Effects of Macroeconomics Variables on Consumer Staples and Consumer Discretionary Sectors

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ABSTRACT

The goal of this study is to identify models that are effective at explaining past price levels in the consumer staples and consumer discretionary sectors. If these models are successful in explaining past price levels, they may help investors understand what drives the price levels in these sectors and how they can potentially profit from this understanding. The models developed suggest that the historical closing prices for the consumer staples and consumer discretionary exchange-traded funds (ETF) can be explained fairly well by macroeconomic variables.

Introduction

Coyote Capital Management (CCM) is a student managed investment fund at the University of South Dakota. Students gain real-world financial experience by working with securities and actively managing over $1.1 million in funds divided between the USD Foundation portfolio, the Dean's portfolio, and the Student portfolio. The assets are split into three portfolios because they are managed for three different purposes or clients: the USD Foundation, the Beacom School of Business International Programs (Dean's Portfolio), and funds that have been donated to CCM. The Foundation and Dean's portfolios are comprised of stocks and account for $1 million in assets between the two portfolios. The Student portfolio includes $75,000 in funds and is invested in passive exchange-traded funds (ETFs). Since the Student portfolio is relatively small, ETFs are a good investment tool because they allow for a well-diversified portfolio and provide more exposure at a lower cost than individual stocks. Students who participate in CCM also learn about different styles of investing by analyzing and evaluating equities for the actively managed Foundation and Dean's portfolios and passively managing the Student portfolio using a sector strategy.

The Standard and Poor's 500 Index divides the stock market into several sectors, including consumer discretionary, consumer staples, energy, financials, healthcare, industrials, information technology, materials, telecommunications, and utilities. CCM divides its assets amongst the different sectors to adequately diversify its holdings in an effort to mitigate the risk. Twice a year, students set sector allocation weights in the Student portfolio and then buy and sell sector ETFs to align each sector with its target weight. After each sector is balanced with its allocation weights, the portfolio is monitored for the next six months.

The macroeconomic landscape constantly influences the value of financial investments as macroeconomic indicators fluctuate over time. Macroeconomic variables, including the unemployment rate, interest rates, trade balance, oil, money supply, and the consumer price index, constantly affect the performance of investments. This project explores the effects of certain macroeconomic variables on the consumer discretionary and consumer staples ETF closing prices to understand key drivers in each sector and see how they differ. This information is useful not only for CCM analysts to help them better understand the drivers of sector performance, but it also has larger implications in terms of the economy and what sectors of investments perform well or poorly under differently macroeconomic conditions.

The goal of this study is to identify models that are effective at explaining past price levels in the consumer staples and consumer discretionary sectors using macroeconomic variables. If these models are successful in explaining past price levels, they may help investors understand what drives price levels in these sectors and how they can potentially profit from this understanding.

Literature Review

In an effort to predict stock price movements, many studies have attempted to identify key determinants of stock prices. The emphasis of the studies has varied across industries, countries, and time periods. Many of the studies have been successful in explaining past stock price volatility but less successful in predicting future stock prices. Stock price changes are the result of several economic and noneconomic forces, including investor sentiment and investor psychology. Thus, the focus of this research project is to explain prices as determined by economic forces. There has been a significant amount of research done in this area, and a few of those studies in particular have helped to guide this research.

Cheung and Lai (1999) explored the causes behind the long-term co-movements of the national stock markets in the three EMS (European Monetary System) countries of France, Germany, and Italy using data from 1979 to 1992. The study examined the co-movements of macroeconomic factors, including money supply, dividends, and industrial production to identify any relationships between the stock market prices and macroeconomic variables. They found that the macroeconomic variables play a limited role in accounting for the co-movements in the stock markets in the three countries and suggest that investor psychology as well as undefined macroeconomic factors, potentially differing across countries, may play a large role in the stock market co-movements. This could also be referred to as omitted variable bias.

In an extension of the aforementioned study, Taing and Worthington (2002) examined co-movements between equity sectors across the stock markets of six selected Member States of the European Union (EU), including Belgium, Finland, France, Germany, Ireland, and Italy from the years 1999 to 2002. The consumer discretionary, consumer staples, financials, industrials, and materials sectors were explored through multiple regression models, and the results showed that there are few long-run relationships between sectors in the different countries but many significant short-run causal linkages between the sectors. The authors find that the consumer discretionary, financial, and materials sectors are more related than the consumer staples and industrials sectors. This study differs from the previous study in that the models do not contain any macroeconomic variables. Rather the authors identify causal relationships between sectors without regard to macroeconomic factors that may play a role in the stock market co-movements.

