Factors Influencing the US Retail Sales: An Empirical Analysis

Chu V. Nguyen[1], Mihai Nica[2] and Utpal Bose[3]

Abstract

This study documents that fluctuations in the current monthly US retail sales are strongly affected by its lagged changes, and changes in (i) Real Disposable Personal Income, (ii) S&P 500 equity index, (ii) University of Michigan: Consumer Sentiment, (iv) Consumer Price Index for All Urban Consumers: All Items, (v) Civilian Unemployment Rate, (vi) Trade Weighted U.S. Dollar Index: Major Currencies, and (vii) lagged changes of these variables. The empirical findings, particularly the time lags, provide useful information for national policy makers to formulate their countercyclical policies and for retail sales management to predict their sales to effectively manage their operations.

Keywords: US aggregate retail sales; empirical analysis;

Introduction

The growth and development of every economy, developed or otherwise, on the globe have not been stable over the years. As a result, every economy has witnessed shocks and disturbances both internally and externally over the last three decades. Internally, the unstable investment and consumption patterns as well as the improper implementation of public policies, changes in future expectations, and the accelerator are some of the factors responsible for economic instabilities. Similarly, the external factors identified are wars, revolutions, population growth rates and migration, technological transfer and changes as well as the openness of the economy.

Almost three quarters of a century ago, commenting on business cycles, Burns (1947) articulated that "….For well over a century business cycles have run an unceasing round. They have persisted through vast economic and social changes; they have withstood countless experiments in industry, agriculture, banking, industrial relations, and public policy; they have confronted forecasters without numbers, belief repeated prophecies of 'a new era of prosperity', and outlived repeated foreboding of 'chronic depression'." With regard to the nature of business cycles, Schumpeter (1939) posited that "….. Cycles are not like tonsils, separable things that might be treated by themselves, but are, like the beat of heart, of the essence of organism that displays them." Clearly, these observations still hold true in the second decade of the 21st century!

Countercyclical monetary policy and fiscal policy are two approaches by which governments attempt to manage the national economies. Fiscal policy uses the government's taxation and spending powers and monetary policy uses interest rates or the money supply to influence the nation's output, employment, and price level. Although countercyclical monetary and fiscal policies have differing effects, both strive to improve aggregate consumption spending and investment in the economy to ultimately affect the aggregate demand in the economy to ensure economic stability. The most important component of the aggregate demand is the consumption demand which critically affects the aggregate retail sales.

[1] *Associate Professor of Economics and Finance and Chair, FAMIS Department, College of Business, University of Houston-Downtown, Houston, Texas, Email: nguyenchu@uhd.edu*
[2] *Assistant Professor of Economics, University of Central Oklahoma Edmond, OK, USA.*
[3] *Associate Professor of MIS, University of Houston Downtown, Houston, TX, USA.*

Additionally, the retail sector plays a key role in the U.S economy, not only because aggregate consumer demand is an indication of a healthy financial system, but also because retailers serve as large employers. Nearly 10.00 percent of the national workforce in the U.S. is employed in the retail sector, which provides both long-term career opportunities for young people and seniors. Retailing also serves as a side job when people look to switch between career objectives. By way of evidence, due to the recent Great Recession beginning in 2008, total U.S. retail sales had declined as much as 21.60 percent 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 to reach \$399,134 million in 2013.Q4 (U.S. Bureau of the Census). Understanding how relevant economic variables may affect the rise and fall of retail sales would provide policymakers and business executives with more insights into the subject.

Aggregate retail sales follow the law of demand, which theorizes that changes in price index results in changes in demand. Additionally, retail sales are affected by non- price factors such as consumers' expectations, changes in their wealth, changes in the purchasing power of their income and financial assets with fixed nominal value that are precipitated by changes in the price level, and changes in the interest rates. Changes in consumption demand affect the aggregate retail sales in the economy.

