SIM Fund UG1 Investment Performance Final Presentation

Prepared by the Undergraduate 1 Student Investment Management Fund
Presented by Connor Smith and Joseph Haverkamp

Under the designation of Dr. Wahal
Friday April 26th, 2024

Team Introduction



Connor Smith
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Ryan Davitt (Manager)

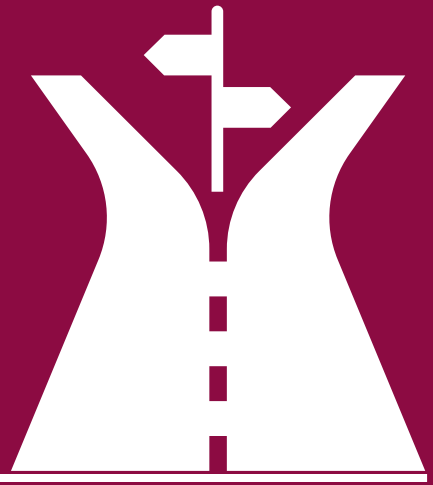



Wesley Knowlton
Caleb Dudas
Tomas Echeverri
Nathan Brunk

Agenda

- Investment Strategy Review
- Portfolio Performance
- Lessons Learned

Our Path to an Investment Strategy



Valuation Identity

Expected Profitability

Expected Investment

$$M_t = \frac{\sum_{\tau=1}^{\infty} E(Y_{t+\tau} - dB_{t+\tau})}{(1+r)^{\tau}} \rightarrow \frac{M_t}{B_t} = \frac{\sum_{\tau=1}^{\infty} E(Y_{t+\tau} - dB_{t+\tau})}{B_t(1+r)^{\tau}}$$

Value

Equity Duration

1 $$Macaulay\ Duration = \sum_{i}^{n} t_i \frac{PV}{V}$$

- Duration calculated through expected cash flows, investment value, and discount rate

Source: Gonçalves (2021)

Equity Duration

- Duration calculated through expected cash flows, investment value, and discount rate
- Equity duration equation derived from bond duration formula

1 $$Macaulay\ Duration = \sum_{i}^{n} t_i \frac{PV}{V}$$

2 $$Equity\ Duration = \sum_{h=1}^{\infty} w_{j,t}^{(h)} h$$

Source: Gonçalves (2021)

Equity Duration

- Duration calculated through expected cash flows, investment value, and discount rate
- Equity duration equation derived from bond duration formula
- Equity duration makes use of same variables as bond duration

1 $$Macaulay\ Duration = \sum_{i}^{n} t_i \frac{PV}{V}$$

2 $$Equity\ Duration = \sum_{h=1}^{\infty} w_{j,t}^{(h)} h$$

3 $$w = \frac{E_t[CF_{j,t+h}] \cdot e^{-h \cdot dr_{j,t}}}{V_{j,t}}$$

Source: Gonçalves (2021)

Cash Flows, Discount Rates & Horizons

$$4\ \frac{E_t[PO_{j,t+h}]}{BE_{j,t}} = E_t\left[\left(e^{CSprof_{j,t\_h} - BEg_{j,t+h}} - 1\right) \cdot e^{\sum_{\tau=1}^{h} BEg_{j,t+\tau}}\right]$$

- Cash flows are a function of value, profit, growth, and leverage

Source: Gonçalves (2021)

Cash Flows, Discount Rates & Horizons

- Cash flows are a function of value, profit, growth, and leverage
- Eq. 5 is vector autoregression predicting future value of state variables with previous period

$$4 \quad \frac{E_t[PO_{j,t+h}]}{BE_{j,t}} = E_t\left[\left(e^{CSprof_{j,t\_h} - BEg_{j,t+h}} - 1\right) \cdot e^{\sum_{\tau=1}^{h} BEg_{j,t+\tau}}\right]$$

$$5 \quad \begin{aligned} Y_{1,t} &= \alpha_1 + \beta_{11,1} Y_{1,t-1} + \beta_{12,1} Y_{2,t-1} + \epsilon_{1,t} \\ Y_{2,t} &= \alpha_2 + \beta_{21,1} Y_{1,t-1} + \beta_{22,1} Y_{2,t-1} + \epsilon_{2,t} \end{aligned}$$

Source: Gonçalves (2021)

Cash Flows, Discount Rates & Horizons

- Cash flows a function of value, profit, growth, and leverage
- Eq. 5 is vector autoregression predicting future value of state variables with previous period
- Rewrite Eq. 4 with CF from VAR & substitute into Eq. 2 to solve

4 $$\frac{E_t[PO_{j,t+h}]}{BE_{j,t}} = E_t\left[\left(e^{CSprof_{j,t\_h} - BEg_{j,t+h}} - 1\right) \cdot e^{\sum_{\tau=1}^{h} BEg_{j,t+\tau}}\right]$$

5 $$\begin{aligned} Y_{1,t} &= \alpha_1 + \beta_{11,1} Y_{1,t-1} + \beta_{12,1} Y_{2,t-1} + \epsilon_{1,t} \\ Y_{2,t} &= \alpha_2 + \beta_{21,1} Y_{1,t-1} + \beta_{22,1} Y_{2,t-1} + \epsilon_{2,t} \end{aligned}$$

$$\frac{BE_{j,t}}{ME_{j,t}} \cdot \sum_{h=1}^{\infty} h \cdot \left[e^{(1_{CSprof} - 1_{BEg})' \Gamma^h s_{j,t} + v_1(h)} - 1\right] \cdot e^{1'_{BEg}(\sum_{\tau=1}^{h} \Gamma^\tau) \cdot s_{j,t} + h \cdot v_2(h) - h \cdot dr_{j,t}}$$

Source: Gonçalves (2021)

