Analyzing Wal-Mart Stores, Inc.'s Revenue with Macroeconomic Variables

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Introduction

Revenue forecasting is an important, common practice among all businesses. It is the exercise that allows all members of a firm to align their plans for the upcoming fiscal period with those of upper management. In addition to uniting a company's thought process, it acts as the main driver of a firm's budget, regulates a manufacturer's production schedule, largely influences a retailer's inventory management, and provides the firm with a better understanding of its previous sales trends and thus its potential future growth. Underlying these benefits is the fact that the revenue forecast is the firm's method of understanding its consumers' demand. Without demand, the firm cannot exist and thus understanding demand is of the utmost importance. By creating an accurate sales forecast, a firm may be able to increase revenue by taking advantage of the best opportunities, decrease costs by properly aligning its resources at the right times, increase its customer satisfaction by becoming more reliable through its planning process, and increase overall efficiency by managing the supply chain in a more effective manner.

While most businesses recognize this importance, the forecasting methods employed by the majority of corporations are over-simplified in that future revenue is only a function of past revenue. While a firm's past performance reveals what it is capable of, this information does not demonstrate how it is impacted by macroeconomic variables, factors which can cause revenue performance to greatly fluctuate from one time period to another. Since a revenue forecast is created in order to help a company prepare for future demand, it is necessary for the forecasting process to accurately represent demand, a factor that is well represented by the theoretical relationships between itself and many macroeconomic variables.

This study will attempt to determine a revenue-forecasting model by utilizing macroeconomic indicators, specifically for Wal-Mart Stores, Inc. Wal-Mart has been chosen as

the subject of this study due its major influence on the global economy. It is the largest company by gross revenue for the past two years (CNN Money), and its influence is incomparable. Wal-Mart's domestic sales were 1.779% of the United State's GDP in 2004 (Lichtenstein, p.130) and its influence can be studied in many other aspects of the economy. As reported by the United States Labor Department Bureau of Labor Statistics, Wal-Mart's commitment to "lower, everyday prices" has decreased consumer prices by 3.1%, as measured by the Consumer Price Index for all urban consumers (p. 108). While this decrease may translate into a major welfare gain and large increases in each household's disposable income, it may also force competitors out of business and thus increase unemployment. Despite the exact impact of decreasing consumer prices, Wal-Mart has an influence on the economy.

In order to understand Wal-Mart Stores, Inc., this paper begins with an introduction to the company itself. While the literature has not specifically addressed how to create a firm-specific revenue model, it has explored related subjects, such as consumer expectations, macroeconomic indicators, financial variables, and macroeconomic econometric models. The next section explores a revenue model, the reasoning for each of the explanatory variables drawn from the literature, and identifies the major categories of variables that could potentially influence Wal-Mart revenue. The paper continues by detailing both the data and methods employed. The paper will then explain the final model in detail and provide econometric results. The paper will conclude with additional findings from this study and suggestions for future studies.

Wal-Mart Stores, Inc.

Wal-Mart was established in 1969 and became a publically held company in 1970 (Data Monitor), and has grown to be the largest company in the world. It is comprised of three business segments, Wal-Mart U.S., International, and Sam's Club, and has 4,413 domestic and 4,557 international stores as of January 31, 2011. However, the corporation's success is not only a result of its size, but from its wide product array, offering both nationally recognized brands and twenty private label brands (Mergent). Wal-Mart's dominant position in the U.S. retail market, 11.3% of the $3 trillion industry as of 2009 (Kapner), and its wide array of products allows it to have a more extensive control over its suppliers than its competitors. Furthermore, this power allows the company to easily adapt to changes in demand. Its dominant position, twenty private labels, and internationalization strategy enable the company to offer all products at low prices, which may promote demand even during difficult economic times. Therefore, demand and consumption patterns were the focus of the revenue-forecasting model.

Literature Review

In order to understand how to approach the creation of the revenue model for Wal-Mart Stores, Inc., literature on a range of topics was examined. Study topics range from the influence of consumer expectations, macroeconomic indicators and financial variables, and specific econometric models.

Consumer Expectations

Despite Wal-Mart's international character, its revenue is the result of consumers' purchases and thus indicators that influence consumers must be considered. In order to better understand the consumer segment and its expenditure on consumer durables, J.F. Pickering and B. C. Isherwood (1975) surveyed 386 households about their expectations as consumers and their socio-economic status. This data was utilized to determine if household expenditures on consumer durables could be forecasted. The independent variables of this study were the ability and willingness to purchase while the dependent variable was the expenditure levels. Pickering and Isherwood first performed a univariate test to determine the differences of means between the buyers and the non-buyers. This data revealed that those who were more confident about their financial position, employment, and had higher confidence in the country's economy were more likely to be buyers. The second test, the discriminate analysis, analyzed if the variables analyzed by the univariate test could be used to determine if individual respondents were buyers or non-buyers; approximately 80% of respondents were correctly identified. Pickering and Isherwood's insight on the importance of consumer expectations provides a basis to select economic indicators that affect consumers.

Macroeconomic Indicators and Financial Variables

Gad Levanon (2010) analyzes macroeconomic indicators that may affect sales forecast. He explores both leading and coincident economic indicators, in relation to forecasting recessions. This analysis is performed through an altered version of the original Markov switching method, a model used to forecast volatility by dividing time-series data based on their probability of being in the low and high regimes. The classic version of this model is flawed in that low and high regimes are not universal for all macroeconomic indicators. In order to account for this issue, Levanon alters the classic Markov switching method so the resulting probabilities are converted into percentiles. Levanon analyzed the recession-forecasting abilities of hundreds of indicators through this model. Among the forty-eight indicators that are significant to this study's model are initial claims for unemployment, the value of durable goods produced, industrial production of consumer goods, personal consumption expenditures, and Michigan Consumer Sentiment Expectations. From his research, Levanon found that housing and durable good variables had the longest leads among all of the indicators.

Catherine Bruneau *et al.* (2005) demonstrate macroeconomic indicators can also be utilized to forecast inflation. By utilizing a methodology modeled after Stock and Watson's (1999) dynamic factor analysis, a model which analyzes the co-movement of multiple variables through time, more than two hundred real and financial macroeconomic variables for both short and medium run inflation forecasts for France are analyzed. These variables include unemployment rates for different categories of workers, household consumption of manufactured goods, survey data, import indices, and interest rates. Bruneau *et al.* found regressions including the unemployment rate and expected production trend for consumer goods and raw materials'

prices provided more accurate forecasts. Although this study's focus is forecasting inflation, the indicators analyzed can be applied to forecasting a firm's revenue.

William Veloce (1996) also demonstrates the importance of including leading indicators in forecasts in his analysis predicting changes in Statistic Canada's GDP. Veloce analyzed furniture and appliance sales, new orders for durable goods, ratio of shipments to inventories of finished goods, average workweek in manufacturing, real money supply, the US leading index, the Toronto stock exchange index, total employment in business and personal services, the housing index, and other durable sales that exclude furniture and appliances as determinants of GDP. He utilized the Box Jenkin's (1970) modeling approach, a forecasting methodology that utilizes autoregressive moving averages to determine the best fit for a time series, to analyze the historical relationship between these indicators and GDP and found that most indicators demonstrated stable relationships. The final section of Veloce's study analyzes bivariate models' forecasting capabilities against univariate models. Veloce found bivariate forecasts, models that are based on past history of the forecasting subject and the leading indicators, outperformed the majority of the univariate models, models that are only based on historical data of the forecasting subject. Thus, Veloce's findings confirm the importance of including macroeconomic indicators in the forecasting process.

In addition to real macroeconomic variables, significant financial variables may also be used as predictors in this study, as suggested by Arturo Estrella and Frederic S. Mishkin (1998). Such variables may include interest rates and spreads, stock prices, and monetary aggregates. These variables also add value to this study in that unlike others, these variables provide a check on econometric predictions. For instance, if the proposed model and the financial explanatory variable agree, confidence in the model will be proven to be true. However, if the two disagree,

this will provide the researcher will a signal to review the model. In addition, Estrella and Mishkin caution other researchers of the overfitting problem, the issue of improving the fit of forecasting models by including additional variables that may not be necessary to the model. It is extremely important to be cautious of this bias because when insignificant variables that should not be included in the model are, the resulting forecast may no longer accurately predict the dependent variable in the future.

Econometric Models

In order to properly analyze the macroeconomic indicators, a proper model must be created. Robert Fildes (1985) thoroughly discusses how to develop an econometric model, providing direction on how to build the model and discussion on modeling strategies. Two crucial steps discussed by Fildes include evaluating the effects of the exogenous variables and comparing the *ex post* and *ex ante* forecasts with the base-line forecast model. Due to the complexity involved with developing such a model, Fildes recommends the use of a modeling strategy. However, prior to Fildes' study, there have been contradictory opinions on two modeling strategies: the specific model to general and the general model to specific.

The specific model to general, an extension of the Box-Jenkins univariate modeling procedure to the multivariate model, is advantageous because of its dynamic structure and its procedure to only add an additional variable after its effects on the endogenous variable have been analyzed separately and in combination with the previous variables. However, the specific model to general gives little attention to the specification of the model and the final model is difficult to interpret due to the many variable transformations. Unlike the specific model to general, the general model to specific creates many models, which are analyzed to determine the

parsimonious model. However, this modeling strategy is flawed due to its potential data limitations and the inability of knowing the best sequence for simplifying the model from the general to the specific. By comparing the accuracy of models derived from both strategies from multiple studies, Fildes determines that the general to specific model is superior. In order to prepare the revenue-forecasting model for this study, Fildes' finding will be applied.

W. Steve Albrecht *et al.* analyzes the times-series properties of firms' annual earnings in order to determine if a general or firm-specific forecasting methodology is necessary. Through the Box Jenkins methodology, forty-nine firms in the food, beverage, tobacco, chemical, and steel industries are examined on both the individual firm and cross-sectional basis. Albrecht *et al.* found that a general firm model has the same level of accuracy as the firm-specific Box-Jenkins model. However, the caveat to this conclusion is that the general model must still be generated based on the nature of the data, or the industry, being studied. In addition, there is little difference between the results of the best random-walk model and the Box-Jenkins models, which suggests a firm's annual earnings may truly be random. However, this study did not consider macroeconomic variables in its forecasts, and thus, its final model and its results may be improved by doing so.

While C. Kurt Zorn's (1982) study discusses forecasting in relation to local governments, both the importance of utilizing forecasting, particularly in relation to ensuring monetary obligations are met, and the best practices proposed can be applied to a revenue forecast for a major corporate such as Wal-Mart. Zorn begins his analysis by discussing the growing unease among local governments about long-term debt obligations. As a solution, Zorn emphasizes the importance of forecasting to the financial-management process and the proper methods to ensure the forecast accurately represents the data. These methods and best practices include verifying

the accuracy of the forecast, the specification of the model, and the potential existence of multicollinearity and autocorrelation with suggestions for correcting both.