Given the aforementioned articulation, the objective of this study is to empirically investigate if monthly changes in the US Real Disposable Personal Income (In_t), S&P 500 equity index (St_t), University of Michigan: Consumer Sentiment (Ms_t), Consumer Price Index for All Urban Consumers: All Items (If_t), Civilian Unemployment Rate (Un_t), and Trade Weighted U.S. Dollar Index: Major Currencies (Ex_t), as well as their changes and changes of retail sales in prior periods affect the current US retail sales (Rs_t) as measured by the monthly changes in the US retail sales levels.

The remainder of the study is organized as follows. The next section briefly reviews the literature, followed by a section that discusses the data, methodology, and model specification, leading to a section that summarizes descriptive statistics and report estimation results, followed by a section to discuss the results, and culminating with some concluding remarks.

Review of Literature

As to the factors influencing retail sales, Motley (1982) found that US 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. It had a negative relationship with the expected inflation rate, the unexpected inflation rate, and the lagged real after-tax interest rate over the 1955-1978 period. In addition, the author indicated that lagged purchases of durables, residences and financial assets had negative impacts on current household spending.

Chopin and Darrat (2000) reported 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. Barrell and Davis (2004) found that US household spending was positively impacted by disposable personal income and net wealth and negatively influenced by the real interest rate during 1981-2001. They further articulated that the impact of tangible wealth had a greater impact on household spending than net financial wealth.

Aviat, Bricongne and Pionnier (2007) reported that if the real US disposable income rises 1.00 percent, household spending is expected to increase 0.74 percent in

the long run; while household spending would rise 0.26 percent if household wealth rises 1.00 percent in the long run. As to the short run, these authors found that 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. Internationally, the impacts of disposable income and wealth in the U.K. were similar to those in the U.S. in the long run; while 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 in comparison to the US's.

Dore and Singh (2009) reported that revolving credit and non-revolving credit accounted for 50 percent of U.S. retail sales whereas the impact of disposable income on retail sales was very moderate during the 1992-2007 period. In their subsequent 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.

Paradiso, Casadio and Rao (2012) studied U.S. household expenditures during 1955.Q1-2010.Q1 and reported: (i) after accounting for an intercept shift and the inflation rate, household spending became more stable in the long run; (ii) the inflation rate played a significant role after the 1990s, (iii) a declining interest rate had a larger impact on household spending than a rising interest rate, (iv) only the declining interest rate was statistically significant, and (v) lagged stock wealth and non-stock wealth also had net positive impacts on household spending.

More recently, Fair (2014) studied the determinants of U.S. consumer spending and the impacts of the recent financial crisis and recession on consumer expenditures. He reported that: (i) 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, (ii) 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, and (iii) the population group aged 66 and older 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.

Data and Methodology

This study uses the time series data on the monthly changes in the US retail sales (Rs_t), Real Disposable Personal Income (In_t), S&P 500 equity index (St_t), University of Michigan: Consumer Sentiment (Ms_t), Consumer Price Index for All Urban Consumers: All Items (If_t), Civilian Unemployment Rate (Un_t), and Trade Weighted U.S. Dollar Index: Major Currencies (Ex_t). Data for all variables, except St_t, are from FRED of the Federal Reserve Bank of St. Louis. Data for the US S&P 500 equity index (St_t) is from Yahoo Finance. The sample period is from February 1978 to March 2013, where the data is available. It should be noted here that money supply, equity indices, and interest rate are highly correlated; therefore, if all of them are used as independent variables, they will cause an unacceptable degree of multicollinearity for the estimation process without improving the quality of the model.

Methodology

In order to apply any statistical procedure for an empirical investigation, the stationarity of time series data must be determined. Econometrically, it is expected that changes in time series of economics variables should be stationary. To ascertain the stationarity of the data

set, which is a precondition for the estimation procedure, this study uses the augmented Dickey-Fuller and Phillips–Perron tests. The null hypothesis for both tests is that a unit root exists in the autoregressive representation of the series.