Maysami, Howe, and Hamzah (2004) studied the relationship between various macroeconomic variables with the overall Singapore stock market index, finance index, property index, and hotel index. Inflation rate, industrial production growth, short-term interbank rate, and

money supply growth all yield a positive effect on the Singapore stock market index price. For the finance index, inflation rate, short-term interbank rate, and money supply growth produce a positive impact on the price. The property index price is positively affected by inflation rate, industrial production growth, short-term interbank rate, and money supply growth. Finally, industrial production growth, exchange rate, and long-term interbank rates impact the hotel index price positively. These authors point out that there seems to be a lack of research on macroeconomic variable impact on sector prices. One of the goals of this study is to help address that void.

Menike (2006) investigates the effects of macroeconomic variables on the prices of 34 individual stocks from various sectors in the Sri Lankan stock market from 1991 to 2002. The author used multiple regression analysis to identify the effects of eight monthly economic indicators (money supply, exchange rate, inflation rate, interest rate, lagged t-1 money supply, lagged t-1 inflation rate, lagged t-2 money supply, and lagged t-2 inflation rate). Menike found that the null hypothesis, which stated money supply, exchange rate, inflation rate, and interest rate variables do not impact stock market prices, was rejected with 95% confidence. The author discovered that inflation, exchange rates, and interest rates negatively affected the stock market prices while money supply yielded a positive impact. Furthermore, Menike's results demonstrate that lagged variables do not provide explanations of current stock market prices nor do they allow for the accurate prediction of future stock market price movements. This final finding provides empirical evidence that markets are efficient and react quickly to changes in key macroeconomic variables.

Jayasuriya (2007) utilized a vector autoregressive model and impulse response function to explore the relationship between macroeconomic factors and consumer discretionary,

consumer staples, financials, and industrials sectors' closing prices in the countries of Malaysia and Thailand. In addition to macroeconomic variables including the interest rate, inflation rate, real exchange rate, and an Asian crisis dummy, the author explores the relationship between sectors' closing prices and other sectors' closing prices as well as the Japanese stock market index, Nikkei. Jayasuriya discovered that the lagged behavior of consumer discretionary and financials sectors affect all four sectors in Malaysia, but the different sectors are mainly independent of each other in Thailand. Furthermore, the author finds that the macroeconomic variables did not have a significant impact on stock prices for any of the sectors.

Madsen (2009) explored the differences between stock prices in the medium and long run by analyzing the effects of technology shocks, supply shocks, imperfections in the credit markets, change in taxes, and riskiness of stocks. He found that stock prices fluctuate in the medium term but converge towards a constant average in the long run, which is consistent with most economists' views. He argues that real stock prices and dividends grow over time because earnings are retained within the company. Furthermore, shifts in earnings or required stock returns do not have any long-lasting effects on the real stock prices and dividends. This study justifies the assumption that stock prices are fair and mean-reverting in the long run as retained earnings determines real stock prices and dividends. The long-term retained earnings of companies are affected by the macroeconomic variables, which helps to explain this study's use of macroeconomic variables in explaining past price behavior rather than stock market factors, which include past prices, volume trends, valuation ratios, etc.

Humpe and Macmillan (2009) utilized a standard discounted value model to study the impact of macroeconomic variables on long-term stock price changes in the US and Japanese markets. The authors explore the effect of industrial production, the consumer price index,

money supply, and long-term interest rates on the S&P 500 index stock market price. Their results showed that long-run US stock prices are positively affected by industrial production and negatively affected by inflation and long-term interest rates. They found money supply did not have a significant effect on US stock prices. The authors did not analyze the effects of the velocity of money on the index stock market price, which would have allowed them to consider the supply and demand for money with changing interest rates. For the Japanese market, Humpe and Macmillan's results are slightly different. For one co-integrating vector, they find that stock prices are positively affected by industrial production and negatively by the money supply. In the second co-integrating vector, they discover that industrial production is negatively influenced by the consumer price index and the long-term interest rate. Humpe and Macmillion conclude that the differences in behavior between the US and Japan stock markets may be a result of Japan's economic decline after 1990 and its subsequent liquidity trap of the late 1990s and early 2000s.

Gaoxiang and Lim (2010) attempt to identify macroeconomic variables that drive the price levels for eleven Australian Stock Exchange (ASX) industry sectors using linear multiple regression models for each sector. The results for the consumer staples and consumer discretionary index prices are of particular interest in terms of this study. Gaoxiang and Lim found that the consumer discretionary prices are negatively correlated with bond rates and positively correlated with dividend yields and market return and capitalization. Furthermore, they found the consumer staples prices are negatively correlated with P/E ratios and positively correlated with market return and capitalization and unemployment rate. By using stock market variables, including dividend yields, market return and capitalization figures, and P/E ratios, the authors attempt to discover what causes both short-term and long-term fluctuations in the

sectors' stock prices. Some of these independent variables may cause short-term noise that is mean-reverting in the long-term since stock markets are believed to be efficient in the long-run.