Alphas & Betas of Duration Deciles

Duration	CAPM		Fama and French (2015) 5-factors					
decile	α_{CAPM}	β_{MKT}	α_{FF}	β_{MKT}	β_{SMB}	β_{HML}	β_{CMA}	β_{RMW}
						Value-weighted portfolios		
Short	5.1%	0.97	0.4%	0.99	0.67	0.33	0.14	0.21
2	4.6%	0.94	1.3%	0.95	0.46	0.19	0.09	0.19
3	5.4%	0.97	1.8%	1.01	0.37	0.17	0.11	0.32
4	4.8%	0.93	2.6%	0.97	0.17	0.14	0.08	0.15
5	4.3%	0.95	2.5%	0.98	0.12	−0.09	0.30	0.14
6	2.2%	0.91	0.6%	0.95	0.08	−0.10	0.22	0.19
7	1.1%	0.95	0.3%	0.97	0.00	−0.08	0.08	0.19
8	−0.2%	1.02	0.2%	1.02	−0.06	−0.16	0.13	−0.02
9	−2.6%	1.10	−3.0%	1.11	0.03	−0.10	0.04	0.14
Long	−4.9%	1.25	−4.1%	1.20	0.13	−0.14	−0.05	−0.04
L-S	−10.0%	0.28	−4.4%	0.21	−0.55	−0.47	−0.19	−0.25
(t_{L-S})	(−3.78)	(4.20)	(−2.49)	(2.98)	(−4.62)	(−2.77)	(−1.20)	(−2.39)

Source: Gonçalves (2021)

Alphas & Betas of Duration Deciles

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Long	−4.9%	1.25	−4.1%	1.20	0.13	−0.14	−0.05	−0.04
L-S	−10.0%	0.28	−4.4%	0.21	−0.55	−0.47	−0.19	−0.25
(t_{L-S})	(−3.78)	(4.20)	(−2.49)	(2.98)	(−4.62)	(−2.77)	(−1.20)	(−2.39)

Value

Profitability

Source: Gonçalves (2021)

Measuring Value and Profitability

Value Statistics	Book-to-Market	$bm_{j,t} = \log\left(\frac{BE_{j,t}}{ME_{j,t}}\right)$
	Payout Yield	$POy_{j,t} = \log\left(\frac{1 + PO_{j,t}}{ME_{j,t}}\right)$
	Sales Yield	$Yy_{j,t} = \log\left(\frac{Y_{j,t}}{ME_{j,t}}\right)$
Profitability Statistics	Clean Surplus Earnings	$CSprof_{j,t} = \log\left(1 + \frac{CSE_{j,t}}{BE_{j,t-1}}\right)$
	Return on Equity	$ROE_{j,t} = \log\left(1 + \frac{E_{j,t}}{0.5BE_{j,t} + 0.5BE_{j,t-1}}\right)$
	Gross Profitability	$Gprof_{j,t} = \log\left(1 + \frac{GP_{j,t}}{0.5A_{j,t} + 0.5A_{j,t-1}}\right)$

Source: Gonçalves (2021)

What happened?

Challenges and Pivot to Value-Profitability

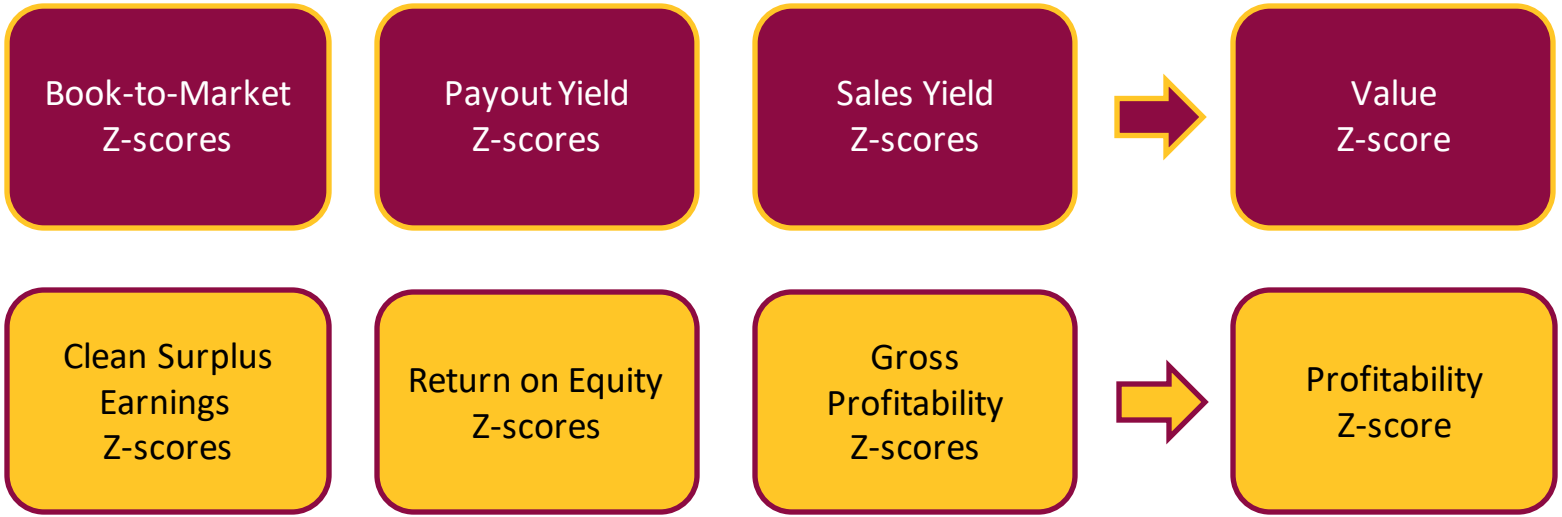
- In December, team had working vector autoregression (VAR)
- Couldn't estimate discount rates
  - Integrate VAR with root-finding algorithm
  - Implement $v_{1,2}(h)$ parameters
- Pivoted when progress ceased in January

```
# Iterate through the last 13 columns
for column in columns_to_test:
    if test_stationarity(filtered_df[column]):
        print(f'{column} is stationary')
    else:
        print(f'{column} could not be tested for stationarity')
        columns_to_difference.append(column)

# Difference the columns that could not be tested and retest for stationarity
for column in columns_to_difference:
    filtered_df[column + '_diff'] = filtered_df[column].diff()
    if test_stationarity(filtered_df[column + '_diff']):
        print(f'{column}_diff is stationary after differencing')
    else:
        print(f'{column}_diff is still not stationary after differencing')

# Drop the original columns
data1 = filtered_df.drop(columns=columns_to_difference)


# this is the gamma matrix
gamma_matrix = results.params
cov_matrix = results.resid.cov()


print(gamma_matrix)
print(cov_matrix)