Unlike the previous studies that analyzed the forecasting capabilities of economic indicators for macroeconomic events, Peter D. Chant (1980) examined the ability of lead indicators to forecast a firm's earnings per share (EPS). In order to test this relationship, Chant employs six alternative EPS forecasting models to examine the variable's predicting ability. Three of these models are extrapolatory and include an average-growth model, an exponential-smoothing model, and a random-walk model. The other three models are leading-indicator models, which include a money-supply model, a stock-index model, and a bank-loan model. In order to test errors, Chant utilizes both a simple average absolute percentage forecasting error and a rank-order of absolute forecast error by model for each firm he examines. Chant's results demonstrate that the money supply model has the minimum overall error of all of the examined models. He cautions that his findings are preliminary in the subject in that it is based on a limited sample of firms and the predictive information was derived from simple leading-indicator models.

Chant's model is later utilized by Simon Hussain (1998) in order to examine a forecasting model for corporate earnings in relation to macroeconomic data. While technology and methodology behind forecasting has grown tremendously, the most modern approaches require large sets of data and specific technology. Hussain suggests that expanding the data set beyond historical earnings, and specifically to include leading indicators, will help to overcome such problems by creating a new way to forecast revenue. While Hussain's model is adapted from the Chant model previously discussed, Hussain's model contains a slight modification in order to account for the possibility of lag. Similar to Chant, Hussain models analyze seasonally adjusted

money supply, the S&P 425 stock index, and bank loans, and finds the money supply model to have the minimum overall error of all of the examined models. Both Chant and Hussain's studies emphasize the importance of the money supply's forecasting capabilities for firm revenue and thus will be included as an indicator in this study.

Since no literature that directly addresses the subject of creating a firm-specific revenue-forecasting model could be found, different aspects of each of the discussed literature will be used throughout this study. For instance, Pickering and Isherwood (1975) demonstrate the importance of understanding consumer expectations because it is these expectations that directly influence consumers' buying habits and thus any firm's revenue. Furthermore, findings from Levanon (2010) and Bruneau *et al.* (2005) will help in developing the list of economic variables that will be used as explanatory variables in the model. Finally, the multiple papers that examined econometric models will be used to determine proper methods to create the forecasting model.

Introduction to Model and Examination of Explanatory Variables

In order to determine a revenue-forecasting model for Wal-Mart, the relationship between Wal-Mart revenue and multiple economic variables were examined. These variables are reflective of Wal-Mart's strategy of responding to the consumer demand in that they focus they are consumption-influential variables. Furthermore, quarterly data was used in order to represent cyclical variation. The following economic indicators were utilized as explanatory variables in this study. While there are multiple variables representing similar statistics, the majority of these variables were included in the original model in order to account for all aspects of each general category. Once each variable's significance was examined, non-significant variables were excluded from the model, allowing only the significant variables of each category in the final model.

Macroeconomic	Consumer Expenditure	Consumer Debt
Real GDP	Consumer Confidence Index	Consumer Credit
Core CPI	Real Personal Consumption	Debt Service Ratio
Unemployment Rate		Financial Obligations Ratio
Unemployment Rate Full Time		Household & Nonprofit Org. Borrowing
Unemployment Rate Part Time		
Labor Underutilization		

Macroeconomic Variables

Real Gross Domestic Product. Real gross domestic product measures an economy's outputs over a particular time period and is adjusted for inflation. While Levanon (2010) suggested the use of GDP of durable goods, this study used Real GDP to predict Wal-Mart revenue because Wal-Mart's inventory includes products beyond durable goods. This indicator

was included in the initial analysis in order to understand the overall health of the economy, the overall economy's demand, and Wal-Mart's resulting revenue.

Core Consumer Price Inflation. The Core Consumer Price Inflation measures the change in prices from one period to another and is adjusted to exclude the prices in food and oil. This inflation measure was important to include in the initial model because of the relationship between inflation and consumers' buying habits. When consumers have an increased purchasing power, they are inclined to purchase more. However, the greater the level of inflation, the less purchasing power consumers have, and thus less consumed.

Unemployment Rate. As discussed by both Levanon (2010) and Bruneau *et al.* (2005), unemployment is a major factor that influences consumers' perceptions of the economy and of their financial situation. When the resulting actions of these perceptions are aggregated, the overall economy and all of its components can be greatly affected. However, there are many goods sold at Wal-Mart stores, such as food, that are necessities and must be consumed despite the perception of the economy. Thus, it is possible Wal-Mart sales may positively affected by pessimistic views of the economy because of their everyday low prices. Due to these conflicting forces, the unemployment rate was included in the initial analysis in order to understand the true relationship between employment and Wal-Mart sales.

Unemployed Persons Searching for Full Time Work and Unemployed Persons Searching for Part Time Work. In order to best understand the relationship between Wal-Mart revenue and unemployment, unemployment was also examined in terms of its parts by analyzing two additional unemployment variables, one which specifically represents persons seeking full time work and another that represents persons searching for part time work. These variables were converted into rates later in the study in order to represent the change in revenue that resulted

from a change in the rate of unemployed persons seeking full time work or from the rate of unemployed persons seeking part time work.

Labor Underutilization. As defined by the Bureau of Labor Statistics, an unemployed person is someone who does not have a job, has been actively searching for one during the past four weeks, and is available to work (U.S. Bureau of Labor Statistics). This definition does not include people who are not actively searching for work despite their economic situation and people who are not satisfied with their current level of employment. If the unemployment rate included the underutilization of its true labor force, the unemployment rate would more accurately represent the true employment situation. The Labor Utilization variable represents exactly that: it is rate of classically defined unemployed persons, discouraged workers, and those who are employed part time but are seeking additional work. This variable was not included in the initial model because of limits on available data, but was included later as a test of the final employment variable included in the model.

Consumer Expenditure

Consumer Confidence Index. The Consumer Confidence Index (CCI) is an index updated each month by The Conference Board and is based on survey data from 5,000 representative households in order to understand consumers' perspectives on employment, the business environment, and their personal income. Unlike other economic indicators, the CCI is a measure of confidence in the market as opposed to the actual dollar amount of consumption. The mentality of the consumer is significant to the Wal-Mart revenue-forecasting process because the corporation's revenue is the direct result of consumers' consumption, the focal point of the CCI's data. While Levanon (2010) discussed the significance of the Michigan Consumer Sentiments

Expectations survey, this study used the CCI because its surveys a sample of 5,000 households while the Michigan survey only interviews 500 (Bloomberg).

Real Personal Consumption Expenditures. As suggested by Levanon (2010), Real Personal Consumption Expenditures was also included in the original model. Similar to the Consumer Confidence Index, real consumer spending represents consumers' consumption habits. However, unlike the CCI, it is the direct measure of this expenditure. Real consumer spending was included in the initial analysis because of its natural relationship with the retailer's revenue: Wal-Mart's revenue is 3.95% of the United States Nominal Personal Consumption Expenditures (BEA). Both the CCI and real consumer spending were included because while both have some representation of consumer spending, CCI is only partially derived from this data while real consumer spending is that exact data.

Furthermore, despite the fact that Real GDP is partially derived from Real Consumption, both Real Consumption and Real GDP were included in the original model because of the Keynesian Income-Expenditure Model. As stated, aggregate consumption is

$$Aggregate\ Consumption = C_a + MPC(Y)$$

where C is autonomous consumption expenditure, Y is real income, and MPC is the marginal propensity to consumer. As demonstrated by this model, it is the relationship between MPC and income that drive consumption. If income increases, consumption will also increase. Thus, the real consumption can be viewed reflecting consumers' income and propensity to spend.

Consumer Debt

Consumer Credit. Milton Friedman's Permanent Income Hypothesis (1957) states that consumers will spend consistent with their expected level of future income. However, credit

allows consumers to spend beyond their permanent level of income and thus allows them to increase their current demand. As Estrella and Mishkin (1998) suggested the use of financial variables in a prediction model, this study utilized financial variables that directly reflect the consumers' behavior. Thus, the variable of consumer credit, the total consumer credit outstanding at a particular point in time, acts as both a consumer financial variable and helps to measure the relationship between outstanding credit and spending.

Debt Service Ratio. In order to capture the impact of debt on consumption, the Debt Service Ratio was included in the initial analysis. The Debt Service Ratio is a quarterly figure released by the Federal Reserve that estimates the ratio of household debt payments to disposable income:

$$Debt\ Service\ Ratio = \frac{House\square old\ Debt\ Payments}{Disposable\ Income}$$

These debt payments may include housing payments and consumer credit. This ratio indicates households' ability to meet their financial obligations and thus the higher the ratio, the higher the risk of not meeting these obligations (Board of Governors of the Federal Reserve System).

Financial Obligations Ratio. The Financial Obligations Ratio is an extension of the Debt Service Ratio in that it also examines the impact of automobile lease payments, rental payments, homeowners' insurance, and property taxes on the household's ability to meet their financial obligations (Board of Governors of the Federal Reserve System).

$$Financial\ Obligations\ Ratio = \frac{House\square old\ Debt\ Pay. + Auto.\ Lease\ Pay. + Rental\ Pay. + Homeowners'Insurance + Property\ Taxes}{Disposable\ Income}$$

By including these additional obligations, the impact of debt on consumer spending may be better represented.

Household and Nonprofit Organizations' Borrowing. In order to capture the level of household borrowing from another perspective, the Household and Nonprofit Organizations'

Borrowing variable was included in the original regression. This variable demonstrates household and nonprofit organizations' level of debt in billions of dollars and is seasonally adjusted (Federal Reserve). This variable may not correctly represent household borrowing due to the inclusion of nonprofit organizations' debt. Thus, this variable and its results were analyzed carefully.

The Initial Model

These twelve explanatory variables were included in the initial regression in order to begin to understand the relationship between Wal-Mart revenue and the multiple economic variables. The initial model was as follows:

$$Revenue(y) = \beta_1(realgdp) + \beta_2(cpipercent) + \beta_3(urate) + \beta_4(ulevel) + \beta_5(ulevelft) + \beta_6(ulevelpt) + \beta_7(cci) + \beta_8(rconsumption) + \beta_9(cpmrcrdtrev) + \beta_{10}(for) + \beta_{11}(dsr) + \beta_{12}(fof) + \epsilon$$

The null hypothesis of this study was as follows:

$$\beta_1, \beta_7, \beta_8 > 0$$

$$\beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_9, \beta_{10}, \beta_{11}, \beta_{12} < 0$$

Results

In order to determine the macroeconomic contributions to Wal-Mart revenue, multiple regressions were performed and analyzed. Each round of regressions led to new ideas on how to approach the explanatory variables in order to determine their true level of significance and potential placement in the final equation.

