of services were laid bare during the pandemic. For example, healthcare accounts for 19.7% of GDP and, therefore, one-third of the share of services in the U.S. economy. A recent study shows that about one in eight U.S. adults claim they reduce spending on food (12%) and over-the-counter drugs (11%) to cover healthcare or medicine costs. At the same time, many cut back on household spending to afford the care that they are currently receiving (West Health-Gallup Healthcare Study, February 15, 2021, sample size: n = 3,753).

6 Robustness Tests

To check the robustness of the model, we estimate durables consumption using a maximum of four lags rather than eight lags (for the sake of space, results are available

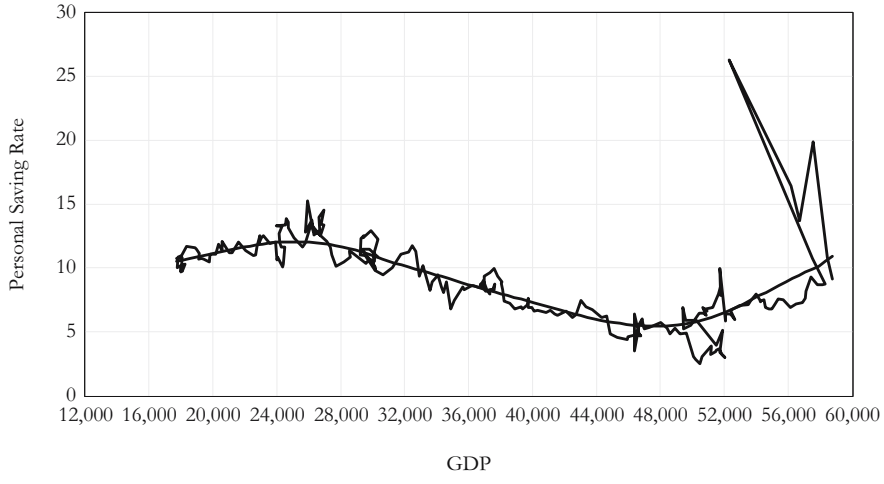


Figure 17: Personal Saving Rate vs GDP (The Kernel Fit Method).

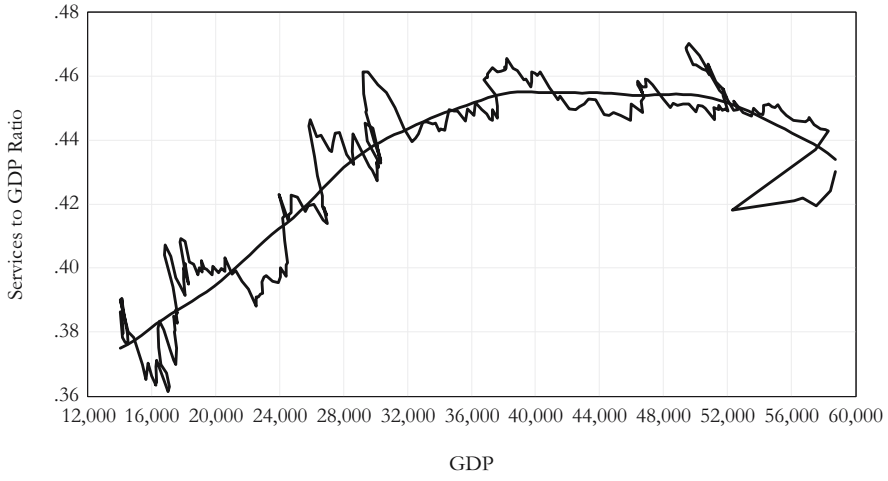


Figure 18: APC (Services) vs GDP (The Kernel Fit Method).

upon request). The results indicate that the coefficients have slightly changed. In addition, we include a proxy variable for inequality in the model using the gap between the net worth of the bottom 50% and the top 1% of U.S. households. However, we find an insignificant coefficient for the variable. The same applies to housing wealth as an explanatory variable in the model. It is worth noting that Panel data studies provide more support for the effect of inequality on consumption (Ebadi, 2022).

In another attempt, we drop the variables from the last variable to reach the first regressor, the primary determinant. First, the model is only stable when we include all the defined variables we use to investigate durables consumption. Second, the model completely collapses (no cointegration and stability) when we have income as the only regressor. Although other variables have a less pronounced effect on durables consumption, dropping those variables significantly affects the model's performance. Third, the income elasticity of durables consumption during economic downturns responds more dramatically to eliminating variables than income elasticity during economic upturns. This fact is attributed to consumers' behavior becoming more complex during recessions. They are likely to be more pessimistic and consider different factors in their decision-making than when optimistic and follow a simple pattern.