```

Source: SIM Fund analysis

Constructing the Value-Profitability Portfolio

Calculating Metrics



Value-Profitability Industry Weights - Initial

GICS Sector	Value Profitability Z Score	Russell 3000 Weight	+	Portfolio Tilt	=	Portfolio Weight
Energy	0.57	4.71%		5.00%		9.71%
Consumer Staples	0.26	6.14%		5.00%		11.14%
Industrials	0.14	9.23%		5.00%		14.23%
Materials	0.30	2.46%		0.34%		2.80%
Communication Services	0.03	8.10%		0.00%		8.10%
Financials	-0.22	12.66%		0.00%		12.66%
Consumer Discretionary	0.53	10.69%		0.00%		10.69%
Information Technology	-0.25	27.60%		-5.00%		22.60%
Health Care	-0.52	13.07%		-5.00%		8.07%
Utilities	-0.19	2.43%		-2.43%		0.00%
Real Estate	0.17	2.91%		-2.91%		0.00%

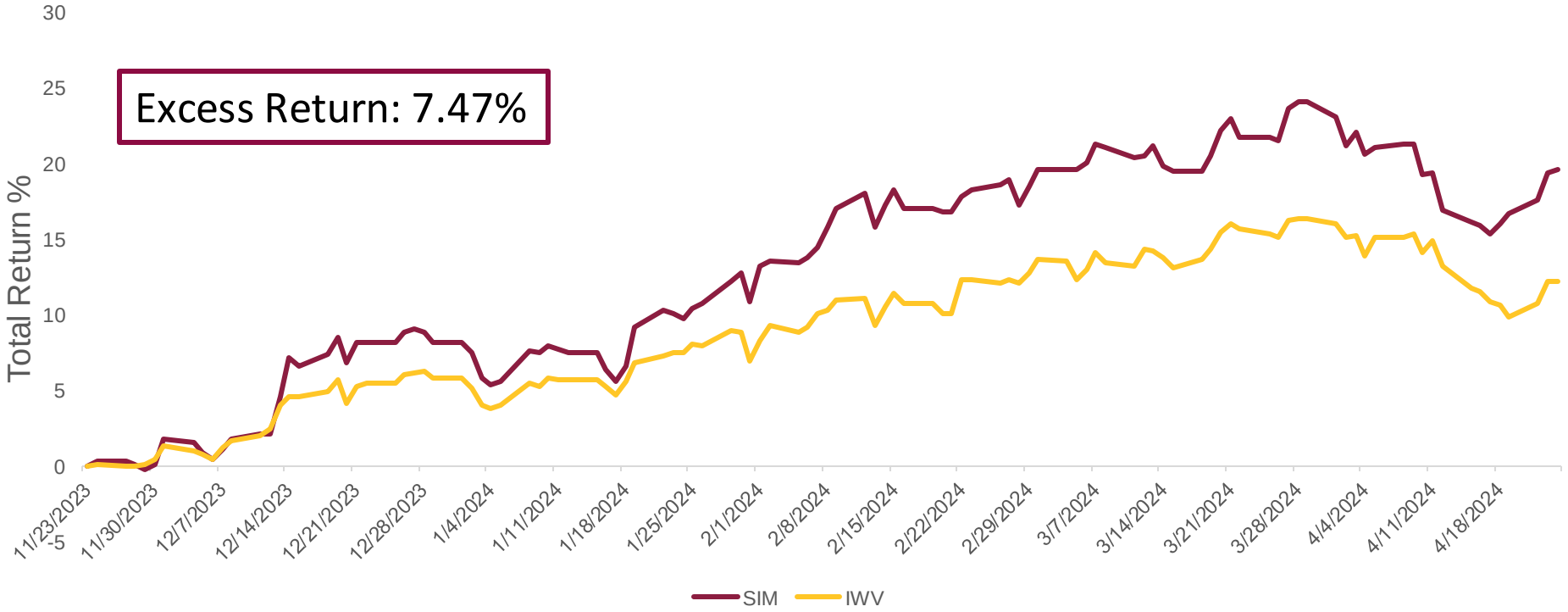
Source: SIM Fund analysis

Performance of the Value-Profitability Portfolio

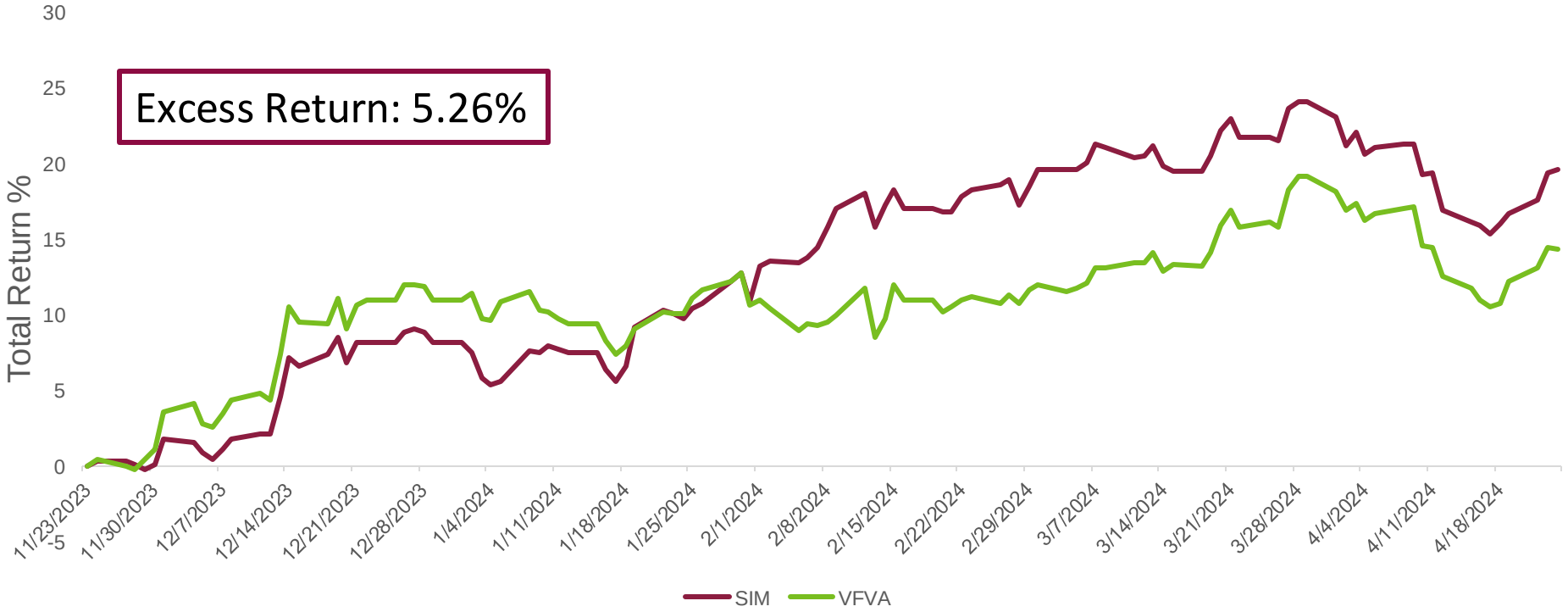
Establishing Benchmarks

Benchmark	Reasoning
IWV (iShares Russell 3000)	Performance of our investable universe; Primary Benchmark
VFVA (Vanguard Value ETF)	Benchmark against performance of value factor
DUHP (Dimensional U.S. Profitability ETF)	Track performance against profitability factor
AVLV AVUV 80/20 Blend	Lowest tracking error. AVLV tracks large cap, AVUV tracks small cap value and profitability stocks