Mahavidyalaya (2012) created a multiple regression model to identify the impact of macroeconomic variables on stock prices in India using data from 1190 to 2011. The results demonstrated that oil and gold prices have a significant negative effect on stock prices, while balance of trade, interest rate, foreign exchange reserve, gross domestic product, industrial production and money supply have a positive influence. Inflation rate, foreign direct investment, exchange rate, and wholesale prices do not have a significant effect on stock prices. Although Mahavidyalaya's study focused on the Indian stock market, it provides ideas for what macroeconomic variables to consider in a study of any stock market.

Yogaswari, Nugroho, and Astuti (2012) sought to identify whether inflation, interest rates, and exchange rates have a significant effect on the Jakarta Composite Index price as well as the agricultural and basic industry sectors' stock market prices. The authors used monthly data from the time period, January 2007 to December 2011, and found a significant positive effect from inflation, a significant negative effect from interest rates, and a significant negative impact from exchange rates on the index price, agricultural sector price, and basic industry sector price.. Furthermore, the exchange rates' impact is twice as negative on the two sector prices as on the index price. This study shows that individual sectors can be affected much differently by macroeconomic variables.

This study builds on previous findings to discover the relationships between macroeconomic variables and the exchange traded funds price levels of two specific U.S. sectors: consumer staples and consumer discretionary. According to Cannivet and Teufel (2009), the macroeconomic drivers in the consumer staples sector are economic growth,

consumer prices, producer prices, government spending, and net exports. According to Renaud and Teufel (2010), the macroeconomic drivers in the consumer discretionary sector are consumer spending, income and employment, economic growth, interest rates, currency, taxes, and trade.

Data

Table 1 lists the variables used in this study. The first two are the dependent variables for the consumer staples and consumer discretionary sectors. The consumer staples variable is the monthly-average closing price for the consumer staples ETF (ticker symbol: XLP) from January 1999 to December 2012 (168 months). The consumer discretionary variable is the monthly-average closing price for the consumer discretionary ETF (ticker symbol: XLY) for the same time period. Closing prices were used rather than the adjusted closing prices because closing price is the actual price at which the ETFs trade. The adjusted closing price is adjusted in percentage terms rather than absolute dollar values for stock splits, dividends/distributions, and rights offerings. The monthly averages are preferred to daily closings because the macroeconomic variables used as independent variables are not all available on a daily basis to affect daily prices. This analysis is looking for variation in monthly prices and so does not use any kind of monthly moving average. Figures 1 and 2 show the two dependent variables over time.

The remaining variables in the Table 1 are the macroeconomic variables used as explanatory variables in the models. Each is included to examine the effect they have on the two sector's ETF prices. Several versions of each model were tested with different macroeconomic variables in an attempt to arrive at the best model for each sector.

Table 1: Variables and Summary Statistics

Definition	Acronym	Units	Seasonally Adjusted	Source	Mean	Std. Dev
Monthly average closing price of the consumer staples ETF	XLPClose	Dollars	NA	Yahoo! Finance	25.63	3.82
Monthly average closing price of the consumer discretionary ETF	XLYClose	Dollars	NA	Yahoo! Finance	31.46	6.17
Unemployment rate	Unrate	Percent	Yes	US Dept. of Labor	6.16	1.93
Interest rate	IntRate	Percent	No	Fed. Res. Board of Governors	4.14	1.16
Trade balance	TradeBal	Millions of dollars	No	US Dept. of Commerce	-43725.1	12858.6
Price of oil	Oil	Dollars per barrel (nominal)	Yes	US Dept. of Energy	57.04	29.14
M2 money stock	M2	Billions of dollars	Yes	Fed. Res. Board of Governors	6907.53	1647.9
Consumer price index	CPI	Base year 1982	Yes	US Dept. of Labor	198.23	19.97
Real disposable income	RDIncome	Monthly average 2005 adj. dollars	Yes	US Dept. of Commerce	9296.62	804.7