The initial regression was created by seasonally adjusting and deflating Wal-Mart revenue and personal consumption, and regressing revenue against all twelve explanatory variables. As the two-tailed p-values (P>|t|) results demonstrate in Table A, the variables Real GDP (realgdp), Consumer Confidence Index (cci), and Household and Nonprofit Organizations Borrowing (fof) are significant at a 5% level. In addition, the adjusted R^2 of the regression, .9961, is extremely high, and may be attributed to the number of explanatory variables, not their true ability to predict the dependent variable. Since autocorrelation, the correlation between data points over time, often occurs when data is seasonally adjusted, the results of this regression were accepted as valid prior to testing for the existence of this issue.

By utilizing Durbin Watson statistics, the initial regression was tested for both positive and negative autocorrelation at the 1% and 5% significance levels. Since there were only 87 observations, a level of degrees of freedom that was not available on the Durbin Watson table, the regression was tested for autocorrelation for the degrees of freedom of 85, 90, and an average of 87.5. As demonstrated by Table B, positive autocorrelation existed at both significance levels and all degrees of freedom. In order to correct for positive correlation, the Prais Winston method was employed (Table C). The Prais Winston method was utilized for all future regressions in order to correct for autocorrelation.

Regressions that tested the relationship between revenue and a single explanatory variable category were also run in order to determine if a single category had more influence on revenue than another. As demonstrated by results contained in Tables D, the regression comparing revenue to the macroeconomic variables had a high adjusted R^2, inferring this category's significance in forecasting Wal-Mart revenue. However, macroeconomic variables do not directly reflect the behaviors of consumers, which do drive Wal-Mart revenue. The results of the regressions containing consumer expenditures and consumer debt could not be further analyzed because their F statistics were not significantly different from zero (Tables E and F).

In order to mirror how corporations report their forecasts, the next step in the process was to change the dependent variable from the dollar level of revenue to a growth rate. In addition, any other variables of magnitude, including Real GDP and Real Personal Consumption Expenditures, were converted to reflect growth percentages. In order to understand the full impact of these changes and the new relationships between the explanatory variables and the converted dependent variable, a full regression containing all variables was run. As demonstrated by the results in Table G, the adjusted R^2 of the equation is lowered to .1807. However, since many of these variables are seasonally adjusted, the potential presence of autocorrelation was examined. As demonstrated by Table H, negative autocorrelation existed. This was expected because negative autocorrelation is characterized by positive observations following negative observations, and vice versa. This is characteristic of a firm's revenue in that quarters of positive growth are occasionally followed by quarters of negative growth.

In order to solve for negative autocorrelation, the Prais Winston command was utilized as before (Table I). With autocorrelation no longer affecting the model, the adjusted R^2 of the

equation increases to .5653 and the only significant variable at a 5% significance level for a two tailed p-value (P>|t|) test is Unemployed Persons Searching for Full Time Work (ulevelft).

With the basic understanding of the relationships between the converted dependent variable and each of the explanatory variables, the significance of each variable within the individual categories was tested. To begin this process, Real GDP and Real Consumption Expenditures were compared. As demonstrated by the correlation coefficient of .9909 between the two variables, the statistics program did not recognize the difference between the two. Thus, in order to determine which of the two variables should be included in the final model, the regressions shown in Tables J and K were run. In the regression containing Real GDP and the remainder of the explanatory variables, the adjusted R^2 of the equation was .4732 with three significant variables, the Financial Obligations Ratio, the Debt Service Ratio, and Household and Nonprofit Organizations' Borrowing. However, the variables Financial Obligations Ratio and Household and Nonprofit Organizations' Borrowing have the opposite signs as expected. Both of these variables demonstrated a positive relationship with the percent change in revenue, indicating that as consumers' debt levels increase, they are more like to spend (Table J). The equation with Real Personal Consumption Expenditure in Table K was only slightly more accurate with an adjusted R^2 of .4755 and the same significant variables and the same incorrect signs.

Since the adjusted R^2 of both of these models was relatively low and both had significant variables with opposite signs, two additional regressions were run with the variables Real GDP and Real Personal Consumption Expenditures lagged one period. The model containing lagged Real GDP had an increased adjusted R^2 of .4892 with four significant variables, Consumer Credit, the Financial Obligations Ratio, the Debt Service Ratio, and Household and Nonprofit

Organizations' Borrowing. Again, the Financial Obligations Ratio and Household and Nonprofit Organizations' Borrowing variables had the opposite sign as demonstrated in the regression from Table J (Table L). However, lagging the Real Consumption variable only increased the adjusted R^2 to .4784 with the same three significant variables as the models that contained Real GDP and Real Personal Consumption and the same incorrect signs (Table M). Since the lagged Real GDP model had both the highest adjusted R^2 and the most significant variables, this explanatory variable, as opposed to the Real GDP, Real Consumption, and lagged Real Consumption variables, was used in future equations to determine the other variables for the final model.

In order to test which of the unemployment variables should be included in the final equation, the variables Unemployed Persons Searching for Full Time Work (ulevelft) and Unemployed Persons Searching for Part Time Work (ulevelpt) were converted to represent percent change. Although the variables percent change of Unemployed Persons Searching for Full Time Work (PcUFt), percent change of Unemployed Persons Searching for Part Time Work (PcUPt), and the Unemployment Rate were not correlated, and thus were recognized as different variables by the statistics program, these measures represent similar ideals and thus were tested in separate regressions were run for Urate, PcUFt, and PcUPt.

As demonstrated by the results contained in Table N, the adjusted R^2 of the model that contained URate was .4804, where the URate variable was significantly different from zero, and also had four other significant variables. The adjusted R^2 of the PcUFt equation was very similar to that of the URate model and was also significantly different from zero, however, only three other variables contained within the equation were significant (Table O). Lastly, the results contained in Table P reveal the PcUPt model was the least successful in that the adjusted R^2 was only .4242, the PcUPt variable itself was not significant, and only three variables within the

equation were significantly different from zero. While the adjusted R^2 of the PcUFt was slightly larger than that of the URate model, the URate variable was used as the unemployment variable in future versions of the model because the PcUFt variable does not account for the portion of the work force who is seeking part time work and therefore is not the most comprehensive variable. Furthermore, the PcUFt coefficient was positive indicating that revenue would increase as the unemployment rate of persons searching for full time jobs increases.

Next, the most representative debt variable was determined by running regressions for each of the four consumer debt variables. While the Consumer Credit variable was significant, no other variables in the model were and the adjusted R^2 of the equation was only .3471 (Table Q). The adjusted R^2 of the Financial Obligations Ratio model was even lower than that of the Consumer Credit at .3246, however, the Financial Obligations Ratio variable was significant as were the Lagged Real GDP and Unemployment Rate variables (Table R). As demonstrated in Table S, the Debt Service Ratio model had an adjusted R^2 of .3863, is a significant variable, and the Lagged Real GDP and Unemployment Rate variables were significant as well. The Household and Nonprofit Organizations' Borrowing variable was not significant in its individual model, as shown in Table T. In addition this variable's model has an adjusted R^2 of .0230 and the Lagged Real GDP's coefficient is negative, which does not follow theory. Thus, the debt variable that was utilized in future versions of the revenue model was the Debt Service Ratio. Although this variable represents less debt factors than the Financial Obligations Ratio, the Debt Service Ratio variable directly represents the relationship between consumer credit and disposable income.

As demonstrated by the models previously discussed, the Consumer Confidence Index was not significant at the 5% significance level in any of the equations. In a final test of its

significance, a regression was run which included the representative variable from each category and the CCI variable (Table U). While Lagged Real GDP, the URate, and the Debt Service Ratio, the CCI variable is not significant. Furthermore, the CCI coefficient is negative, representing that when consumer confidence increases, Wal-Mart revenue decreases. In addition, the Lagged Real GDP coefficient is negative, demonstrating that revenue increases as GDP decreases. These relationships do not make theoretical sense and thus the CCI variable will not be included in the final model.

Once all variables had been analyzed and a parsimonious equation was created, the analysis of Real GDP versus Lagged Real GDP was revisited in order to ensure that the correct variable representing income was chosen. As demonstrated by the results in Tables V and W, the adjusted R^2 of the model containing the Lagged Real GDP variable was higher than that of the variable Real GDP. In addition, in the Real GDP model, the variable itself was not significant and had a negative coefficient. The model containing the Lagged Real GDP variable had a significant GDP variable, however, it was still negatively related to Wal-Mart revenue.

In order to examine if the Labor Utilization variable was superior the Unemployment rate, a regression containing the Labor Utilization variable was run to compare to the regression (Table W). As demonstrated by Table X, the adjusted R^2 increased to .4897 and all three variables were significant. However, the Lagged Real GDP continued to demonstrate a negative relationship with Wal-Mart revenue. Since the model containing the Labor Utilization variable had a much higher adjusted R^2, it was used in the final model.

The Final Model & Its Examination

Through thorough examination and analysis of multiple versions of the Wal-Mart revenue-forecasting model, the final model was determined as:

$$Percent\ C\square ange\ of\ Revenue(y) = \beta_0 - \beta_1(Lagged\ Real\ GDP) - \beta_2(Labor\ Underutilization) - \beta_3(Debt\ Service\ Ratio) + \epsilon$$

or

$$Percent\ C\square ange\ of\ Revenue(y) = .20814 - .69596(Lagged\ Real\ GDP) - .004585(Labor\ Underutilization) - .011081(Debt\ Service\ Ratio) + \epsilon$$

As demonstrated by the results in Table Y, all explanatory variables were significant at the 5% significance level and the adjusted R^2 of the final model is .4897.

The coefficient of the Lagged Real GDP variable demonstrated that there is a negative relationship between GDP and the growth of Wal-Mart revenue. This result does not follow economic theory. An increase in GDP is the result of an increase in consumption, investment, government spending, exports, or a combination of any of these variables. Since revenue is the direct result of consumption, when consumption increases, and thus GDP possibly increases, revenue would also increase. However, this is not the relationship depicted by this model, suggesting that Wal-Mart's revenue increases during economic downturns. This relationship is especially troubling in that the coefficient demonstrates that a 1% decrease in GDP would lead to 69.59% increase in revenue.