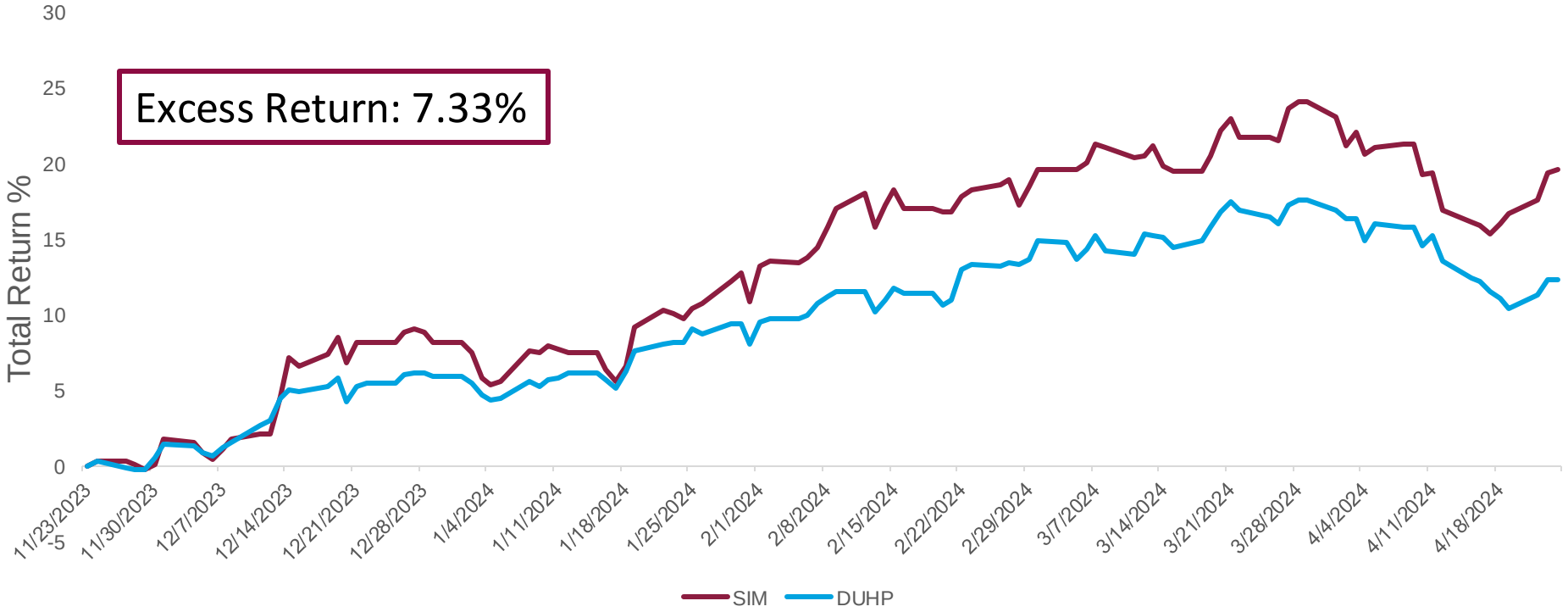
Portfolio vs IWV Inception to Date



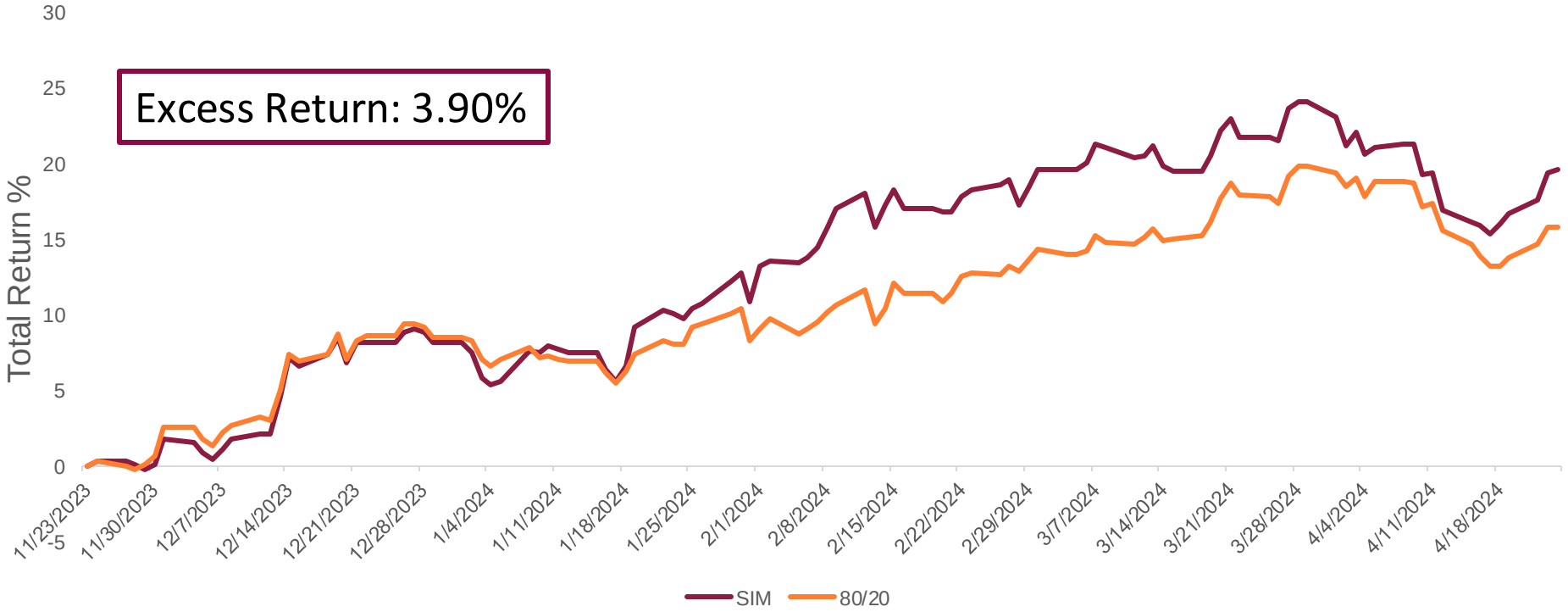
Portfolio vs VFVA Inception to Date



Portfolio vs DUHP Inception to Date



Portfolio vs AVANTIS 80/20 Inception to Date



Average Portfolio Weightings

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GICS Sector	Russell 3000 Weight %	+	Portfolio Tilt %	=	Portfolio Weight %
Energy	4.00		5.83		9.83
Consumer Staples	5.66		5.34		11.00
Industrials	9.86		4.34		14.20
Materials	2.64		3.06		5.70
Communication Services	8.23		-0.16		8.07
Financials	13.62		0.04		13.66
Consumer Discretionary	10.62		-2.94		7.68
Information Technology	27.56		-5.35		22.21
Health Care	12.58		-4.93		7.65
Utilities	2.20		-2.20		0.00