To empirically investigate the relationship between monthly changes in the US retail sales and monthly changes in: Real Disposable Personal Income, S&P 500 equity index, University of Michigan: Consumer Sentiment, Consumer Price Index for All Urban Consumers: All Items, Civilian Unemployment Rate, and Trade Weighted U.S. Dollar Index: Major Currencies, as well as their lagged changes; this study algebraically specifies and estimates the following model

$$Rs_t = \alpha_t + \sum_{i=1}^{I}\beta_{t-i}Rs_{t-i} + \sum_{j=0}^{J}\delta_{t-j}In_{t-j} + \sum_{k=0}^{K}\gamma_{t-k}St_{t-k} + \sum_{l=0}^{L}\eta_{t-l}Ms_{t-l} + \sum_{m=0}^{M}\varphi_{t-m}If_{t-m} + \sum_{n=0}^{N}\varsigma_{t-n}Un_{t-n} + \sum_{q=0}^{Q}\upsilon_{t-q}Ex_{t-q} + \varepsilon_t \text{ --(1)}$$

If the augmented Dickey-Fuller and Phillips–Perron test results confirm the stationarity of the aforementioned time series, the ordinary least squares (OLS) procedure can be utilized to estimate the coefficients of equation (1).

Empirical Results

Stationarity of the Time Series

The augmented Dickey-Fuller and Phillips–Perron test results are summarized in Table 1. An analysis of the testing results indicates that all eight time series data in question are stationary over the sample period.

Table 1: **ADF and PP Test Results, US Monthly Data From February 1992 to March 2013**

Series	*Augmented Dickey- Fuller*		*Phillips- Perron*	
	t-Statistic	*Probability**	*t-Statistic*	*Probability**
Rs_t	-16.54730	0.0000	-16.57243	0.0000
In_t	-16.45570	0.0000	-30.60583	0.0000
St_t	-18.88787	0.0000	-18.98418	0.0000
Ms_t	-21.03458	0.0000	-22.48913	0.0000
If	-12.78352	0.0000	-12.25041	0.0000
Un_t	-4.395631	0.0003	-18.91587	0.0000
Ex_t	-14.78104	0.0000	-14.84625	0.0000

Note: * *MacKinnon (1996) one-sided p-values; Null Hypothesis: the variable has a unit root.*

Estimation Results

Given the confirmation of the stationarity, the OLS method is used to estimate equation (1) and the estimation results are reported in Table 2. In the estimation process, the retention of the variables and their time lags are based on t-statistics at the significance level of 5 percent indicated by their p-values. An analysis of the empirical results summarized in Table 2 reveals that the standard diagnosis measures, overall F-statistic, log-likelihood (Ln), coefficient of determination ($\bar{R}^2$), Akaike information criterion (AIC), and Schwarz information criterion (SIC) indicate that the data set fits the model well. Additionally, the reported calculated partial *F-statistics* are used to test the null hypothesis that the sum of estimated coefficients of the group variable is equal to zero. Failing to reject this null hypothesis suggests that these variables significantly influence the changes in the retail sales in the current period.

Table 2: Estimation Results, US Monthly Data from February 1978 to March 2013.