We also estimate the model using a maximum of four lags for services. The results reveal that the coefficients have slightly changed. When we include the inequality proxy and housing wealth in the model, the coefficients are also insignificant for service consumption.

When we test the sensitivity of the coefficients dropping variables for services consumption, the results reveal evidence of serial correlation, misspecification, and instability. Again, income has more deterministic power than other variables in the model, but we should consider those variables statistically.

When we apply the same practice for nondurables and estimate the model using a maximum of 4 lags, the coefficients experience a slight change. In addition, including the inequality proxy provides an insignificant coefficient. However, housing wealth inclusion collapses the model.

As with durables and services, dropping other variables from the nondurables model creates no cointegration, instability, or misspecification.

7 Conclusion and Discussion

Consumption as a core macroeconomic concept has attracted considerable attention from researchers despite experiencing ups and downs. Different econometrics methodologies have challenged consumption theories, and the understanding of consumer behavior has been modified historically. Nevertheless, the lack of disaggregated data has generated controversial explanations about U.S. consumption. For instance, Foster (2021) formulated a consumption function for the U.S. macroeconomy to investigate the reason behind the increase in the consumption share of income over time. However, the fact that the consumption of nondurables has declined over time as a share of income, while services consumption has followed an inverted U-shape pattern, casts doubt on his "new perspective."

Although some leading economists in the field believe that stable cointegration is problematic (Carroll, 2001), mainly due to structural breaks in the model caused by demographic factors and financial system changes, any attempt to build an invariant model which can explain

the whole history of consumption while accounting for variant economic agents' behavior seems irrational.

When we apply quarterly disaggregated consumption expenditure data and include diverse hypothetical variables in the model from 1994 to 2019, using a methodology that enables nonlinearity, we find that consumers behave differently during economic upturns and downturns. Although the literature lacks attention to this phenomenon, we postulate that a critical factor may be "imperfect information" and confusion regarding consumers' decision-making processes. The results of our study support this. U.S. consumers are more likely to need clarification during recessions than in growth periods, as they receive more mixed information during an economic downturn. This fact causes severe uncertainty that makes individuals more pessimistic and erratic, as shown by the dynamic multiplier, which reveals long-lasting shocks during economic downturns. While U.S. consumers rapidly adjust their spending on durables, the speed of adjustment is slow for nondurables and services. This may be a signal of habit formation concerning U.S. consumer behavior.

In addition, neither classical nor Keynesian consumption theory can adequately explain that the MPC is greater than the APC for durables as, at most, unitary income elasticity of consumption was hypothesized. However, the income elasticity of consumption is less than unity for services and nondurables, following Keynesian doctrine.

Since services account for more than 60% of overall consumption, the asymmetry in the response of U.S. consumers to economic downturns and upturns arises more from the consumption of services than of durables and nondurables.

We postulate that service consumption is the primary determinant of U.S. consumer behavior and that smoothing service demand could solve the puzzle of higher savings for more affluent Americans. Carroll (1998) mentioned that "unspent wealth yields a flow of services" that might be a reason for the accumulation of wealth (higher saving rates). This hypothesis desires further research to build more service-focused models which can explain U.S. consumer behavior.

While in our proposed model, the interest rates, the real effective exchange rate, and the uncertainty coefficients (negative, positive, and negative, respectively) are significant for durables, the coefficients are insignificant for services. In the case of nondurables, only the exchange rate and the uncertainty coefficients (positive and negative, respectively) are significant.

Therefore, our model indicates that increases in interest rates discourage durable consumption, and a strong dollar makes imports cheaper, which encourages consumption. For services, neither interest rates nor the real effective exchange rate has any impact. For nondurables, an interest rate hike raises consumption through cheaper imports rather than reducing it (i.e., a money growth reduction – interest rate hike – fosters nondurable consumption). Hence, the study suggests that monetary policy has a limited effect on consumption.

The Fed's recent monetary policy to overcome surging inflation through hindering consumption supports our findings as U.S. consumption slowly responded to the policy. We postulate that disinflation occurred through cooling down the housing market and a more stable energy market than a considerable decline in consumption.

Our findings justify the reason behind the slow impact of money growth reduction on controlling inflation (Lucas, 1976) through aggregate consumer behavior and that the Fed's inflation fight has a "long way to go" (Jerome Powell; Reuters, Jun 21, 2023).

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