Figure 1: Consumer Staples Dependent Variable

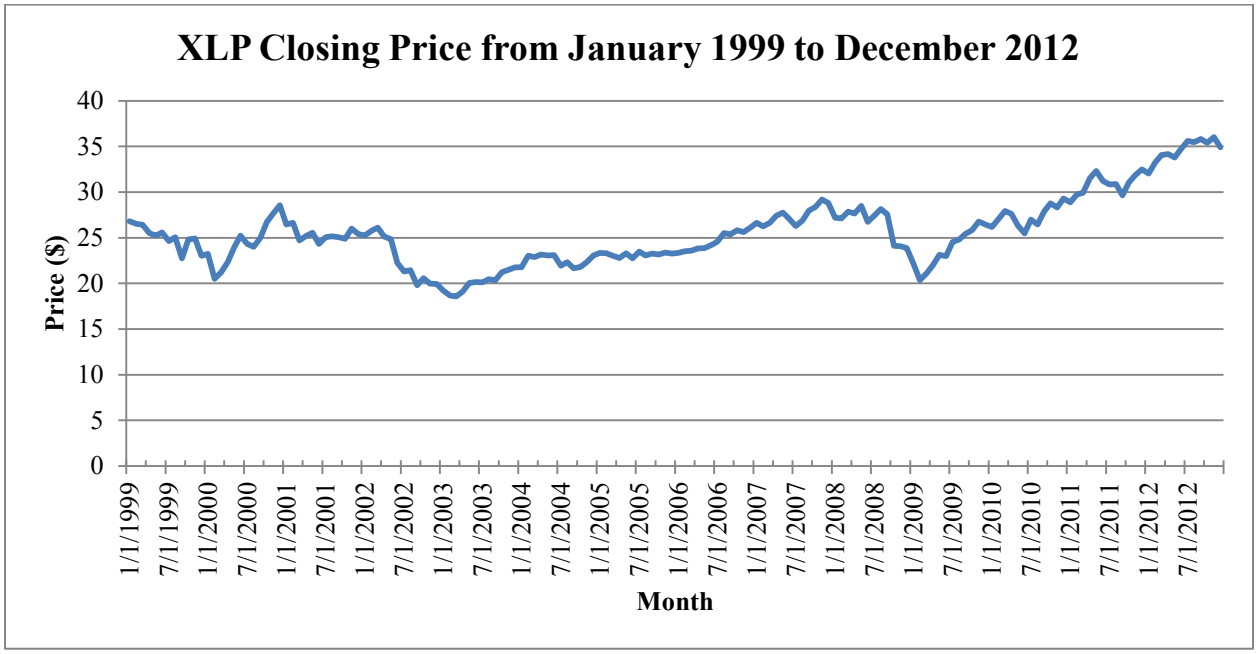
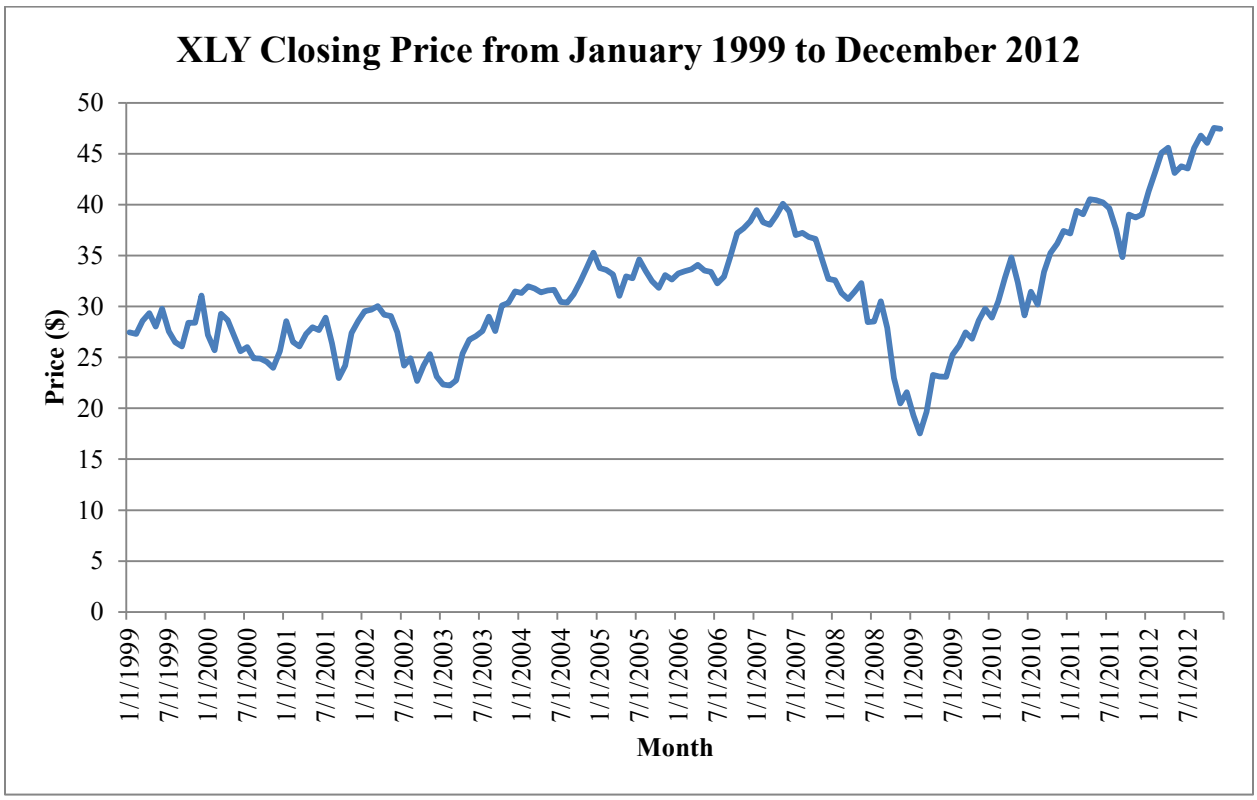


