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# THE DETERMINANTS OF U.S. RETAIL SALES: 1993-2003

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## ABSTRACT

Applying the exponential GARCH (EGARCH) model and based on a quarterly sample during 1993.Q1 – 2013.Q2, this paper finds that real retail sales in the U.S. are positively affected by real disposable personal income, the stock index and the lagged consumer confidence index and negatively influenced by the real lending rate. The recent financial crisis has shifted the regression intercept downward, suggesting that retail sales have declined at all levels of real disposable personal income. **JEL Classification:** E21, D12

## INTRODUCTION

Retail sales are one of the most important business indicators in gauging whether the U.S. economy is strong or weak. Due to the recent Great Recession beginning in 2008, total U.S. retail sales had declined as much as 21.6% from a record high of \$353,916 million in 2007.Q4 to a record low of \$277,414 million in 2009.Q1. It took more than 2 years for retail sales to recover and surpass the previous record and reached \$399,134 million in 2013.Q4 (U.S. Bureau of the Census). Understanding how relevant economic variables may have affected the rise and fall of retail sales would provide policymakers and business executives with more insights into the subject.

This paper revisits retail sales in the U.S. and has several focuses. First, in addition to conventional explanatory variables, stock values and consumer confidence are incorporated into the model to determine whether retail sales would be influenced by household financial wealth or consumer sentiment. Second, the elasticity of retail sales with respect to an explanatory variable is estimated based on the advanced econometric technique such as the EGARCH method. Third, the sample period ranges from 1993.Q1 to 2013.Q2 and covers the recent global financial crisis so that estimated parameters will be more applicable to the post-crisis period.

The organization of manuscript is as follows: First, a brief literature review is put forth. The second section offers a discussion of the proposed model. The next section describes the empirical results. The final section offers a summary and conclusion.

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## LITERATURE SURVEY

The review focuses on economic factors of consumer expenditures or retail sales. In an early study, Motley (1982) investigated U.S. household expenditures based on a semi-annual sample during 1955-1979. He found that household spending on nondurables and services had a positive relationship with the current and lagged disposable income and the current real after-tax interest rate and a negative relationship with the expected inflation rate, the unexpected inflation rate and the lagged real after-tax interest rate. In addition, lagged purchases of durables, residences and financial assets had negative impacts on current household spending.

Applying a multivariate model, Chopin and Darrat (2000) explored the causal relationship between consumer attitudes and selected economic variables including retail sales and stock market performance. They showed that stock market performance caused retail sales to change and that it is possible that consumer attitudes would affect retail sales via interactions with stock market performance.

Applying the SUR/3SLS models and using a pooled sample during 1981-2001, Barrell and Davis (2004) analyzed household spending in the G5 countries (France, Germany, Japan, the U.K. and the U.S.). For the U.S., household spending was positively impacted by disposable personal income and net wealth and negatively influenced by the real interest rate. Furthermore, the impact of tangible wealth had a greater impact on household spending than net financial wealth.

Aviat, Bricongne and Pionnier (2007) examined the impacts of wealth and other relevant variables on household spending in France, the U.K. and the U.S. For the U.S., if real disposable income rises 1%, household spending is expected to increase 0.74% in the long run; and if household wealth rises 1%, household spending would rise 0.26% in the long run. In the short run, bank credit had a positive impact on household spending whereas the unemployment rate, the interest rate and the inflation rate had negative effects on household spending. The impacts of disposable income and wealth in the U.K. were similar to those in the U.S. in the long run. In comparison, in the long run, the effect of real disposable income on household spending in France was much greater, and the impact of wealth on household spending in France was much smaller.

Muellbauer (2008) compared the housing and stock market wealth effects on household expenditures for the U.K. and the U.S. He indicated that there was lack of the housing wealth effect before liberalization of the credit market. After liberalization, the housing wealth effect became significant and was twice as large as the stock market wealth effect in the U.S. as in the U.K. Specifically, the marginal propensity to consume due to increased housing wealth was around 6%-7% for the U.S. and 3% for the U.K.