Due to these results, a Partial F test was constructed in order to test the Lagged Real GDP variable's significance to the final model. The test performed is detailed below:

Unrestricted Model

$$Percent\ C\square ange\ of\ Revenue(y) = \beta_0 - \beta_1(Lagged\ Real\ GDP) - \beta_2(Labor\ Underutilization) - \beta_3(Debt\ Service\ Ratio) + \epsilon$$

Restricted Model

$$Percent\ C\square ange\ of\ Revenue(y) = \beta_0 - \beta_2(Labor\ Underutilization)$$

$$- \beta_3(Debt\ Service\ Ratio) + \epsilon$$

Hypothesis

$$H_0: \beta_1 = 0$$

$$H_a: \beta_1 \neq 0$$

Partial F-Test

$$F = \frac{(.054560247 - .054603367)/1}{.027948889} = -.001542816$$

Since the F statistic was smaller than the critical F-statistic, |.001542816| < 23.07, the null hypothesis is not rejected and thus the Lagged Real GDP variable is not significantly difference from zero and thus should not be included in the final model.

According to economic theory, a higher level of unemployment would lead to a decrease in firms' revenues due to the decrease in demand. This result occurs because a greater proportion of the labor force that is unemployed, the greater the number of people who no longer have a disposable income. However, the extent to which the Labor Underutilization rate would decrease revenue was not as extensive as expected. The coefficient implies that when the Labor Underutilization rate increases by 1 percentage point, revenue decreases by only .4%. This small decrease may be the result of Wal-Mart's pledge to everyday low prices on all of its products. While an unemployed person will have to decrease his consumption on all products, there are certain goods that are necessities and thus demand for them is inelastic. Wal-Mart sells many of

these products in its supercenter stores. The combination of Wal-Mart's product line and its low prices may explain the small impact on revenue.

The Debt Service Ratio's coefficient revealed a negative relationship between itself and the growth of Wal-Mart's revenue. This relationship follows directly from economic theory in that the higher the ratio, the more difficult it will be for the household to pay off its debts, and thus the less demand the household will have for goods. This decreased demand translates directly into decreased revenue, specifically a decrease of 1.1 percentage points for 1 percentage point decrease in revenue. However, as just previously mentioned, there are certain goods that are necessities and will need to purchased despite levels of debt. Since larger levels of debt would require a large proportion of one's disposable income, less money will be available to spend on these necessities and thus they will be purchased at the store that offers the lowest prices. Wal-Mart is this store in many cities and thus its revenue is only slightly impacted by an increase in the Debt Service Ratio.

It is also important to understand the relative importance of each explanatory variable, which can be determined by standardizing each of the variables and analyzing their t-statistics. To begin this process, first the means and standard deviations of each of these variables were calculated (Table AB). Next, each variable was standardized (Table AC) and a regression was run with the standardized variables. As demonstrated by the t-statistics in Table AD, the Labor Underutilization variable had the largest impact on Wal-Mart revenue, followed by the Debt Service Ratio and the Lagged Real GDP variables, respectively. These results were unexpected due to the level of impact explained by each of the variables' coefficients. With the unstandardized coefficients of each of the explanatory variables in mind, it would be expected

that the Lagged Real GDP variable would have the largest impact, followed by the Debt Service Ratio and the Labor Underutilization variables, respectively.

If the coefficients are not considered, what the t-statistics reveal makes perfect sense. The unemployment variable should have the most impact in that a person's employment directly affects his disposable income, which helps determine his demand. The variable with the second largest impact should be the Debt Service Ratio, as demonstrated by the t-statistic, because the higher a person's level of debt, the less disposable income is available for other purchases, and thus the lower a person's demand. While the t-statistic of the Lagged Real GDP revealed that it had the lowest relative importance to Wal-Mart revenue, this finding was expected because GDP represents investments, government expenditures, and net exports in addition to consumption. These additional variables, while they may have some impact on Wal-Mart as a whole, they do not necessarily have a direct impact on the company's revenue.

Additional Findings and Motivations for Future Research

As declared in the introduction, the purpose of this study was to determine a revenue-forecasting model for Wal-Mart. In the processing of determining this model, two additional findings were made.

The Consumer Confidence Index reports the majority's perception of the economy by polling 5,000 representative households. When consumers have higher levels of confidence in the economy, they are more motivated to spend. While Wal-Mart is dedicated to lower prices and sells many necessities, its product line expands to many durable goods, such as furniture, televisions, and computers. Thus, when economy is booming, it would be expected that revenue would increase due to increased demand. However, the relationship revealed in the regression in Table V demonstrates that as Consumer Confidence increases, Wal-Mart revenue decreases. Thus, more research is needed to determine if this indicator truly represents the majority's perception of the economy and if this variable is useful for firms to utilize in order to understand future demand.

The second unexpected finding was the negative relationship between the growth of Wal-Mart revenue and the Lagged Real GDP. This relationship does not follow economic theory and thus it is either a flaw in the model or demonstrates that Wal-Mart's revenue is not affected in the same manner as other firms. Wal-Mart's commitment to "everyday low prices" and its wide array of products may help it to continue to profit even during times of economic downturn. As demonstrated by its revenue during the most recent recession, or from December 2007 to June 2009 (National Bureau of Economic Research), it continued to grow revenue with only one period of negative growth and one of flat growth (Table AE). Furthermore, the finding that this variable was not significantly different from zero was also unexpected in that it suggests Wal-

Mart's revenue is not influenced by U.S. Real GDP. Thus, the impact of macroeconomic variables on Wal-Mart must be further investigated in order to determine which variables can truly help to forecast its revenue.

Conclusion

It is important to note that while this study is examining the potential of including macroeconomic variables in the forecasting process, it is doing so specifically for Wal-Mart Stores, Inc. It is not this study's intention to generalize the final model to all firms because while all firms are affected by macroeconomic variables, they are all affected differently and to different magnitudes. Instead, it is the study's motive to find if the concept of including macroeconomic variables in the revenue-forecasting process is possible, and if so, to emphasize the practice.

The results of the final model are reflective of Wal-Mart's focus on demand, which is extremely influenced by consumers' perceptions of their income stability and the overall economic situation. As demonstrated by the final model, both the Labor Underutilization and Debt Service Ratio variables reveal the impact of consumers' disposable income on Wal-Mart's revenue. While this model demonstrates certain successes, it is important for each of the final explanatory variables to be further analyzed in order to finalize a revenue-forecasting model. An accurate model will help Wal-Mart to forecast demand and to plan its inventory in a more efficient manner.

Tables

Table A: The Initial Regression

```
. regress  revenue realgdp cpipercent urate ulevel ulevelft ulevelpt cci rconsumption conrcrdtrev for dsr fof

      Source |       SS       df       MS              Number of obs =      88
-------------+------------------------------           F( 12,    75) = 1866.57
       Model |  2.5189e+22    12  2.0991e+21           Prob > F      =  0.0000
    Residual |  8.4344e+19    75  1.1246e+18           R-squared     =  0.9967
-------------+------------------------------           Adj R-squared =  0.9961
       Total |  2.5274e+22    87  2.9050e+20           Root MSE      =  1.1e+09

------------------------------------------------------------------------------
     revenue |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     realgdp |    1.08e+07    1094481     9.83   0.000      8582458    1.29e+07
  cpipercent |   -1.20e+09   1.34e+09    -0.90   0.373     -3.87e+09    1.47e+09
       urate |   -6.77e+08   5.88e+08    -1.15   0.253     -1.85e+09    4.94e+08
      ulevel |   -9462555    6433727     -1.47   0.146     -2.23e+07    3354087
    ulevelft |    1.08e+07    6445390     1.67   0.099     -2060069     2.36e+07
    ulevelpt |    1.18e+07    6687258     1.77   0.081     -1489476     2.52e+07
         cci |   -1.46e+07   1.13e+07    -1.29   0.202     -3.71e+07    7983697
rconsumption |   -6956866    3074333     -2.26   0.027     -1.31e+07   -832480.3
 conrcrdtrev |    3.06e+07   2.89e+07     1.06   0.293     -2.69e+07    8.82e+07
         for |    1.55e+09   1.68e+09     0.92   0.362     -1.81e+09    4.90e+09
         dsr |   -4.35e+08   1.80e+09    -0.24   0.810     -4.02e+09    3.15e+09
         fof |     1657500   909022.7     1.82   0.072      -153366     3468366
       _cons |   -8.77e+10   1.17e+10    -7.52   0.000     -1.11e+11   -6.44e+10
------------------------------------------------------------------------------
```

Table B: Testing the Initial Regression for Autocorrelation

DW Statistic = 1.030054					
1) 1.030054<1.184	TRUE	1%, n=85	1) 1.030054<1.315	TRUE	5%, n=85
2) 1.030054>1.866	FALSE		2) 1.030054>2.009	FALSE	
1) 1.030054<1.215	TRUE	1%, n=90	1) 1.030054<1.344	TRUE	5%, n=90
2) 1.030054>1.856	FALSE		2) 1.030054>1.995	FALSE	
1) 1.030054<1.200	TRUE	Avg, n=87.5	1) 1.030054<1.330	TRUE	Avg, n=87.5
2) 1.030054>1.861	FALSE		2) 1.030054>2.002	FALSE	
At all significance levels and degrees of freedom, positive autocorrelation exists.					