Figure 2: Consumer Discretionary Dependent Variable



The unemployment rate measures the percentage of the total labor force over the age of 16 that is willing and able to work and is actively seeking employment but is not employed. The unemployment rate decreases as people either find work or quit actively looking for work. This data is collected by the US Department of Labor and is a seasonally adjusted percentage.

Interest rates on 10-year bonds were used as a proxy for all of the interest rates either paid or received on financial instruments. This data is collected by the Board of Governors of the Federal Reserve System. The interest rates are not seasonally adjusted and are reported as percentages.

The trade balance is the difference between the amount of imports and exports of the merchandise of a country during the course of a year. Historically, the United States has had a negative trade balance since more goods are imported than exported. This seasonally adjusted data is collected by the US Department of Commerce and is measured in millions of dollars.

The United States receives approximately 40% of its oil from within the United States, mainly from Texas and North Dakota. As a result, the West Texas Intermediate Crude Oil Prices were used as a measure of oil prices within the country. This data is collected by the US Department of Energy. It is not seasonally adjusted and is measured in units of dollars per barrel.

The M2 money stock is a broad measure of the money supply in the United States. The M2 money stock consists of the M1 money stock plus savings deposit, small denomination time deposits, and balances in retail money market mutual funds. The M1 money stock includes coins, currency, demand deposits, and negotiable order of withdrawal accounts. This data is collected by the Board of Governors of the Federal Reserve System, and it is seasonally adjusted and measured in billions of dollars.

The consumer price index was used as a proxy for inflation in the United States. The consumer price index measures the changes in prices of a basket of commonly purchased consumer goods from the base year. It measures how expensive the goods in the basket become over time as a result of inflation. This data is collected by the US Department of Labor, and it is a seasonally adjusted index with a base year of 1982.

Real disposable personal income measures the amount of income consumers have available to spend after taxes. Real disposable personal income is expected to affect spending on consumer discretionary products more than consumer staples products since consumer staples are seen as necessities. This data is collected by the US Department of Commerce; it is a monthly average of 2005 adjusted dollars and is seasonally adjusted.

In addition to the variables in Table 1, the regressions include a time trend (monthly) and dummy variables for quarters (using quarter 1 as the comparison period).

Methodology

Three models are estimated for each of the two sectors. The first consumer staples model (Model 1) is a simple linear regression of the macroeconomic variables on the monthly average XLP closing price:

$$XLPClose_t = \beta_0 + \beta_1 Month_t + \beta_2 Q2_t + \beta_3 Q3_t + \beta_4 Q4_t + \beta_5 UnRate_t + \beta_6 IntRate_t + \beta_7 TradeBal_t + \beta_8 Oil_t + \beta_9 M2_t + \beta_{10} CPI_t + u_t$$

where Month represents the time trend, Q2 through Q4 are quarter indicators , UnRate represents the unemployment rate, IntRate represents the interest rate, TradeBal represents the trade balance, Oil represents the oil prices, M2 represents the M2 money stock, CPI represents the consumer price index, and RDIncome represents the real disposable income. Many macroeconomic variables are believed to have diminishing or increasing effects, therefore, the

model involves quadratic variables. By adding quadratic variables, the model is allowed to be non-linear, which would increase the effectiveness of the model if the data has a curved distribution.

The quadratic consumer staples model (Model 2) includes quadratics to allow for non-linear effects:

$$XLPClose_t = \beta_0 + \beta_1 Month_t + \beta_2 Q2_t + \beta_3 Q3_t + \beta_4 Q4_t + \beta_5 UnRate_t + \beta_6 UnRate^2_t + \beta_7 IntRate_t + \beta_8 IntRate^2_t + \beta_9 TradeBal_t + \beta_{10} Oil_t + \beta_{11} Oil^2_t + \beta_{12} M2_t + \beta_{13} CPI_t + u_t$$

The third and final consumer staples model (Model 3) includes lags the macroeconomic variables by one month to allow for delays in the effects on the asset price:

$$XLYClose_t = \beta_0 + \beta_1 Month_t + \beta_2 Q2_t + \beta_3 Q3_t + \beta_4 Q4_t + \beta_5 UnRate_{t-1} + \beta_6 IntRate_{t-1} + \beta_7 TradeBal_{t-1} + \beta_8 Oil_{t-1} + \beta_9 M2_{t-1} + \beta_{10} CPI_{t-1} + u_t$$

This study will explore which of the three model alternatives appears to be most effective in explaining the price changes in the consumer staples ETF.