Real Estate	2.83		-2.83		0.00

Attribution - Sectors

GICS Sector	Return %	Contribution %	Total Attribution %
Energy	33.49	2.64	1.83
Consumer Staples	14.64	1.38	0.66
Industrials	14.65	1.13	-0.55
Materials	37.15	0.31	-0.21
Communication Services	12.41	0.32	-1.02
Financials	21.91	1.99	0.64
Consumer Discretionary	5.38	-0.07	-0.36
Information Technology	47.02	5.06	3.01
Health Care	-7.15	-0.73	-1.02
Utilities	0.00	0.00	0.00
Real Estate	0.00	0.00	0.00

Special Instances and Breakout Performance

Security Impact Within Portfolio

The Good

- **Super Micro Computer**
- Builders FirstSource
- Marathon Petroleum
- News Corp

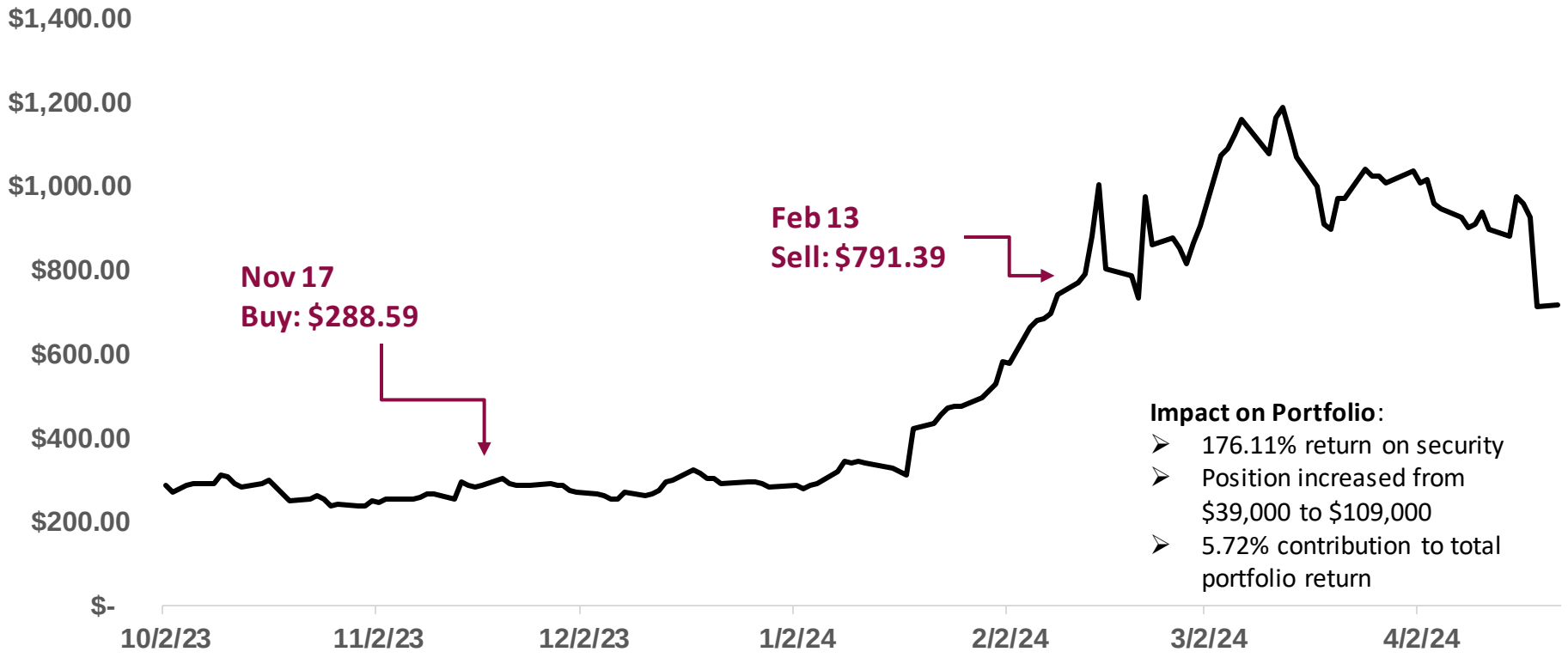
The Bad

- **Avis Budget Group**
- Perficient
- Hertz Car Rental
- AMN Healthcare Services