Using a U.S. sample during 1992-2007, Dore and Singh (2009) reported that revolving credit and non-revolving credit accounted for 50% of U.S. retail sales whereas the impact of disposable income on retail sales was very moderate. In another study, Dore and Singh (2010) revealed that disposable income and revolving credit Granger caused retail sales and that retail sales Granger caused corporate profits and disposable income. Hence, retail sales and disposable income interacted with each other.

Zhou and Carroll (2011) used state-level data to study the relationship between

household spending, financial wealth and housing wealth. They showed that there was lack of evidence of a stock wealth effect whereas there was a housing wealth effect where for each additional \$1 increase in housing wealth two years prior, there would be an additional household spending of 5 cents.

Paradiso, Casadio and Rao (2012) studied U.S. household expenditures during 1955.Q1-2010.Q1 and presented several major findings. After including a binary variable accounting for an intercept shift and the inflation rate, household spending became more stable in the long run. The inflation rate played a significant role after the 1990s. The impact of the nominal interest rate was asymmetrical, meaning that a declining interest rate had a larger impact on household spending than a rising interest rate. However, only the declining interest rate was statistically significant. Lagged stock wealth and non-stock wealth also had net positive impacts on household spending.

Mei (2012) extended the conventional model by including debt burden and consumer credit (Mishkin, 1977) in U.S. household spending. The author discovered that there was a structural shift in the 1980s. During 1952-2011, current income was highly significant whereas consumer credit was insignificant. During 1980-2011, current income became less significant whereas consumer credit became highly significant. Hence, the findings are consistent with Campbell and Mankiw (1989) and in contrast with the life-cycle hypothesis.

Fair (2014) investigated the determinants of U.S. consumer spending and the impacts of the recent financial crisis and recession on consumer expenditures. For nondurable goods, disposable income, net wealth and the lagged dependent variable had positive effects whereas the after-tax interest rate had a negative impact. For durable goods, disposable income and net wealth had positive impacts whereas stocks of durable goods and the after-tax interest rate had negative impacts. The population group aged 66 and older minus percent 16-25 spent less on nondurables or durables. He concluded that the decline in consumer expenditures during the recent recession was largely due to the wealth effect.

## THE MODEL

Extending previous studies, we can express U.S. retail sales as a function of disposable personal income, the lending rate, the stock index, consumer confidence and a binary variable:

$$RS_t = f(DI_t, LR_t, SP_t, CC_t, B2008) \quad (1)$$

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where

- RS = real retail sales,
- DI = real disposable personal income,
- LR = the real lending rate,
- SP = the stock market index,
- CC = consumer confidence, and
- B2008 = a binary variable with a value of 0 before 2008.Q1 and 1 since 2008.Q1.

Real retail sales are expected to be positively associated with real disposable

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personal income, the stock index and lagged consumer confidence and negatively correlated with the real lending rate and a binary variable representing a potential downward shift of real retail sales due to the recent financial crisis. The positive relationship between retail sales and the stock price represents the wealth effect of financial assets. Lagged consumer confidence is chosen to convey the notion that consumer confidence predicts economic activities about six months ahead of the time. Housing wealth is not included in equation (1) due to lack of quarterly data.

## EMPIRICAL RESULTS

The data came from the Bureau of Economic Analysis, U.S. Bureau of the Census, the Conference Board, and the Federal Reserve Bank of St. Louis. Total retail sales are divided by the consumer price index to derive real retail sales, which are expressed in millions. Real disposable personal income is measured in billions of chained 2009 dollars. The real lending rate is equal to the nominal lending rate minus the annual inflation rate. The annual inflation rate is derived from the percent change in the consumer price index. The Wilshire 5000 stock index is selected to represent financial wealth. The consumer confidence index reflects the degree of optimism expressed by consumers and has a base year in 1985. RS, DI, SP and CC are transformed to the log scale. LR and B2008 are in the linear form due to zero or negative values. The original sample ranges from 1992.Q1 to 2013.Q2. After calculating the annual inflation rate, the actual sample runs from 1993.Q1 to 2013.Q2. Earlier data for retail sales before 1992.Q1 are not available.