Table C: Correcting for Positive Autocorrelation in the Initial Regression

```
. prais  revenue realgdp cpipercent urate ulevel ulevelft ulevelpt cci rconsumption conrcrdtrev for dsr fof, corc

Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.4842
Iteration 2:  rho = 0.6083
Iteration 3:  rho = 0.6527
Iteration 4:  rho = 0.6707
Iteration 5:  rho = 0.6786
Iteration 6:  rho = 0.6822
Iteration 7:  rho = 0.6839
Iteration 8:  rho = 0.6847
Iteration 9:  rho = 0.6851
Iteration 10:  rho = 0.6852
Iteration 11:  rho = 0.6853
Iteration 12:  rho = 0.6854
Iteration 13:  rho = 0.6854
Iteration 14:  rho = 0.6854
Iteration 15:  rho = 0.6854
Iteration 16:  rho = 0.6854
Iteration 17:  rho = 0.6854

Cochrane-Orcutt AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      87
-------------+------------------------------           F( 12,    74) =  251.69
       Model |  2.3522e+21    12  1.9602e+20           Prob > F      =  0.0000
    Residual |  5.7632e+19    74  7.7881e+17           R-squared     =  0.9761
-------------+------------------------------           Adj R-squared =  0.9722
       Total |  2.4098e+21    86  2.8021e+19           Root MSE      =  8.8e+08

------------------------------------------------------------------------------
     revenue |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     realgdp |    8123018    1435095     5.66   0.000      5263529    1.10e+07
  cpipercent |   -6.37e+08   9.28e+08    -0.69   0.494     -2.49e+09    1.21e+09
       urate |   -2.28e+08   4.82e+08    -0.47   0.638     -1.19e+09    7.32e+08
      ulevel |   -7562545    4009769     -1.89   0.063     -1.56e+07    427094.5
   ulevelft |    8907231    4076157      2.19   0.032      785310.8    1.70e+07
   ulevelpt |    9161258    4328345      2.12   0.038      536841.8    1.78e+07
        cci |    1.80e+07   1.10e+07     1.63   0.107     -3965594     4.00e+07
rconsumption |   -1215486    3913225    -0.31   0.757     -9012757     6581786
 conrcrdtrev |    2.73e+07   2.84e+07     0.96   0.340     -2.93e+07    8.40e+07
         for |   -1.41e+09   2.13e+09    -0.66   0.509     -5.65e+09    2.83e+09
         dsr |    2.91e+09   2.29e+09     1.27   0.207     -1.65e+09    7.47e+09
         fof |    1134926    919689.5     1.23   0.221     -697594.9    2967448
       _cons |   -7.48e+10   1.40e+10    -5.36   0.000     -1.03e+11   -4.70e+10
-------------+----------------------------------------------------------------
         rho |    .6854049
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    1.030054
Durbin-Watson statistic (transformed) 2.360849
```

Table D: Regression of Revenue Against Macroeconomic Variables

```
. prais  revenue realgdp urate urate ulevel ulevelft ulevelpt
note: urate omitted because of collinearity

Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.7323
Iteration 2:  rho = 0.7789
Iteration 3:  rho = 0.7962
Iteration 4:  rho = 0.8052
Iteration 5:  rho = 0.8107
Iteration 6:  rho = 0.8141
Iteration 7:  rho = 0.8165
Iteration 8:  rho = 0.8181
Iteration 9:  rho = 0.8192
Iteration 10:  rho = 0.8200
Iteration 11:  rho = 0.8206
Iteration 12:  rho = 0.8210
Iteration 13:  rho = 0.8213
Iteration 14:  rho = 0.8215
Iteration 15:  rho = 0.8217
Iteration 16:  rho = 0.8218
Iteration 17:  rho = 0.8219
Iteration 18:  rho = 0.8219
Iteration 19:  rho = 0.8220
Iteration 20:  rho = 0.8220
Iteration 21:  rho = 0.8220
Iteration 22:  rho = 0.8220
Iteration 23:  rho = 0.8221
Iteration 24:  rho = 0.8221
Iteration 25:  rho = 0.8221
Iteration 26:  rho = 0.8221
Iteration 27:  rho = 0.8221
Iteration 28:  rho = 0.8221
Iteration 29:  rho = 0.8221
Iteration 30:  rho = 0.8221
Iteration 31:  rho = 0.8221
Iteration 32:  rho = 0.8221
```

Prais-Winsten AR(1) regression -- iterated estimates

Source	SS	df	MS		Number of obs =	88
Model	7.2723e+20	5	1.4545e+20		F(5, 82) =	161.92
Residual	7.3659e+19	82	8.9828e+17		Prob > F =	0.0000
					R-squared =	0.9080
Total	8.0089e+20	87	9.2056e+18		Adj R-squared =	0.9024
					Root MSE =	9.5e+08

revenue	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
realgdp	8367387	293144.5	28.54	0.000	7784229	8950545
urate	-1.09e+08	4.62e+08	-0.24	0.813	-1.03e+09	8.09e+08
urate	(omitted)					
ulevel	-6367984	3926353	-1.62	0.109	-1.42e+07	1442783
ulevelft	7245590	3989392	1.82	0.073	-690581	1.52e+07
ulevelpt	6603943	4161755	1.59	0.116	-1675113	1.49e+07
_cons	-6.35e+10	3.97e+09	-16.01	0.000	-7.14e+10	-5.56e+10
rho	.8220924					

Durbin-Watson statistic (original) 0.570414
Durbin-Watson statistic (transformed) 2.424659

Table E: Regression of Revenue Against Consumer Expenditure Variables

```
. prais revenue cci rconsumption

Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.8532
Iteration 2:  rho = 0.8747
Iteration 3:  rho = 0.8871
Iteration 4:  rho = 0.8965
Iteration 5:  rho = 0.9051
Iteration 6:  rho = 0.9136
Iteration 7:  rho = 0.9228
Iteration 8:  rho = 0.9332
Iteration 9:  rho = 0.9451
Iteration 10:  rho = 0.9582
Iteration 11:  rho = 0.9709
Iteration 12:  rho = 0.9809
Iteration 13:  rho = 0.9872
Iteration 14:  rho = 0.9905
Iteration 15:  rho = 0.9921
Iteration 16:  rho = 0.9929
Iteration 17:  rho = 0.9932
Iteration 18:  rho = 0.9934
Iteration 19:  rho = 0.9935
Iteration 20:  rho = 0.9935
Iteration 21:  rho = 0.9935
Iteration 22:  rho = 0.9935
Iteration 23:  rho = 0.9935
Iteration 24:  rho = 0.9935
Iteration 25:  rho = 0.9935

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      88
-------------+------------------------------           F(  2,    85) =    0.00
       Model |           0     2           0           Prob > F      =  1.0000
    Residual |  9.4886e+19    85  1.1163e+18           R-squared     =       .
-------------+------------------------------           Adj R-squared =       .
       Total |  7.2361e+19    87  8.3174e+17           Root MSE      =  1.1e+09

------------------------------------------------------------------------------
     revenue |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cci |    7417650   1.05e+07     0.71   0.481    -1.34e+07    2.83e+07
rconsumption |    9192237    2827146     3.25   0.002     3571114    1.48e+07
       _cons |   -4.78e+09   1.34e+10    -0.36   0.721    -3.14e+10    2.18e+10
-------------+----------------------------------------------------------------
         rho |     .99355
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    0.285722
Durbin-Watson statistic (transformed) 2.290705
```

Table F: Regression of Revenue Against Consumer Debt Variables

```
. prais  revenue conrcrdtrev for dsr fof

Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.8583
Iteration 2:  rho = 0.9808
Iteration 3:  rho = 0.9949
Iteration 4:  rho = 0.9966
Iteration 5:  rho = 0.9969
Iteration 6:  rho = 0.9970
Iteration 7:  rho = 0.9970
Iteration 8:  rho = 0.9970
Iteration 9:  rho = 0.9970

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      88
-------------+------------------------------           F(  4,    83) =    0.00
       Model |           0     4           0           Prob > F      =  1.0000
    Residual |  9.9501e+19    83  1.1988e+18           R-squared     =       .
-------------+------------------------------           Adj R-squared =       .
       Total |  7.2920e+19    87  8.3816e+17           Root MSE      =  1.1e+09

------------------------------------------------------------------------------
     revenue |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  conrcrdtrev |  -1.73e+07   3.18e+07    -0.54   0.587    -8.06e+07    4.59e+07
         for |  -4.09e+09   2.80e+09    -1.46   0.147    -9.66e+09    1.47e+09
         dsr |   4.88e+09   3.36e+09     1.45   0.150    -1.80e+09    1.16e+10
         fof |   762022.1    1022054     0.75   0.458     -1270802     2794846
       _cons |   4.24e+10   1.83e+10     2.32   0.023     6.03e+09    7.88e+10
-------------+----------------------------------------------------------------
         rho |   .9970161
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    0.225291
Durbin-Watson statistic (transformed) 2.145741
```

Table G: Percent Change Full Regression

```
. regress  perchrevenue perchrealgdp cpipercent urate ulevelft ulevelpt cci perchrconsu
> mption perchconrcrdtrev for dsr fof

      Source |       SS       df       MS              Number of obs =      87
-------------+------------------------------           F( 11,    75) =    2.72
       Model |  .026147861    11  .002377078           Prob > F      =  0.0052
    Residual |  .065427655    75  .000872369           R-squared     =  0.2855
-------------+------------------------------           Adj R-squared =  0.1807
       Total |  .091575516    86  .001064832           Root MSE      =  .02954

------------------------------------------------------------------------------
perchrevenue |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
perchrealgdp |   .3528052   .7547156     0.47   0.642    -1.150665    1.856276
  cpipercent |   .0274865   .0311986     0.88   0.381    -.0346643    .0896373
       urate |   .0082349   .0155989     0.53   0.599    -.0228396    .0393095
    ulevelft |  -8.56e-06   .0000101    -0.85   0.398    -.0000286    .0000115
    ulevelpt |   2.48e-06   .0000647     0.04   0.970    -.0001265    .0001314
         cci |  -.0000827   .0002951    -0.28   0.780    -.0006707    .0005052
perchrcons~n |  -.8406207   .5918863    -1.42   0.160    -2.019719    .3384773
perchconrc~v |   .0066927   .0258781     0.26   0.797    -.0448591    .0582446
         for |   .0302377   .0331942     0.91   0.365    -.0358886     .096364
         dsr |  -.0329345   .0332638    -0.99   0.325    -.0991994    .0333304
         fof |   9.34e-06   .0000224     0.42   0.678    -.0000353     .000054
       _cons |  -.0866665    .254307    -0.34   0.734     -.593272     .419939
------------------------------------------------------------------------------
```

Table H: Testing Percent Change Regression for Negative Autocorrelation

DW Statistic = 2.977401					
1) (4-2.977401)<1.184	TRUE	1%, n=85	1) (4-2.977401)<1.315	TRUE	5%, n=85
2) (4-2.977401)>1.866	FALSE		2) (4-2.977401)>2.009	FALSE	
1) (4-2.977401)<1.215	TRUE	1%, n=90	1) (4-2.977401)<1.344	TRUE	5%, n=90
2) (4-2.977401)>1.856	FALSE		2) (4-2.977401)>1.995	FALSE	
1) (4-2.977401)<1.200	TRUE	Avg, n=87.5	1) (4-2.977401)4<1.330	TRUE	Avg, n=87.5
2) (4-2.977401)>1.861	FALSE		2) (4-2.977401)>2.002	FALSE	
Negative autocorrelation exists at all significance levels and degrees of freedom.					