The same three model types are used for the consumer discretionary sector. The linear model (Model 4) is:

$$XLYClose_t = \beta_0 + \beta_1 Month_t + \beta_2 Q2_t + \beta_3 Q3_t + \beta_4 Q4_t + \beta_5 UnRate_t + \beta_6 IntRate_t + \beta_7 TradeBal_t + \beta_8 Oil_t + \beta_9 M2_t + \beta_{10} CPI_t + \beta_{11} RDIncome_t + u_t$$

The quadratic consumer discretionary model (Model 5):

$$XLYClose_t = \beta_{0t} + \beta_1 Month_t + \beta_2 Q2_t + \beta_3 Q3_t + \beta_4 Q4_t + \beta_5 UnRate_t + \beta_6 UnRate^2_t + \beta_7 IntRate_t + \beta_8 IntRate^2_t + \beta_9 TradeBal_t + \beta_{10} Oil_t + \beta_{11} Oil^2_t + \beta_{12} M2_t + \beta_{13} CPI_t + \beta_{14} CPI^2_t + \beta_{15} RDIncome_t + \beta_{16} RDIncome^2_t + u_t$$

The final consumer discretionary model (Model 6) lags the macroeconomic variables by one month to allow for delays in the effects on asset price:

$$XLYClose_t = \beta_{0t} + \beta_1 Month_t + \beta_2 Q2_t + \beta_3 Q3_t + \beta_4 Q4_t + \beta_5 UnRate_{t-1} + \beta_6 IntRate_{t-1} + \beta_7 TradeBal_t + \beta_8 Oil_{t-1} + \beta_9 M2_t + \beta_{10} CPI_t + \beta_{11} RDIncome_{t-1} + u_t$$

Again, this study will explore which model best explains the variation in the consumer discretionary closing price. A secondary objective is to determine differences between the key drivers of the prices of consumer staples and consumer discretionary sector ETFs.

Results

The results for the consumer staples sector are reported in Table 2 below. The linear model has a slightly lower adjusted R^2 than the other models but the lowest specification error. The linear regression for the consumer staples ETF shows no significant seasonality, consistent with economic theory in that consumers need to purchase consumer staple products at fairly regular intervals regardless of the quarter. The unemployment rate had a statistically significant negative effect, which is consistent with the theory that consumers can afford more expensive, higher profit margin items and more items overall when they are employed. This results in higher earnings for the consumer staples companies. The interest rate had a positive but statistically insignificant effect on the closing price. The expected effect is negative as consumers typically spend more when interest rates are low because they can obtain cheaper financing to make purchases. Trade balance had a statistically significant positive effect, implying that customers purchase more staples as net exports rises. Oil had an increasing and statistically significant effect, which makes me believe customers buy more consumer staple items and spend less on gasoline to travel places when gasoline becomes more expensive. The M2 money supply had a positive and statistically significant effect as customers spend more money when there is more money being exchanged in the economy. Finally, the CPI had a negative but not statistically

significant (at the 5% significance level) effect on closing prices as consumers tend to spend less money as consumer staples become more expensive.

Table 2: Consumer Staples Regressions

	Consumer Staples Closing Price Model 1	Consumer Staples Closing Price Model 2	Consumer Staples Closing Price Model 3
$Month_t$	.0017 (.0668)	-.0399 (.0914)	.0612 (.0644)
$Q2_t$	-.2047 (.5716)	-.1373 (.5321)	-.3097 (.5619)
$Q3_t$	-.1853 (.5191)	.0658 (.4795)	-.4116 (.5510)
$Q4_t$	.3787 (.5341)	.4302 (.4830)	.3505 (.5428)
Unemployment $Rate_t$	-1.6638 *** (.2638)	-7.7871 *** (2.1631)	---
Unemployment $Rate_t^2$	---	.4384 *** (.1477)	---
Unemployment $Rate_{t-1}$	---	---	-1.7890 (.2443)
Interest $Rate_t$	.8681 (.5661)	2.0969 (2.278)	---
Interest $Rate_t^2$	---	-.1880 (.2572)	---
Interest $Rate_{t-1}$	---	---	1.0565 (.6028)
Trade $Balance_t$	.0002 *** (.0000)	.0001 (.0000)	---
Trade $Balance_{t-1}$			.0002 (.00004)
Oil_t	.1234 *** (.0300)	-.1095 (.1146)	---
Oil_t^2	---	.0012 * (.0007)	---
Oil_{t-1}	---	---	.1363 (.0311)
M2 Money $Supply_t$	.0071 *** (.0018)	.0096 *** (.0027)	---
M2 Money $Supply_t$	----	---	.0076 (.0018)
CPI_t	-.4087 ** (.1631)	-.4240 ** (.1740)	---
CPI_{t-1}	---	---	-.5774 (.1699)
Constant	64.2843 *** (24.0675)	75.4400 *** (28.0204)	89.4786 (24.5207)
R^2	.7735	.7987	.7810
Adjusted R^2	.7590	.7817	.7669
F-statistic	67.65	47.00	55.63