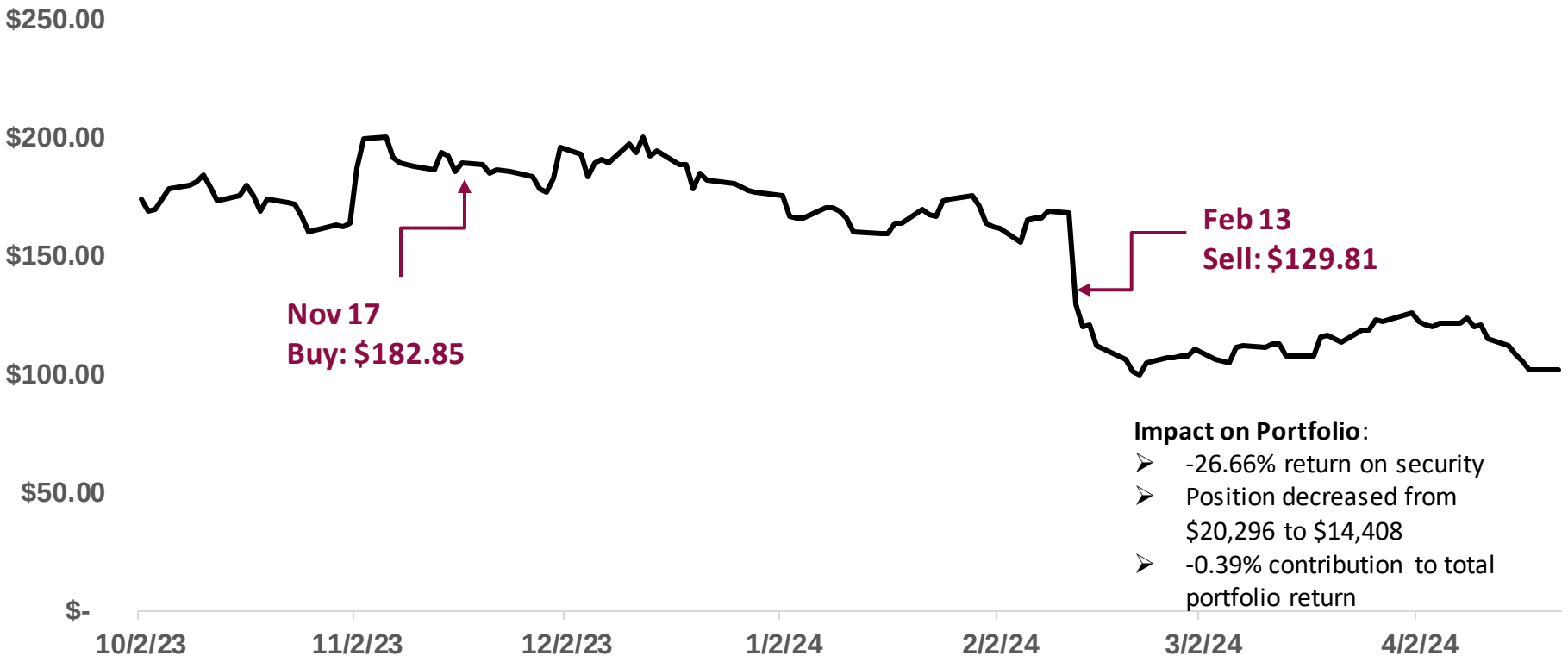
The M&A

- **Macy's**
- Discover Financial Services
- Chesapeake Energy
- Kroger & Albertsons