Table I: Correcting for Negative Autocorrelation with Prais Winston in the Percent Change Regression

```
. prais  perchrevenue perchrealgdp cpipercent urate ulevelft ulevelpt cci perchrconsumption perchconrc
> rdtrev for dsr fof

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.4907
Iteration 2:  rho = -0.5994
Iteration 3:  rho = -0.6084
Iteration 4:  rho = -0.6090
Iteration 5:  rho = -0.6090
Iteration 6:  rho = -0.6090
Iteration 7:  rho = -0.6090

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      87
-------------+------------------------------           F( 11,    75) =   11.17
       Model |  .072484397    11  .006589491           Prob > F      =  0.0000
    Residual |   .0442499     75  .000589999           R-squared     =  0.6209
-------------+------------------------------           Adj R-squared =  0.5653
       Total |  .116734297    86  .001357376           Root MSE      =  .02429

------------------------------------------------------------------------------
perchrevenue |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
perchrealgdp |  -.7195829   .6004372    -1.20   0.235    -1.915715    .4765494
  cpipercent |   .0394946   .0205355     1.92   0.058    -.0014142    .0804034
       urate |   .0183274    .010394     1.76   0.082    -.0023785    .0390332
    ulevelft |  -.0000136   6.61e-06    -2.05   0.044    -.0000267   -3.94e-07
    ulevelpt |  -.0000569   .0000409    -1.39   0.169    -.0001384    .0000246
         cci |  -.0002296   .0001895    -1.21   0.230    -.0006072     .000148
perchrcons~n |  -.4207481   .4984845    -0.84   0.401     -1.41378    .5722841
perchconrc~v |  -.0281157   .0199712    -1.41   0.163    -.0679003    .0116688
         for |   .0161326   .0193174     0.84   0.406    -.0223495    .0546148
         dsr |  -.0206391   .0198412    -1.04   0.302    -.0601647    .0188866
         fof |  -8.08e-09   .0000134    -0.00   1.000    -.0000267    .0000267
       _cons |   .0879521    .145908     0.60   0.548    -.2027116    .3786158
-------------+----------------------------------------------------------------
         rho |  -.6090309
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.977401
Durbin-Watson statistic (transformed) 1.736856
```

Table J: Testing the Significance of Real GDP

```
. prais pclnrrev pcrgdp urate pcuft pcupt cci ccr finobgratio debtserratio flowoffunds

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.4453
Iteration 2:  rho = -0.4951
Iteration 3:  rho = -0.4969
Iteration 4:  rho = -0.4969
Iteration 5:  rho = -0.4969
Iteration 6:  rho = -0.4969

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      87
-------------+------------------------------           F(  9,    77) =    9.58
       Model |  .056505054     9  .006278339           Prob > F      =  0.0000
    Residual |  .050439677    77  .000655061           R-squared     =  0.5284
-------------+------------------------------           Adj R-squared =  0.4732
       Total |  .106944731    86  .001243543           Root MSE      =  .02559

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      pcrgdp |   .0001897   .5549433     0.00   1.000    -1.104844    1.105223
       urate |  -.0033454   .0040481    -0.83   0.411    -.0114063    .0047155
       pcuft |   .1609554   .0904304     1.78   0.079    -.0191146    .3410253
       pcupt |   .0191191   .0817545     0.23   0.816    -.1436749    .1819131
         cci |  -.0001388   .0001858    -0.75   0.458    -.0005088    .0002313
         ccr |  -.0006238   .0003676    -1.70   0.094    -.0013558    .0001082
 finobgratio |   .0770247    .021242     3.63   0.001     .0347266    .1193229
debtserratio |  -.0944109   .0218734    -4.32   0.000    -.1379665   -.0508554
 flowoffunds |   .0000451    .000013     3.46   0.001     .0000192    .000071
       _cons |  -.1238464   .1336126    -0.93   0.357    -.3899031    .1422103
-------------+----------------------------------------------------------------
         rho |    -.49692
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.879108
Durbin-Watson statistic (transformed) 1.667091
```

Table K: Testing the Significance of Real Personal Consumption Expenditures

```
. prais  pclnrrev pclnrc urate pcuft pcupt cci ccr finobgratio debtserratio flowoffunds

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.4602
Iteration 2:  rho = -0.4961
Iteration 3:  rho = -0.4968
Iteration 4:  rho = -0.4968
Iteration 5:  rho = -0.4968

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      87
-------------+------------------------------           F(  9,    77) =    9.66
       Model |  .056721953     9  .006302439           Prob > F      =  0.0000
    Residual |  .050213853    77  .000652128           R-squared     =  0.5304
-------------+------------------------------           Adj R-squared =  0.4755
       Total |  .106935805    86   .00124344           Root MSE      =  .02554

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      pclnrc |  -.2778097   .4720317    -0.59   0.558    -1.217745    .6621255
       urate |  -.0030699   .0040528    -0.76   0.451      -.01114    .0050003
       pcuft |   .1341147   .0925671     1.45   0.151    -.0502099    .3184393
       pcupt |   .0291717   .0832971     0.35   0.727    -.1366941    .1950375
         cci |  -.0001119   .0001849    -0.61   0.547    -.0004801    .0002563
         ccr |   -.000603   .0003685    -1.64   0.106    -.0013367    .0001307
 finobgratio |   .0750172   .0214626     3.50   0.001     .0322797    .1177546
debtserratio |  -.0923755   .0220975    -4.18   0.000    -.1363772   -.0483739
 flowoffunds |    .000045    .000013     3.47   0.001     .0000192    .0000708
       _cons |  -.1167434   .1336877    -0.87   0.385    -.3829495    .1494628
-------------+----------------------------------------------------------------
         rho |  -.4968037
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.907624
Durbin-Watson statistic (transformed) 1.666987
```

Table L: Testing the Significance of Lagged Real GDP

```
. prais  pclnrrev lagpcrgdp urate pcuft pcupt cci ccr finobgratio debtserratio flowoffunds

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.4144
Iteration 2:  rho = -0.4821
Iteration 3:  rho = -0.4860
Iteration 4:  rho = -0.4862
Iteration 5:  rho = -0.4862
Iteration 6:  rho = -0.4862

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  9,    76) =   10.05
       Model |  .057195614     9  .006355068           Prob > F      =  0.0000
    Residual |  .048080824    76  .000632642           R-squared     =  0.5433
-------------+------------------------------           Adj R-squared =  0.4892
       Total |  .105276438    85  .001238546           Root MSE      =  .02515

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpcrgdp |  -.8481278   .5123557    -1.66   0.102    -1.868573     .172317
       urate |  -.0046065   .0040543    -1.14   0.259    -.0126812    .0034683
       pcuft |   .1101583   .0852685     1.29   0.200    -.0596685    .2799852
       pcupt |    .033561   .0806355     0.42   0.678    -.1270385    .1941605
         cci |  -.0001008   .0001796    -0.56   0.577    -.0004585     .000257
         ccr |  -.0006705   .0003645    -1.84   0.070    -.0013964    .0000554
 finobgratio |   .0674912   .0216085     3.12   0.003     .0244541    .1105284
debtserratio |  -.0889124   .0218252    -4.07   0.000     -.132381   -.0454438
 flowoffunds |   .0000446   .0000129     3.47   0.001      .000019    .0000702
       _cons |  -.0143804   .1446295    -0.10   0.921     -.302435    .2736743
-------------+----------------------------------------------------------------
         rho |  -.4861969
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.811189
Durbin-Watson statistic (transformed) 1.672205
```

Table M: Testing the Significance of Lagged Real Personal Consumption Expenditures

```
. prais  pclnrrev lagpclnrc urate pcuft pcupt cci ccr finobgratio debtserratio flowoffunds

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.4623
Iteration 2:  rho = -0.5009
Iteration 3:  rho = -0.5017
Iteration 4:  rho = -0.5017
Iteration 5:  rho = -0.5017

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  9,    76) =    9.66
       Model |  .05680612     9  .006311791            Prob > F      =  0.0000
    Residual |  .049649285   76   .00065328            R-squared     =  0.5336
-------------+------------------------------           Adj R-squared =  0.4784
       Total |  .106455405   85  .001252417            Root MSE      =  .02556

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpclnrc |   -.222115   .4693456    -0.47   0.637    -1.156898    .7126679
       urate |  -.0036153   .0040322    -0.90   0.373    -.0116461    .0044156
       pcuft |   .1456153   .0865658     1.68   0.097    -.0267955    .3180261
       pcupt |   .0306803   .0828211     0.37   0.712    -.1342723    .1956329
         cci |  -.0001279   .0001835    -0.70   0.488    -.0004933    .0002375
         ccr |  -.0006298   .0003665    -1.72   0.090    -.0013597      .0001
 finobgratio |   .0711771   .0232691     3.06   0.003     .0248326    .1175216
debtserratio |  -.0900131   .0231313    -3.89   0.000    -.1360832   -.0439431
 flowoffunds |   .0000449    .000013     3.45   0.001     .0000189    .0000708
       _cons |  -.0738894   .1526952    -0.48   0.630    -.3780082    .2302294
-------------+----------------------------------------------------------------
         rho |  -.5017002
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.919810
Durbin-Watson statistic (transformed) 1.693273
```

Table N: Regression Containing URate

```
. prais  pclnrrev lagpcrgdp urate cci ccr finobgratio debtserratio flowoffunds

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.4094
Iteration 2:  rho = -0.4680
Iteration 3:  rho = -0.4708
Iteration 4:  rho = -0.4709
Iteration 5:  rho = -0.4709
Iteration 6:  rho = -0.4709

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  7,    78) =   12.22
       Model |  .054491878     7  .007784554            Prob > F      =  0.0000
    Residual |   .04966836    78  .000636774            R-squared     =  0.5232
-------------+------------------------------           Adj R-squared =  0.4804
       Total |  .104160239    85  .001225415            Root MSE      =  .02523

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpcrgdp |  -1.127807   .4820443    -2.34   0.022    -2.087484   -.1681308
       urate |  -.0085001    .003104    -2.74   0.008    -.0146796   -.0023206
         cci |  -.0002556   .0001499    -1.71   0.092     -.000554    .0000428
         ccr |  -.0005377   .0003596    -1.50   0.139    -.0012537    .0001782
 finobgratio |    .062185   .0216037     2.88   0.005     .0191754    .1051946
debtserratio |  -.0800627   .0213616    -3.75   0.000    -.1225903   -.0375351
 flowoffunds |   .0000318   9.85e-06     3.23   0.002     .0000122    .0000514
       _cons |   .0110752   .1448781     0.08   0.939     -.277355    .2995054
-------------+----------------------------------------------------------------
         rho |  -.4709467
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.805487
Durbin-Watson statistic (transformed) 1.686039
```