N	168	168	167
Heteroskedasticity F-Statistic	5.46	6.34	4.28
Serial Correlation F-Statistic	311.56	321.08	243.63
RESET Test F-Statistic	.01	.81	.68
Notes: Coefficient estimates derived from ordinary least squares regression of the ETF closing price on the independent variables listed in the first column are the first row of data. The Newey-West standard errors are given in the parentheses for each independent variable. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels respectively.			

The quadratic model had the highest adjusted R^2 and lowest specification error of the three consumer discretionary models as shown in Table 3 below. Consumer discretionary items are those products that consumers buy with their extra spending money. Thus, spending on these items exhibits increasing and decreasing marginal changes in response to macroeconomic variables. This finding is consistent with the theory that consumer spending on discretionary items is not linearly related to the macroeconomic variables as it is for consumer staples items. Furthermore, it does not appear that the lagged model is the best version of the consumer discretionary ETF model as the independent and dependent variables are monthly averages so much of the daily volatility is smoothed out.

There is a statistically significant positive trend from the month variable but no significant seasonality for consumer discretionary. The unemployment rate has a statistically significant but decreasing effect as consumers spend less money on discretionary items when they are unemployed. The interest rate has a statistically significant positive but decreasing effect. This seems counter-intuitive as consumers typically spend more on discretionary spending when interest rates are low because they can obtain cheaper financing. The trade balance had a statistically insignificant (at the 5% significance level) negative effect. Once again, this seems counter-intuitive as prices of goods typically decrease as countries trade more with each other. Oil had a statistically insignificant negative but decreasing effect. As consumers spend more on gasoline, they have less money to spend on discretionary items. The M2 money supply had a

statistically insignificant positive effect as consumers feel more confident purchasing discretionary items when there is a surplus of cash in the economy. The CPI displayed a negative but decreasing effect as consumers buy fewer discretionary items when the price levels are higher. Finally, real disposable income had a positive but decreasing effect as consumers spend more money on discretionary items when their purchasing power is increased.

Table 3: Consumer Discretionary Regressions

	Consumer Disc. Closing Price Model 4	**Consumer Disc. Closing Price Model 5**	**Consumer Disc. Closing Price Model 6**
$Month_t$	.7864 *** (.1486)	.9912 *** (.1598)	.9301 (.1726)
$Q2_t$	-.1136 (.7889)	.3359 (.5271)	-.2105 (.8361)
$Q3_t$	-.7067 (.7095)	-.2487 (.4319)	-1.0203 (.7180)
$Q4_t$	-.4542 (.7718)	-.0328 (.5881)	-1.2537 (.9111)
Unemployment $Rate_t$	-3.6839 *** (.4703)	-8.5370 *** (3.2294)	---
Unemployment $Rate_t^2$	---	.2949 (.2208)	---
Unemployment $Rate_{t-1}$	---	---	-3.701 (.5050)
Interest $Rate_t$	2.4848 *** (.7707)	14.4714 *** (2.5917)	---
Interest $Rate_t^2$	---	-1.4028 *** (.2651)	---
Interest $Rate_{t-1}$	---	---	1.9696 (.7637)
Trade $Balance_t$	-.00006 (.00006)	-.0001 ** (.00006)	-.00008 (.00007)
Oil_t	.1963 *** (.0455)	-.0980 (.1252)	---
Oil_t^2	---	.0011 (.0008)	---
Oil_{t-1}	---	---	.2002 (.0539)
M2 Money $Supply_t$	.0111*** (.0030)	.0056 (.0045)	.0084 (.0031)
CPI_t	-2.1844 *** (.2659)	-11.1060 *** (1.5747)	-2.2294 (.3368)
CPI_t^2	---	.0223 *** (.0039)	---
CPI_{t-1}	---	---	-2.3040*** (.2046)
Real Disposable $Income_t$	-.0086 *** (.0025)	.0995 *** (.0235)	---

Real Disposable Income$_t^2$	---	-.00001 *** (.000001)	---
Real Disposable Income$_{t-1}$	---	---	-.0115 (.0034)
Constant	399.9637 *** (52.6664)	775.6808 *** (97.9131)	444.1782 (61.1128)
R^2	.8141	.8902	.7764
Adjusted R^2	.8010	.8786	.7605
F-statistic	62.10	76.51	48.92
N	168	168	167
Heteroskedasticity F-Statistic	6.18	2.59	3.83
Serial Correlation F-Statistic	167.51	49.78	211.85
RESET Test F-Statistic	7.59	.08	5.13

Notes: Coefficient estimates derived from ordinary least squares regression of the ETF closing price on the independent variables listed in the first column are the first row of data. The Newey-West standard errors are given in the parentheses for each independent variable. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels respectively.