The Good - Super Micro Computers



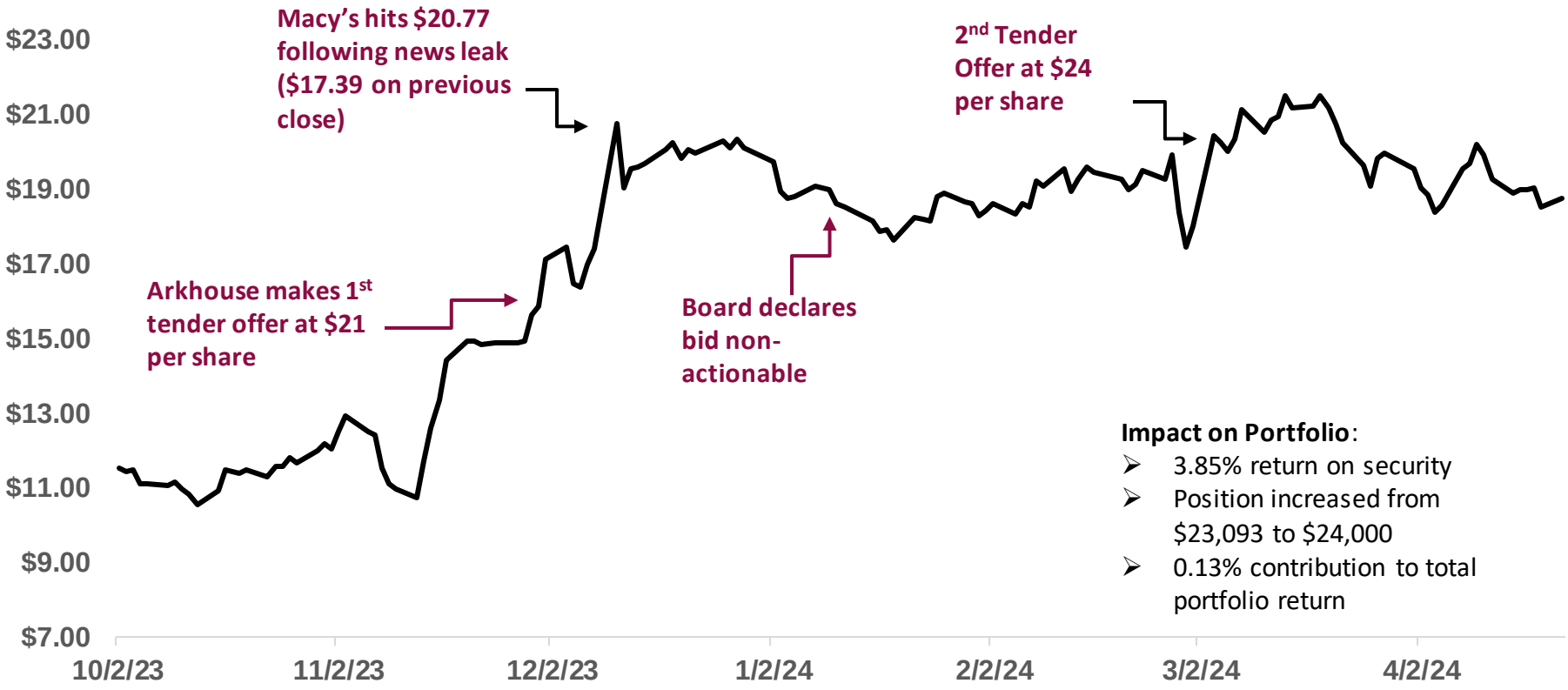
The Bad - AVIS Budget Group



Impact on Portfolio:

- -26.66% return on security
- Position decreased from $20,296 to $14,408
- -0.39% contribution to total portfolio return

Macy's – Acquisition Bid



Impact on Portfolio:

- 3.85% return on security
- Position increased from $23,093 to $24,000
- 0.13% contribution to total portfolio return

Why We Chose to Exit

Strong Anti-Takeover Provisions

Uncertainty in Market Conditions

No Potential White Knights Bidders

Since Exiting

Macy's Board declined $24 tender offer

Arkhouse awarded 2 seats to work on offer consideration

Macy's currently trades at $18.74 (Exited $19.69)

Lessons & Takeaways

Thank You
Questions?

Appendix

Portfolio Constraints

- No more than 10% of the funds market value may be invested in the stock of any one company
- Minimum of 30 securities must be maintained by portfolio
- Portfolio sector weights cannot deviate more than 7.5% from the sector weights of the Russell 3000
- No more than 25% of the funds market value may be invested in a particular industry group or sector
- Minimum average daily volume of 5000 shares
- Companies must have market cap of at least $1 billion at time of purchase

Ranking Securities

Security	Value Z-Score	Rank	Profitability Z-Score	Rank	Combined Rank	Security Rank
Security 1	4.5	1	-.01	1600	1601	200
Security 2	.5	300	.6	200	500	1
Security 3	.02	1000	.03	1200	2200	400

Source: SIM Fund analysis

Security Selection

- # of securities within sector were determined by sector weight
- Sectors that did not meet diversification standards gained a security
- Securities were market-cap weighted within their sectors

Value-Profitability Portfolio Initial Investments

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Communication Services	Portfolio Weight	Position	shares
NEWS CORPORATION (XNAS:NWS)	6.83%	$42,596.08	1829.728719
CARGURUS, INC. (XNAS:CARG)	1.27%	$7,940.39	367.440359
Consumer Discretionary			
AUTONATION, INC. (XNYS:AN)	3.87%	$24,145.51	182.120342
LEVI STRAUSS & CO. (XNYS:LEVI)	4.16%	$25,956.91	1700.977055
GROUP 1 AUTOMOTIVE, INC. (XNYS:GPI)	2.66%	$16,593.24	59.20447579
Consumer Staples			
INGLES MARKETS, INCORPORATED (XNAS:IMKTA)	0.38%	$2,348.81	29.30146076
PERFORMANCE FOOD GROUP COMPANY (XNYS:PFGC)	2.46%	$15,359.90	240.03593
CENTRAL GARDEN & PET COMPANY (XNAS:CENT)	0.49%	$3,058.97	76.24544333
THE KROGER CO. (XNYS:KR)	7.81%	$48,735.57	1109.644205
Energy			
PBF ENERGY INC. (XNYS:PBF)	0.74%	$4,641.39	102.5381756
HF SINCLAIR CORPORATION (XNYS:DINO)	1.31%	$8,152.93	150.7567802
MARATHON PETROLEUM CORPORATION (XNYS:MPC)	7.66%	$47,787.06	318.60162
Financials			
PROG Holdings, Inc (XNYS:PRG)	0.37%	$2,303.43	84.09732126
FIRST CITIZENS BANCSHARES, INC. (XNAS:FCNCA)	6.28%	$39,190.27	27.51468553
ROCKET COMPANIES, INC. (XNYS:RKT)	5.57%	$34,777.98	3727.543862
MERCHANTS BANCORP (XNAS:MBIN)	0.44%	$2,714.95	81.31042194