Table O: Regression Containing PcUFt

```
. prais  pclnrrev lagpcrgdp pcuft cci ccr finobgratio debtserratio flowoffunds

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.4122
Iteration 2:  rho = -0.4712
Iteration 3:  rho = -0.4747
Iteration 4:  rho = -0.4749
Iteration 5:  rho = -0.4749
Iteration 6:  rho = -0.4749

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  7,    78) =   12.63
       Model |  .055480021     7  .007925717           Prob > F      =  0.0000
    Residual |  .048964105    78  .000627745           R-squared     =  0.5312
-------------+------------------------------           Adj R-squared =  0.4891
       Total |  .104444127    85  .001228754           Root MSE      =   .02505

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpcrgdp |  -.7470584   .5039432    -1.48   0.142    -1.750332    .2562155
       pcuft |   .1796408    .060583     2.97   0.004     .0590293    .3002522
         cci |   .0000572   .0001083     0.53   0.599    -.0001584    .0002727
         ccr |  -.0006061   .0003617    -1.68   0.098    -.0013263     .000114
 finobgratio |   .0686598   .0216408     3.17   0.002     .0255763    .1117432
debtserratio |  -.0898247   .0218665    -4.11   0.000    -.1333576   -.0462919
 flowoffunds |   .0000522    .000011     4.76   0.000     .0000304    .000074
       _cons |  -.0719666   .1360013    -0.53   0.598    -.3427244    .1987912
-------------+----------------------------------------------------------------
         rho |  -.4748817
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.803651
Durbin-Watson statistic (transformed) 1.664041
```

Table P: Regression Containing PcUPt

```
. prais  pclnrrev lagpcrgdp pcupt cci ccr finobgratio debtserratio flowoffunds

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.3660
Iteration 2:  rho = -0.4041
Iteration 3:  rho = -0.4061
Iteration 4:  rho = -0.4062
Iteration 5:  rho = -0.4062
Iteration 6:  rho = -0.4062

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  7,    78) =    9.95
       Model |  .047119381     7   .00673134           Prob > F      =  0.0000
    Residual |  .052782426    78  .000676698           R-squared     =  0.4717
-------------+------------------------------           Adj R-squared =  0.4242
       Total |  .099901807    85  .001175315           Root MSE      =  .02601

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpcrgdp |  -1.228903   .5103461    -2.41   0.018    -2.244924   -.2128815
       pcupt |   .1052971   .0765403     1.38   0.173    -.0470829    .2576771
         cci |   .0000623   .0001182     0.53   0.600    -.0001731    .0002976
         ccr |  -.0002498   .0003629    -0.69   0.493    -.0009723    .0004727
 finobgratio |   .0583608   .0231557     2.52   0.014     .0122613    .1044603
debtserratio |   -.073275    .022793    -3.21   0.002    -.1186523   -.0278976
 flowoffunds |   .0000397   .0000107     3.72   0.000     .0000184    .0000609
       _cons |  -.0978467   .1462472    -0.67   0.505    -.3890026    .1933091
-------------+----------------------------------------------------------------
         rho |  -.4062202
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.720941
Durbin-Watson statistic (transformed) 1.707656
```

Table Q: Financial Obligations Ratio Regression

```
. prais pclnrrev lagpcrgdp urate cci  finobgratio

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.2842
Iteration 2:  rho = -0.3212
Iteration 3:  rho = -0.3236
Iteration 4:  rho = -0.3237
Iteration 5:  rho = -0.3237
Iteration 6:  rho = -0.3237

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  4,    81) =   11.21
       Model |  .034069762     4  .008517441           Prob > F      =  0.0000
    Residual |  .061524458    81  .000759561           R-squared     =  0.3564
-------------+------------------------------           Adj R-squared =  0.3246
       Total |   .09559422    85  .001124638           Root MSE      =  .02756

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpcrgdp |  -1.433788   .4901159    -2.93   0.004    -2.408965   -.4586109
       urate |  -.0104751   .0030017    -3.49   0.001    -.0164477   -.0045026
         cci |  -.0001547   .0001745    -0.89   0.378    -.0005019    .0001926
 finobgratio |  -.0236821   .0036793    -6.44   0.000    -.0310028   -.0163614
       _cons |   .5242305   .0811194     6.46   0.000     .3628284    .6856325
-------------+----------------------------------------------------------------
         rho |   -.323737
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.543102
Durbin-Watson statistic (transformed) 1.711694
```

Table R: Debt Service Ratio Regression

```
. prais pclnrrev lagpcrgdp urate cci   debtserratio

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.3295
Iteration 2:  rho = -0.3764
Iteration 3:  rho = -0.3793
Iteration 4:  rho = -0.3794
Iteration 5:  rho = -0.3794
Iteration 6:  rho = -0.3794

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  4,    81) =   14.37
       Model |  .040835321     4  .01020883             Prob > F      =  0.0000
    Residual |  .057531154    81  .000710261            R-squared     =  0.4151
-------------+------------------------------           Adj R-squared =  0.3863
       Total |  .098366475    85  .001157253            Root MSE      =  .02665

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpcrgdp |  -1.131175   .4460042    -2.54   0.013    -2.018584   -.2437667
       urate |  -.0108871   .0027824    -3.91   0.000    -.0164232   -.0053509
         cci |  -.0002267   .0001641    -1.38   0.171    -.0005532    .0000998
debtserratio |  -.0188159   .0025684    -7.33   0.000    -.0239261   -.0137056
       _cons |   .3503628   .0505057     6.94   0.000     .2498722    .4508533
-------------+----------------------------------------------------------------
         rho |  -.3794478
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.643605
Durbin-Watson statistic (transformed) 1.695572
```

Table S: Household and Nonprofit Organizations' Borrowing Regression

```
. prais pclnrrev lagpcrgdp urate cci  flowoffunds

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.0712
Iteration 2:  rho = -0.0946
Iteration 3:  rho = -0.1014
Iteration 4:  rho = -0.1032
Iteration 5:  rho = -0.1038
Iteration 6:  rho = -0.1039
Iteration 7:  rho = -0.1039
Iteration 8:  rho = -0.1040
Iteration 9:  rho = -0.1040
Iteration 10:  rho = -0.1040

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  4,    81) =    1.50
       Model |  .006217951     4  .001554488            Prob > F      =  0.2101
    Residual |  .083977564    81   .00103676            R-squared     =  0.0689
-------------+------------------------------           Adj R-squared =  0.0230
       Total |  .090195515    85  .001061124            Root MSE      =   .0322

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpcrgdp |  -.4826536   .5904637    -0.82   0.416    -1.657491    .6921839
       urate |  -.0056145   .0044836    -1.25   0.214    -.0145355    .0033065
         cci |    .000071   .0002356     0.30   0.764    -.0003978    .0005399
 flowoffunds |  -.0000179   .0000102    -1.76   0.082    -.0000381    2.30e-06
       _cons |   .0632562   .0466809     1.36   0.179    -.0296242    .1561366
-------------+----------------------------------------------------------------
         rho |  -.1039631
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.140433
Durbin-Watson statistic (transformed) 1.879176
```

Table T: Regression Testing Significance of CCI with Lagged GDP

```
. prais  pclnrrev lagpcrgdp urate cci debtserratio

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.3295
Iteration 2:  rho = -0.3764
Iteration 3:  rho = -0.3793
Iteration 4:  rho = -0.3794
Iteration 5:  rho = -0.3794
Iteration 6:  rho = -0.3794

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  4,    81) =   14.37
       Model |  .040835321     4  .01020883            Prob > F      =  0.0000
    Residual |  .057531154    81  .000710261           R-squared     =  0.4151
-------------+------------------------------           Adj R-squared =  0.3863
       Total |  .098366475    85  .001157253           Root MSE      =  .02665

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpcrgdp |  -1.131175   .4460042    -2.54   0.013    -2.018584   -.2437667
       urate |  -.0108871   .0027824    -3.91   0.000    -.0164232   -.0053509
         cci |  -.0002267   .0001641    -1.38   0.171    -.0005532    .0000998
debtserratio |  -.0188159   .0025684    -7.33   0.000    -.0239261   -.0137056
       _cons |   .3503628   .0505057     6.94   0.000     .2498722    .4508533
-------------+----------------------------------------------------------------
         rho |  -.3794478
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.643605
Durbin-Watson statistic (transformed) 1.695572
```

Table U: Regression Testing the Significance of CCr with Lagged Real GDP

```
. prais  pclnrrev lagpcrgdp urate ccr debtserratio

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.3294
Iteration 2:  rho = -0.3396
Iteration 3:  rho = -0.3398
Iteration 4:  rho = -0.3398
Iteration 5:  rho = -0.3398

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  4,    81) =   13.28
       Model |  .038161371     4  .009540343           Prob > F      =  0.0000
    Residual |  .058171873    81  .000718171           R-squared     =  0.3961
-------------+------------------------------           Adj R-squared =  0.3663
       Total |  .096333244    85  .001133332           Root MSE      =   .0268

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpcrgdp |  -1.295864   .4325605    -3.00   0.004    -2.156524   -.4352041
       urate |  -.0059901   .0025445    -2.35   0.021    -.0110528   -.0009274
         ccr |   .0002793   .0003062     0.91   0.364    -.0003299    .0008885
debtserratio |  -.0139482   .0052929    -2.64   0.010    -.0244795   -.0034169
       _cons |   .2327539   .0874453     2.66   0.009     .0587651    .4067427
-------------+----------------------------------------------------------------
         rho |  -.3397621
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.651166
Durbin-Watson statistic (transformed) 1.714775
```

Table V: Testing Parsimonious Model with Real GDP

```
. prais  pclnrrev pcrgdp urate debtserratio

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.3238
Iteration 2:  rho = -0.3557
Iteration 3:  rho = -0.3571
Iteration 4:  rho = -0.3572
Iteration 5:  rho = -0.3572
Iteration 6:  rho = -0.3572

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      87
-------------+------------------------------           F(  3,    83) =   13.56
       Model |  .03224856     3   .01074952            Prob > F      =  0.0000
    Residual |  .06579177    83  .000792672            R-squared     =  0.3289
-------------+------------------------------           Adj R-squared =  0.3047
       Total |  .09804033    86  .001140004            Root MSE      =  .02815

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      pcrgdp |  -.6516233    .405696    -1.61   0.112    -1.458536    .1552897
       urate |  -.0060959   .0015938    -3.82   0.000     -.009266   -.0029259
debtserratio |  -.0160897    .002644    -6.09   0.000    -.0213485   -.0108309
       _cons |   .2645869    .038348     6.90   0.000     .1883142    .3408597
-------------+----------------------------------------------------------------
         rho |  -.3572068
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.631533
Durbin-Watson statistic (transformed) 1.661328
```

