
A Two Factor Portfolio Weighting Model for 6 SPDR
Sectors with Industrial Production the “State”
Economic Variable: An Empirical Analysis 2009-2019

By: Nick Cragon

Davis Center for Portfolio Management

Background

- Study Objective

- 1) Determine if Industrial Production is a priced-in risk factor in the equity markets
- 2) Determine if there is persistence in excess returns over S&P 500 returns

- Research Approach

- 1) Run univariate regressions with Sector Price Indexes (Y) and Industrial Production (X)
- 2) Data Frequency: Monthly
- 3) Time Period: 2009-2019
- 4) Develop sector portfolio weights based on regression slope coefficients
- 5) Generate cumulative portfolio returns: 2009-2019

- Investment Strategy

- 1) Constant Shares Model
- 2) Adjustable Shares Model

Constant Share Model Algorithm

Factor 1

Constant Share Model

Step 1

$$P_i = A_i + B_i(IP)$$

Step 2

$$W_i(t) = B_i / \text{Sum } B_i$$

Step 3

$$D_i(t) = W_i(t) * 1,000,000$$

Step 4

$$SHRS_i(t) = D_i(t) / P_i(t)$$

Step 5

$$M_{vi}(t+1) = SHRS_i(t) * P_i(t+1)$$

Step 6

$$PV(t+1) = \text{Sum } M_{vi}(t+1)$$

2nd Iteration

$$M_{vi}(t+2) = SHRS_i(t) * P_i(t+2)$$

$$PV(t+2) = \text{Sum } M_{vi}(t+2)$$

Nomenclature for Factor 1 - Constant Share Model

P_i = Price Index

i = i^{th} sector

t = Time in Months, 2009-2019

A, B = Equation Parameters

IP = Industrial Production
(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

$SHRS_i(t)$ = 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

Adjusted Shares Model Algorithm

Factor 2

Adjusted Shares Model

- Step 1 $RPM_{li}(t+1) = (P_i(t+1) / P_i(t))$
- Step 2 $ARPM_{li}(t+1) = \text{Sum } RPM_{li}(t+1) / N$
- Step 3 $RPM_{Wi}(t+1) = RPM_{li}(t+1) / ARPM_{li}(t+1)$
- Step 4 $ADSHRS_i(t+1) = RPM_{Wi}(t+1) * SHRS_i(t)$
- Step 5 $M_{vi}(t+2) = ADSHRS_i(t+1) * P_i(t+2)$
- Step 6 $PV(t+2) = \text{Sum } M_{Vi}(t+2)$

Nomenclature for Factor 2 - Adjusted Shares Model

P_i = Price Index

RPMI = Relative Price

Momentum Index

ARPMI = Average RPM Index

RPMW = Relative Price

Momentum Weight

ADSHRS $_i$ = Adjusted Shares
for Sector i

M_{vi} = Market Value of i^{th}
sector

PV = Portfolio Value for 6
sector Portfolio

(Note ASM run in logs and
NM logs)

Cumulative Returns of CSM

Table 1

IP Factor Weighting Constant Shares Model			
Cumulative Return Alpha			
vs SPY 2009 - 2019			
Year	IP Model CR	SPY CR	IP Alpha vs SPY
2009	23.6%	27.5%	-3.8%
2010	46.9%	43.8%	3.1%
2011	58.8%	43.6%	15.3%
2012	61.3%	62.9%	-1.6%
2013	93.6%	111.3%	-17.6%
2014	120.2%	135.1%	-14.9%
2015	130.2%	133.2%	-3.0%
2016	169.2%	155.7%	13.5%
2017	251.8%	205.3%	46.5%
2018	244.5%	185.9%	58.6%
2019	352.9%	214.3%	138.6%

Cumulative Returns of ASM

Table 3

IP Factor Weighting Adjustable Shares Model			
Cumulative Return Alpha			
vs SPY 2009 - 2019			
Year	RB Model CR	SPY CR	RB Alpha vs SPY
2009	23.7%	27.5%	-3.8%
2010	48.7%	43.8%	4.8%
2011	64.0%	43.6%	20.5%
2012	89.8%	62.9%	26.9%
2013	138.7%	111.3%	27.4%
2014	186.7%	135.1%	51.6%
2015	182.1%	133.2%	48.9%
2016	224.6%	155.7%	68.9%
2017	311.6%	205.3%	106.3%
2018	322.6%	185.9%	136.7%
2019	404.9%	214.3%	190.6%

Comparing Returns of Both Models

Table 5

IP Factor Weighting Model Cumulative Returns vs. SPY End of 2009-2019 Time Period			
Investment Strategy	IP Model	SPY	Alpha vs. SPY
CSM	352.9%	214.3%	138.6%
ASM	404.9%	214.3%	190.6%

Q&A