Coefficient	Estimation	Standard Error	t-statistic	Significant
α_t	121.3294325	36.4610531	3.32764	0.00105162
β_{t-1}	-0.3251522	0.0504099	-6.45016	0.00000000
β_{t-9}	0.1980630	0.0547721	3.61613	0.00038308
β_{t-10}	0.1580393	0.0539908	2.92715	0.00383845
β_{t-12}	-0.1119336	0.0524317	-2.13484	0.03405499
β_{t-14}	0.1036106	0.0487769	2.12417	0.03494892
β_{t-20}	0.1567421	0.0494007	3.17288	0.00176053
β_{t-21}	0.0878114	0.0493067	1.78092	0.07652282
β_{t-22}	0.0975068	0.0489932	1.99021	0.04800166
Partial: $H_{0,1}: \beta_{t-1} + \beta_{t-9} + \beta_{t-10} + \beta_{t-12} + \beta_{t-14} + \beta_{t-20} + \beta_{t-21} + \beta_{t-22} = 0$, $F_{(8,190)} = 9.7661$, p-value=0.00000				
δ_{t-3}	0.9090421	0.2041368	4.45310	0.00001442
δ_{t-5}	-0.7009251	0.2121356	-3.30414	0.00113860
δ_{t-14}	0.6944243	0.2283665	3.04083	0.00269232
δ_{t-15}	0.7556573	0.2360768	3.20090	0.00160595
δ_{t-22}	0.3652866	0.2106351	1.73422	0.08450186
Partial: $H_{0,2}: \delta_{t-3} + \delta_{t-5} + \delta_{t-14} + \delta_{t-15} + \delta_{t-22} = 0$, $F_{(5,190)} = 12.8216$, p-value = 0.00000				
γ	-2.3373497	1.1736195	-1.99157	0.04785037
γ_{t-7}	2.3023668	0.9939877	2.31629	0.02160912
γ_{t-8}	1.8135973	0.9889384	1.83388	0.06823566
Partial: $H_{0,3}: \gamma + \gamma_{t-7} + \gamma_{t-8} = 0$ $F_{(3,190)} = 3.2400$ p-value = 0.02329				
η_t	15.5750139	3.7491877	4.15424	0.00004929
η_{t-14}	-17.2982991	3.8651534	-4.47545	0.00001312
Partial: $H_{0,4}: \eta_t + \eta_{t-14} = 0$, $F_{(2,190)} = 20.1466$, p-value=0.00000				
φ_t	259.5725798	27.0257598	9.60464	0.00000000
φ_{t-6}	-145.6095633	28.2621927	-5.15210	0.00000064
φ_{t-9}	-96.0587931	33.0988314	-2.90218	0.00414375
φ_{t-12}	-82.5426390	30.4594553	-2.70992	0.00734575
φ_{t-15}	-54.2692892	28.9415576	-1.87513	0.06230855
φ_{t-18}	-144.2800277	30.1023524	-4.79298	0.00000331
Partial: $H_{0,5}: \varphi_t + \varphi_{t-6} + \varphi_{t-9} + \varphi_{t-12} + \varphi_{t-15} + \varphi_{t-18} = 0$, $F_{(6,190)} = 26.3518$, p-value = 0.00000				
ς_{t-3}	-281.7139309	76.4976919	-3.68265	0.00030078
ς_{t-4}	-94.4183456	42.2036739	-2.23721	0.02643482
ς_{t-5}	-176.5481859	74.0046630	-2.38564	0.01803255
ς_{t-15}	196.9783121	75.5937509	2.60575	0.00989371
ς_{t-17}	199.6048137	73.8654876	2.70227	0.00751027
ς_{t-21}	166.1651775	42.1907297	3.93843	0.00011508
Partial: $H_{0,6}: \varsigma_{t-3} + \varsigma_{t-4} + \varsigma_{t-5} + \varsigma_{t-17} + \varsigma_{t-21} = 0$, $F_{(6,190)} = 6.4519$, p-value = 0.00000				
υ_{t-2}	-44.6442153	0.2940757	-4.33688	0.00002343

Coefficient	Estimation	Standard Error	t-statistic	Significant
υ_{t-5}	17.6717886	10.0202149	1.76361	0.07940431
υ_{t-9}	20.5496534	10.6116281	1.93652	0.05428722
υ_{t-11}	23.9223098	10.6009329	2.25662	0.02517042
υ_{t-16}	10.8323694	10.8323694	-3.09788	0.00224470
υ_{t-17}	32.1623384	10.2506264	3.13760	0.00197477
υ_{t-19}	-30.7348520	10.6056431	-2.89797	0.00419734
υ_{t-20}	32.4824302	10.4582772	3.10591	0.00218753
υ_{t-24}	-19.4499663	10.0178602	-1.94153	0.05367315
Partial: $H_{0,7}: \upsilon_{t-2} + \upsilon_{t-5} + \upsilon_{t-9} + \upsilon_{t-11} + \upsilon_{t-16} + \upsilon_{t-17} + \upsilon_{t-19} + \upsilon_{t-20} + \upsilon_{t-24} = 0$, $F_{(9,190)} = 6.8576$ *p-value* =0.00000				
Overall: $F_{(39,190)} = 8.8783*$; $Ln = -1529.1143$; $\overline{R}^2 = 0.573$; D.W.= 2.061, $aic = 10.8066$; $Sic = 11.4045$				

Note: "*" indicates 1 percent significant level.