The ADF unit root test on the regression residuals is performed to determine whether these time series variables may have a long-term relationship. The value of the test statistic is estimated to be  $-3.8077$ , which is greater than the critical value of  $-3.5155$  in absolute values at the 1% level. Therefore, variables in equation (1) are cointegrated.

Table 1 presents the estimated regression and related statistics. The exponential GARCH method is applied in empirical work. The value of R-squared suggests that the five independent variables can explain approximately 82.44% of the variation in real retail sales in the U.S. All the coefficients are significant at the 1% level. The mean absolute percent error of 3.94% implies that the forecast error is relatively small.

Specifically, a 1% increase in real disposable personal income is expected to lead a 0.6842% increase in real retail sales. When the real lending rate rises 1 percentage point, the log of real retail sales would decline by 0.0046. If the Wilshire stock index rises 10%, real retail sales would increase 0.386%. A 1% increase in the lagged consumer confidence index would cause real retail sales to rise 1.5108%. The recent financial crisis beginning in 2008 has shifted the log of real retail sales downward by  $-0.0747$ . These results suggest that the elasticity of real retail sales with respect to the consumer confidence index is much greater than other elasticities in absolute values and that stock market performance does affect consumer spending.

Several different versions were considered. If the linear form is chosen, all the coefficients are significant at the 1% level, the value of R-squared is estimated to be 0.8280, and the mean absolute percent error is 3.9294%. These results suggest that the linear form may be considered as well. A major difference is that the estimated coefficient in the linear form is the slope instead of the elasticity when both the

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dependent and an independent variable are measured in the log scale. When the University of Michigan's consumer sentiment is chosen to replace the consumer confidence index, its coefficient is significant at the 1% level, but the coefficient of the real lending rate is negative and insignificant. Other results are similar.

## **SUMMARY AND CONCLUSION**

This paper has examined the determinants of U.S. retail sales based on a quarterly sample during 1993.Q1 – 2013.Q2. The EGARCH process is applied in estimating the regression. A higher real disposable personal income, a lower real lending rate, a higher stock price or a higher consumer confidence would increase real retail sales. The regression has shifted downward because of the recent financial crisis beginning in 2008.

There are several policy implications. Business creation and expansion and more job opportunities would raise disposable income and retail sales. Monetary easing leading to a lower lending rate is expected to increase retail sales. A healthy stock market is conducive to retail sales due to the wealth effect. The government may pursue low inflation, high economic growth, less government debt and budget deficits, more efficiency, etc. to enhance consumer sentiment and retail sales.

A limitation of the paper is the use of the stock price as a proxy for household wealth, which includes stocks, bonds, mutual funds, deposits, savings, currency, real properties, etc. Hence, the magnitude of the coefficient may change if the data for household wealth is available and used in empirical work.

A potential area for future research is to apply the model to retail e-commerce sales, which have grown significantly in recent years due to lack of sales tax in many states, convenience, lower prices, online comparison of products, more choices, and other reasons. Retail e-commerce sales may be more or less sensitive to the explanatory variables included in equation (1).

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**TABLE 1. THE ESTIMATED REGRESSION OF REAL RETAIL SALES  
IN THE U.S.**

<i>Explanatory variables</i>	<i>Coefficient (z-Statistic)</i>
Log(real disposable personal income)	0.6842 (58.2484)
Real lending rate	-0.0046 (-2.4862)
Log(Wilshire 5000 index)	0.0386 (3.6649)
Log(lagged consumer confidence index)	1.5108 (41.4403)
Binary variable	-0.0747 (-7.1751)
Constant	-1.4457 (-11.3803)
R-squared	0.8244
Mean absolute percent error	3.9419%
Sample period	1993.Q1 – 2013.Q2
Sample size	84
Methodology	EGARCH

**Notes:** The dependent variable is log(real retail sales).