Table W: Testing Parsimonious Model with Lagged Real GDP

```
. prais  pclnrrev lagpcrgdp urate debtserratio

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.3289
Iteration 2:  rho = -0.3367
Iteration 3:  rho = -0.3368
Iteration 4:  rho = -0.3368
Iteration 5:  rho = -0.3368

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  3,    82) =   17.41
       Model |  .03742442      3  .012474807            Prob > F      =  0.0000
    Residual |  .058768926    82  .000716694            R-squared     =  0.3891
-------------+------------------------------           Adj R-squared =  0.3667
       Total |  .096193346    85  .001131686            Root MSE      =  .02677

------------------------------------------------------------------------------
     pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
    lagpcrgdp |  -1.411119   .4143239    -3.41   0.001    -2.235341   -.5868966
        urate |  -.0077677   .0016414    -4.73   0.000     -.011033   -.0045025
debtserratio |  -.0181558   .0026047    -6.97   0.000    -.0233375   -.0129742
        _cons |   .3043626   .0387018     7.86   0.000     .2273723    .3813528
--------------+---------------------------------------------------------------
          rho |  -.3368054
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.642315
Durbin-Watson statistic (transformed) 1.702189
```

Table X: Testing U6 Significance in Parsimonious Equation

```
. prais  pclnrrev lagpcrgdp  u6  debtserratio

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.5643
Iteration 2:  rho = -0.6025
Iteration 3:  rho = -0.6030
Iteration 4:  rho = -0.6030
Iteration 5:  rho = -0.6030

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      70
-------------+------------------------------           F(  3,    66) =   23.07
       Model |  .027947249     3  .00931575             Prob > F      =  0.0000
    Residual |  .026654348    66  .000403854            R-squared     =  0.5118
-------------+------------------------------           Adj R-squared =  0.4897
       Total |  .054601598    69  .000791328            Root MSE      =   .0201

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpcrgdp |  -.6959638   .3101902    -2.24   0.028    -1.315279   -.0766491
          u6 |   -.004585   .0006468    -7.09   0.000    -.0058763   -.0032937
debtserratio |  -.0110811   .0019617    -5.65   0.000    -.0149978   -.0071645
       _cons |   .2081446    .029042     7.17   0.000     .1501604    .2661287
-------------+----------------------------------------------------------------
         rho |  -.6030294
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    3.119562
Durbin-Watson statistic (transformed) 1.887860
```

Table Y: Final Model

```
. prais  pclnrrev lagpcrgdp  u6  debtserratio

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.5643
Iteration 2:  rho = -0.6025
Iteration 3:  rho = -0.6030
Iteration 4:  rho = -0.6030
Iteration 5:  rho = -0.6030

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      70
-------------+------------------------------           F(  3,    66) =   23.07
       Model |  .027947249     3   .00931575           Prob > F      =  0.0000
    Residual |  .026654348    66  .000403854           R-squared     =  0.5118
-------------+------------------------------           Adj R-squared =  0.4897
       Total |  .054601598    69  .000791328           Root MSE      =   .0201

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpcrgdp |  -.6959638   .3101902    -2.24   0.028    -1.315279   -.0766491
          u6 |   -.004585   .0006468    -7.09   0.000    -.0058763   -.0032937
debtserratio |  -.0110811   .0019617    -5.65   0.000    -.0149978   -.0071645
       _cons |   .2081446    .029042     7.17   0.000     .1501604    .2661287
-------------+----------------------------------------------------------------
         rho |  -.6030294
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    3.119562
Durbin-Watson statistic (transformed) 1.887860
```

Table Z: Testing Lagged Real Personal Consumption in the Final Model

```
. prais  pclnrrev pclnrc u6 debtserratio

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.6160
Iteration 2:  rho = -0.6163
Iteration 3:  rho = -0.6163

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      70
-------------+------------------------------           F(  3,    66) =   22.32
       Model |  .027716694     3  .009238898            Prob > F      =  0.0000
    Residual |  .027321997    66   .00041397            R-squared     =  0.5036
-------------+------------------------------           Adj R-squared =  0.4810
       Total |  .055038691    69  .000797662            Root MSE      =  .02035

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      pclnrc |  -.4679677   .2570508    -1.82   0.073    -.9811862    .0452508
          u6 |  -.0042609   .0006032    -7.06   0.000    -.0054651   -.0030567
debtserratio |  -.0098108   .0017798    -5.51   0.000    -.0133644   -.0062573
       _cons |   .1876932   .0254226     7.38   0.000     .1369353    .2384512
-------------+----------------------------------------------------------------
         rho |  -.6162915
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    3.229361
Durbin-Watson statistic (transformed) 1.935934
```

Table AA: Partial F-Test to Determine Lagged Real GDP's Significance to Final Model

Complete Model

```
. prais pclnrrev lagpcrgdp u6 debtserratio

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.5642
Iteration 2:  rho = -0.6025
Iteration 3:  rho = -0.6030
Iteration 4:  rho = -0.6030
Iteration 5:  rho = -0.6030

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      70
-------------+------------------------------           F(  3,    66) =   23.07
       Model |  .027948889     3  .009316296           Prob > F      =  0.0000
    Residual |  .026654478    66  .000403856           R-squared     =  0.5119
-------------+------------------------------           Adj R-squared =  0.4897
       Total |  .054603367    69  .000791353           Root MSE      =   .0201

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lagpcrgdp |  -.6959571   .3101947    -2.24   0.028    -1.315281   -.0766334
          u6 |  -.0045851   .0006468    -7.09   0.000    -.0058764   -.0032938
debtserratio |   -.011082   .0019617    -5.65   0.000    -.0149987   -.0071652
       _cons |   .2081563   .0290424     7.17   0.000     .1501713    .2661414
-------------+----------------------------------------------------------------
         rho |  -.6030065
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    3.119520
Durbin-Watson statistic (transformed) 1.887876
```

Reduced Model

```
. prais pclnrrev u6 debtserratio

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.6016
Iteration 2:  rho = -0.6017
Iteration 3:  rho = -0.6017

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      70
-------------+------------------------------           F(  2,    67) =   30.21
       Model |  .025872633     2  .012936316           Prob > F      =  0.0000
    Residual |  .028687614    67  .000428173           R-squared     =  0.4742
-------------+------------------------------           Adj R-squared =  0.4585
       Total |  .054560247    69  .000790728           Root MSE      =  .02069

------------------------------------------------------------------------------
    pclnrrev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          u6 |  -.0038303   .0005692    -6.73   0.000    -.0049665   -.0026941
debtserratio |  -.0088637    .001746    -5.08   0.000    -.0123488   -.0053787
       _cons |   .1683013   .0236766     7.11   0.000     .1210427    .2155599
-------------+----------------------------------------------------------------
         rho |   -.601664
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    3.199168
Durbin-Watson statistic (transformed) 1.890818
```

Table AB: The Means and Standard Deviations of the Variables in the Final Equation

```
. sum  pclnrrev lagpcrgdp u6 debtserratio

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
     pclnrrev |         70   .0183841    .0284056    -.03323    .07416
   lagpcrgdp |         70   .0062787    .0070378    -.02328    .01932
          u6 |         70   10.06571    2.824114          7      17.1
debtserratio |         70   12.57057    .9227054      10.86      13.96
```

Table AC: Standardizing Variables in the Final Equation

```
. egen z2rev = std( pclnrrev)

. egen z2lagrgdp = std( lagpcrgdp)

. egen z2u6 = std( u6)

. egen z2dsr = std( debtserratio)

. sum z2rev z2lagrgdp z2u6 z2dsr
```

Variable	Obs	Mean	Std. Dev.	Min	Max
z2rev	70	3.73e-10	1	-1.81704	1.963551
z2lagrgdp	70	2.39e-10	1	-4.200015	1.853044
z2u6	70	-4.15e-09	1	-1.085549	2.490794
z2dsr	70	-6.39e-10	1	-1.853866	1.50582

Table AD: Regression with Standardized Variables

```
. prais  z2rev z2lagrgdp z2u6 z2dsr

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.5643
Iteration 2:  rho = -0.6025
Iteration 3:  rho = -0.6030
Iteration 4:  rho = -0.6030
Iteration 5:  rho = -0.6030

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      70
-------------+------------------------------           F(  3,    66) =   23.35
       Model |  35.0612257     3  11.6870752            Prob > F      =  0.0000
    Residual |  33.0338878    66  .500513451            R-squared     =  0.5149
-------------+------------------------------           Adj R-squared =  0.4928
       Total |  68.0951134    69  .986885702            Root MSE      =  .70747

------------------------------------------------------------------------------
       z2rev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   z2lagrgdp |  -.1724317   .0768526    -2.24   0.028    -.3258729   -.0189905
        z2u6 |  -.4558477   .0643024    -7.09   0.000    -.5842315   -.3274639
       z2dsr |  -.3599503   .0637222    -5.65   0.000    -.4871757   -.2327249
       _cons |  -.0020022   .0530482    -0.04   0.970    -.1079163    .1039119
-------------+----------------------------------------------------------------
         rho |  -.6030294
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    3.119562
Durbin-Watson statistic (transformed) 1.887860
```

Table AE: Wal-Mart's Revenue During 2007 Recession

Quarter Ending	Revenue
1/31/08	1%
4/30/08	1%
7/31/08	4%
10/31/08	-2%
1/31/09	3%
4/30/09	0%
7/31/09	1%

Chart of Variables and Abbreviated Names

	Full Name	Abbreviated Name
Dependent Variable	Standard Dependent Variable	1) Revenue
	Percent Change of Dependent Variable	1) PerChRevenue 2) PcLnRRev
Macroeconomic Variables	Real GDP	1) RealGDP
	Percent Change of Real GDP	1) PerChRealGDP 2) PcRGDP
	Lagged Percent Change of Real GDP	1)LagPcRGDP
	US Core CPI Percent Change	1) CPIPercent
	Unemployment Rate	1) URate
	Unemployment Level in 1000s	1) ULevel
	Unemployed Persons Looking for Full Time Work in 1000s	1) ULevelFT
	Percent Change of Unemployed Persons Looking for Full Time Jobs	1) PcUFT
	Unemployed Persons Looking for Part Time Work in 1000s	1) ULevelPT
	Percent Change of Unemployed Persons Looking for Part Time Jobs	1) PcUPT
	Labor Underutilization	1) U6
Consumer Expenditures	Consumer Confidence Index	1) CCI
	US Personal Consumption Real	1) RConsumption 2) RC
	Percent Change of Personal Consumption Real	1) PerChRConsumption 2) PcLnRC
	Lagged Percent Change of Natural Log of US Personal Consumption	1) LagPcLnRC
Consumer Debt	Consumer Credit	1) ConrCrdRev 2) CCR
	Financial Obligations Ratio	1) FOR 2) FinObgRatio
	Debt Service Ratio	1) DSR 2) DebtSerRatio
	Household and Nonprofit Organizations' Borrowing	1) FOF 2) FlowofFunds

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