Discussion of the Estimation Results

A closer look at the estimation results, and based on partial *F-statistics,* reveals that changes in US retail sales are affected by its lagged changes and long lagged changes in these included independent variables. In fact, the changes in retail sales in the current period are affected by its changes 1, 9, 10, 12, 14, 20, 21, and 22 months ago. Also, the empirical results suggest changes in the US disposable income lagged 3, 5, 14, 15, and 22 months significantly affect the current retail sales in the economy. The changes in current S & P 500 stock price index and its changes 7 and 8 months ago significantly affect the US retail sales in the current month.

As to the impact of the consumers' sentiments, the estimation results indicate that changes in the sentiment in the current month and 14 months ago strongly affect the current retail sales in the US. With regard to inflation, the results reveal that change in retail sales in the current month is influenced by the changes in inflation in the current month and 6, 9, 12, and 15 months ago. Additionally, the estimation results strongly suggest that changes in the unemployment rate 3, 4, 5, 15, 17, and 21 months ago significantly affect the current retail sales. Finally, the empirical results indicate that current US retail sales are strongly influenced by changes in the trade weighted US dollar index against major currencies 2, 5, 9, 11, 16, 17, 19, 20, and 24 months ago.

The empirical findings, particularly the time lags, are very useful information for national policy makers to properly formulate and implement countercyclical policies as well as for retail sales management to predict sales to effectively manage their operations.

Concluding Remarks

The retail sector plays a key role in the U.S economy because it is a large component of the target variable of the national economic policies that is aggregate consumption, and it employs 10.00 percent of the national workforce. More importantly, it provides both long-term career opportunities for young people and seniors. This study hypothesized and empirically tested-factors that affect the US aggregate retail sales.

The empirical results strongly suggest that changes in the current monthly US retail sales are affected by its lagged changes and Real Disposable Personal Income, S&P 500 equity index, University of Michigan: Consumer Sentiment, Consumer Price Index for All Urban Consumers: All Items, Civilian Unemployment Rate, and Trade Weighted U.S. Dollar Index: Major Currencies, as well as their lagged changes.

The empirical findings are consistent with theoretical articulation in economics. The findings provide policy makers with valuable information to properly formulate and implement their policies. The estimation results are also useful for retail management because they help in predicting changes in retail sales to effectively manage their operations.

References

- Aviat, A., Bricongne, J. C., & Pionnier, P. A. (2007). Asset wealth and consumption: weakly correlated in France, strongly in the United States. Special analysis in Conjuncture in France, 11-25.
- Barrell, R., & Davis, E. P. (2004). Consumption, financial and real wealth in the G-5. National Institute of Economic and Social Research.
- Burns, A. F. (1947). Stepping Stones towards the Future. Annual Report 27. New York: National Bureau of Economic Research.
- Chopin, M. C., & Darrat, A. F. (2000). Can consumer attitudes forecast the macroeconomy? *The American Economist,* 44, 34-42.
- Dickey, D. A., and Fuller, W. A. (1979). Distribution of the estimators for autoregression time series with a unit root, *Journal of the American Statistical Association,* 74: 427–31
- Dore, M. H. I., & Singh, R. G. (2009). Turning points in nonlinear business cycle theories, financial crisis and the global 2007–2008 downturn. Nonlinear Dynamics, *Psychology and Life Sciences*, 13, 423–444.
- Dore, M. H. I., & Singh, R. G. (2010). The role of credit in the 2007–09 great recession. The 8th OxMetrics User Conference, The George Washington University, Washington, DC, March 18– 19, 2010.
- Fair, R. C. (2014). The Financial Crisis and Macroeconomic Activity: 2008-2013(No. 1944). Cowles Foundation for Research in Economics, Yale University.
- Motley, B. (1982). Consumption, saving and asset accumulation. *Federal Reserve Bank of San Francisco Economic Review*.
- Paradiso, A., Casadio, P., & Rao, B. B. (2012). US inflation and consumption: A long-term perspective with a level shift. *Economic Modelling,* 29(5), 1837-1849.
- Schumpeter, J. A. (1939). Business Cycles. New York: McGraw-Hill.