There were a few coefficients with counterintuitive results, such as the positive effect of interest rates for both sectors and the negative effect of trade balance for the consumer discretionary sector. These coefficients may be incorrect as a result of omitted variable bias. In addition, noneconomic variables that affect ETF prices, such as consumer psychology and investor sentiment have also not been taken into account in the models.

RESET Tests

A regression specification error test (RESET) was completed to identify whether the consumer staples and consumer discretionary regressions contained a statistically significant amount of specification error at the 95% confidence level. If the models contained a significant specification error, the forms of the independent variable was adjusted in an attempt to correct the error.

The RESET test was used to try to attempt the best form for the linear, quadratic, and lagged models for both the consumer staples and consumer discretionary ETFs. Through adjustment of the independent variables, three models for consumer staples and one model for consumer discretionary were developed that do not contain a statistically significant amount of

specification error. The two models for the consumer discretionary ETF that contain specification error were adjusted to have the lowest amount of specification error while maintaining the regressions as quadratic and lagged models. The linear, quadratic, and lagged models for consumer staples returned RESET test F-values of .01, .81, and .68 respectively. The linear, quadratic, and lagged models for consumer discretionary returned RESET test F-values of 7.59, .08, and 5.13 respectively.

Heteroskedasticity Tests

Heteroskedasticity tests were conducted for each of the consumer staples and consumer discretionary models. The linear, quadratic, and lagged models for consumer staples returned heteroskedasticity test F-values of 5.46, 6.34, and 4.28 respectively. The linear, quadratic, and lagged models for consumer discretionary returned heteroskedasticity test F-values of 6.18, 2.59, and 3.83 respectively. Based on these numbers, the quadratic regression for the consumer discretionary ETF was the only model to pass the heteroskedasticity test at the 5% significance level. Given these findings, all reported standard errors are the Newey-West heteroskedasticity-robust standard errors.

Serial Correlation Tests

A serial correlation test was conducted at the 95% confidence level to identify whether the standard errors were related through time. If the models displayed a significant amount of serial correlation, the standard errors could be adjusted to correct for this issue.

All of the regressions for both the consumer staples ETF and consumer discretionary ETF failed the serial correlation test. The linear, quadratic, and lagged models for consumer staples returned serial correlation test F-values of 311.56, 321.08, and 243.63 respectively. The linear, quadratic, and lagged models for consumer discretionary returned serial correlation test F-values

of 167.51, 49.78, and 211.85 respectively. Accordingly, the reported standard errors are the Newey-West standard errors, which are valid in the presence of serial correlation.

Stationarity Tests

Dickey-Fuller tests for unit roots in each of our variables fail to reject the presence of a unit root in all of our variables[1] at the 5% level. This raises the possibility of spurious correlation unless the variables are also cointegrated. Using the Engle-Granger two-step test for cointegration, we are able to reject the presence of a unit root in the residuals of each regression at the 5% level (using both 1 and 12 lags). This suggests cointegration in each of the regressions, mitigating concern about spurious correlation.

Conclusion

The macroeconomic variables examined here are useful in explaining variation in historical closing prices of consumer staples and consumer discretionary ETFs. The consumer staples linear model maintains the lowest specification error at .01 followed by the lagged model at .68 and the quadratic model at .81. The quadratic model has the highest adjusted R^2 at .7817, which surpasses the lagged and linear models at .7669 and .7590.

For the consumer discretionary models, the quadratic model boasts the lowest specification error at .08 followed by the lagged and linear models at 5.13 and 7.59 respectively. The quadratic model also has the highest adjusted R^2 at .8786 followed by the linear model at .8010 and the lagged model at .7605.

Neither of the sectors was best explained by the lagged variable model, indicating that markets incorporate macroeconomic information fairly quickly and lagged information is less useful in predicting current prices.

[1] Except, of course, for the quarter indicators.

The goal of this study was to identify models that are effective at explaining past price levels in the consumer staples and consumer discretionary sectors. The models developed suggest that the historical closing prices for the consumer staples and consumer discretionary exchange-traded funds can be explained fairly well by macroeconomic variables. Therefore, these models may help investors understand what drives the price levels in the consumer discretionary and consumer staples sectors and how they can potentially profit from this understanding.

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