

# **FIN 498 – Independent Study**

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**A Two-Factor Portfolio Weighting Model for 6 SPDR Sectors with U.S. Consumer Credit the “State”  
Economic Variable: An Empirical Analysis 2009-2019**

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## II. Study Objectives

### Objectives

- (1) Determine if U.S. Consumer Credit (CCR) is a priced-in risk factor in the equity market
- (2) Determine if CCR shows persistence in generating excess returns over the S&P 500
- Period of analysis: 2009 – 2019

### III. Portfolio Sectors

#### SPDR Sectors

- (1) Consumer Staples (XLP)
- (2) Consumer Discretionary (XLY)
- (3) Industrials (XLI)
- (4) Technology (XLK)
- (5) Healthcare (XLV)
- (6) Financials (XLF)

## IV. Research Design

### Weighting Factors

- (1) Factor 1: U.S. Consumer Credit
- (2) Factor (2): Relative Price Momentum

### Research Design

- (1) Use regression analysis to generate factor 1 weights
- (2) Use year-to-year sector price changes to develop factor 2 weights

### Investment Strategy

- (1) Constant share model
- (2) Adjustable share model

## V. Factor 1

### Portfolio Weighting Algorithm

- Constant share model

#### Factor 1

##### Constant Share Model

- Step 1  $P_i = A_i + B_i(\text{CCR})$
- Step 2  $W_i(t) = B_i / \text{Sum } B_i$
- Step 3  $D_i(t) = W_i(t) * 1,000,000$
- Step 4  $\text{SHRS}_i(t) = D_i(t) / P_i(t)$
- Step 5  $MV_i(t+1) = \text{SHRS}_i(t) * P_i(t+1)$
- Step 6  $PV(t+1) = \text{Sum } MV_i(t+1)$

##### 2nd Iteration

- $MV_i(t+2) = \text{SHRS}_i(t) * P_i(t+2)$
- $PV(t+2) = \text{Sum } MV_i(t+2)$

\* Shares Remain Constant Overtime

#### Nomenclature for Factor 1

##### Constant Share Model

- $P_i$  = Price Index
- $i$  =  $i$  th sector
- $t$  = Time in Months, 2009-2018
- $A, B$  = Equation Parameters
- $\text{CCR}$  = U.S. Consumer Credit (Billions of Dollars)
- $W_i$  = Weight Assigned to Sector  $i$
- 1,000,000 = Original Investment
- $B_i$  = Slope Coefficient
- $D_i$  = Dollar Investment in  $i$
- $\text{SHRS}_i(t)$  = Shares Held in Sector  $i$  at  $t$
- $P_i(t)$  = Index Value at Time  $t$
- $MV_i$  = Market Value of Sector  $i$
- $PV$  = Portfolio Value

## VI. Factor 1 Plus Factor 2

### Portfolio Weighting Algorithm

- Factor 1 plus factor 2 portfolio weighting model
- Adjustable share model

#### Factor 1 Plus Factor 2 (Short-Term Price Momentum)

##### Share Rebalanced Model

- Step 1  $RPM_i(t+1-t) = P_i(t+1) / P_i(t)$   
Step 2  $ARPM(t+1-t) = \text{Sum } RPM_i(t+1-t) / 6$   
Step 3  $PMI_i(t+1) = RPM_i(t+1-t) / ARPM(t+1-t)$   
Step 4  $SHRS_i(t+1) = SHRS_i(t) * PMI_i(t+1)$   
Step 5  $MV_i(t+2) = SHRS_i(t+1) * P_i(t+2)$   
Step 6  $PV(t+2) = \text{Sum } MV_i(t+2)$

#### Nomenclature for Factor 1 Plus Factor 2 (Short-Term Price Momentum)

##### Share Rebalanced Model

- $P_i$  = Price Index for Sector  $i$   
 $RPM$  = Relative Price Momentum Index  
 $ARPM(t+1-t) = \text{Sum } RPM_i(t+1-t) / 6$   
 $PMI_i(t+1)$  = Price Momentum Index Sector  $i$   
 $SHRS_i(t+1)$  = Adjusted Shares for Sector  $i$   
 $MV_i(t+2)$  = Market Value of  $i$  at  $t+2$   
 $PV$  = Portfolio Value for 6 sector Portfolio

## VII. Performance Analysis

### Tables

**Table 1**  
**Factor Model 1 and SPY Cumulative Performance**  
**2009-2019**

Year	Factor 1 Model Cumulative Return	SPY Cumulative Return	Factor Model 1 Alpha
2009	39.87%	29.65%	10.22%
2010	67.70%	55.35%	12.35%
2011	74.61%	58.54%	16.07%
2012	103.80%	80.73%	23.07%
2013	150.06%	115.12%	34.94%
2014	196.40%	140.79%	55.61%
2015	185.07%	133.88%	51.19%
2016	233.68%	174.70%	58.98%
2017	323.33%	240.34%	82.99%
2018	307.41%	225.88%	81.53%
2019	388.61%	288.42%	100.19%

**Table 3**  
**Factor Model 2 and SPY Cumulative Performance**  
**2009-2019**

Year	Factor 2 Model Cumulative Return	SPY Cumulative Return	Factor Model 2 Alpha
2009	39.87%	29.65%	10.22%
2010	73.02%	55.35%	17.66%
2011	78.73%	58.54%	20.19%
2012	107.01%	80.73%	26.28%
2013	154.35%	115.12%	39.23%
2014	203.43%	140.79%	62.63%
2015	186.95%	133.88%	53.07%
2016	241.24%	174.70%	66.54%
2017	338.55%	240.34%	98.21%
2018	330.98%	225.88%	105.09%
2019	430.71%	288.42%	142.29%

Reference: Independent Study (pg. 27 & 33)



## VIII. Questions and Answers