Health Care	Portfolio Weight	Position	Shares
SURGERY PARTNERS, INC. (XNAS:SGRY)	5.05%	$31,499.12	983.4255127
GOODRX HOLDINGS, INC. (XNAS:GDRX)	3.02%	$18,850.18	3157.483996
Industrials			
AVIS BUDGET GROUP, INC. (XNAS:CAR)	3.21%	$20,002.84	111.8164178
BUILDERS FIRSTSOURCE, INC. (XNYS:BLDR)	8.12%	$50,691.64	380.939688
Matson, Inc. (XNYS:MATX)	1.64%	$10,229.11	107.8450753
HERTZ GLOBAL HOLDINGS, INC. (XNAS:HTZ)	1.26%	$7,858.38	950.2278121
Information Technology			
ARROW ELECTRONICS, INC. (XNYS:ARW)	2.80%	$17,459.79	146.5362314
AVNET, INC. (XNAS:AVT)	1.82%	$11,384.20	244.8214649
JABIL INC. (XNYS:JBL)	7.25%	$45,238.06	346.1743072
SUPER MICRO COMPUTER, INC. (XNAS:SMCI)	6.60%	$41,198.57	144.2476326
PC CONNECTION, INC. (XNAS:CNXN)	0.68%	$4,240.72	71.08146568
VISHAY INTERTECHNOLOGY, INC. (XNYS:VSH)	1.34%	$8,365.33	374.287876
INSIGHT ENTERPRISES, INC. (XNAS:NSIT)	2.10%	$13,116.32	88.14141031
Materials			
ALPHA METALLURGICAL RESOURCES, INC. (XNYS:AMR)	2.80%	$17,469.40	63.26511894
Real Estate			
EXP WORLD HOLDINGS, INC. (XNAS:EXPI)	0.00%	$0.00	0
FORESTAR GROUP INC. (XNYS:FOR)	0.00%	$0.00	0
NEWMARK GROUP, INC. (XNAS:NMRK)	0.00%	$0.00	0
Utilities			
CLEARWAY ENERGY, INC. (XNYS:CWEN)	0.00%	$0.00	0
NRG ENERGY, INC. (XNYS:NRG)	0.00%	$0.00	0
NORTHWEST NATURAL HOLDING COMPANY (XNYS:NWN)	0.00%	$0.00	0

Source: SIM Fund analysis

Value-Profitability Portfolio Final Investments

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Communication Services	Portfolio Weight	Position	Shares
SCHOLASTIC CORPORATION (XNAS:SCHL)	0.84%	$ 12,341.28	336
JOHN WILEY & SONS, INC. (XNYS:WLY)	0.88%	$ 13,010.82	339
SHUTTERSTOCK, INC. (XNYS:SSTK)	0.86%	$ 12,659.92	296
COMCAST CORPORATION (XNAS:CMCSA)	3.00%	$ 44,311.42	1102
THE INTERPUBLIC GROUP OF COMPANIES, INC. (XNYS:IPG)	1.31%	$ 19,279.60	614
FOX CORPORATION (XNAS:FOX)	1.42%	$ 20,956.65	715
Consumer Discretionary			
WYNDHAM HOTELS & RESORTS, INC. (XNYS:WH)	3.00%	$ 44,327.36	616
AUTONATION, INC. (XNYS:AN)	3.00%	$ 44,346.56	278
THE ODP CORPORATION (XNAS:ODP)	2.30%	$ 34,030.00	664
VICTORIA'S SECRET & CO. (XNYS:VSCO)	1.95%	$ 28,815.96	1641
SONIC AUTOMOTIVE, INC. (XNYS:SAH)	2.21%	$ 32,665.68	639
V.F. CORPORATION (XNYS:VFC)	3.00%	$ 44,308.89	3411
Consumer Staples			
WEIS MARKETS, INC. (XNYS:WMK)	0.12%	$ 1,801.52	28
DOLLAR GENERAL CORPORATION (XNYS:DG)	1.41%	$ 20,758.20	145
FLOWERS FOODS, INC. (XNYS:FLO)	0.28%	$ 4,079.89	163
CAL-MAINE FOODS, INC. (XNAS:CALM)	0.17%	$ 2,529.26	43
TARGET CORPORATION (XNYS:TGT)	3.00%	$ 44,311.12	268
INGLES MARKETS, INCORPORATED (XNAS:IMKTA)	0.11%	$ 1,610.84	22
PERFORMANCE FOOD GROUP COMPANY (XNYS:PFGC)	0.51%	$ 7,563.51	109
Energy			
CVR ENERGY, INC. (XNYS:CVI)	0.09%	$ 1,376.37	41
VALERO ENERGY CORPORATION (XNYS:VLO)	1.50%	$ 22,211.00	133
MARATHON PETROLEUM CORPORATION (XNYS:MPC)	1.96%	$ 28,875.30	145
PBF ENERGY INC. (XNYS:PBF)	0.19%	$ 2,744.64	48
Financials			
BREAD FINANCIAL HOLDINGS, INC. (XNYS:BFH)	1.43%	$ 21,069.29	593
SYNCHRONY FINANCIAL (XNYS:SYF)	3.00%	$ 44,299.68	984
NERDWALLET, INC. (XNAS:NRDS)	1.15%	$ 17,034.88	1238
ENOVA INTERNATIONAL, INC. (XNYS:ENVA)	1.42%	$ 20,968.20	330
OneMain Holdings, Inc. (XNYS:OMF)	3.00%	$ 44,280.53	863
PROG Holdings, Inc (XNYS:PRG)	1.34%	$ 19,826.96	556
THE WESTERN UNION COMPANY (XNYS:WU)	2.56%	$ 37,807.38	2782

Health Care	Portfolio Weight	Position	Shares
Patterson Companies, Inc. (XNAS:PDCO)	0.51%	$ 7,539.84	288
AMN HEALTHCARE SERVICES, INC. (XNYS:AMN)	0.50%	$ 7,320.32	128
CONMED CORPORATION (XNYS:CNMD)	0.49%	$ 7,281.04	104
CENTENE CORPORATION (XNYS:CNC)	3.00%	$ 44,266.39	581
HUMANA INC. (XNYS:HUM)	3.00%	$ 44,237.20	140
Industrials			
MILLERKNOLL, INC. (XNAS:MLKN)	1.26%	$ 18,581.55	733
HERTZ GLOBAL HOLDINGS, INC. (XNAS:HTZ)	1.25%	$ 18,420.80	3176
WABASH NATIONAL CORPORATION (XNYS:WNC)	1.07%	$ 15,799.74	647
UNITED AIRLINES HOLDINGS, INC. (XNAS:UAL)	3.00%	$ 44,295.47	841
HUB GROUP, INC. (XNAS:HUBG)	1.44%	$ 21,274.68	532
MDU RESOURCES GROUP, INC. (XNYS:MDU)	2.11%	$ 31,232.85	1265
BUILDERS FIRSTSOURCE, INC. (XNYS:BLDR)	3.00%	$ 44,245.53	237
MANPOWERGROUP INC. (XNYS:MAN)	1.77%	$ 26,136.90	339
Information Technology			
PERFICIENT, INC. (XNAS:PRFT)	1.42%	$ 20,966.85	465
ARROW ELECTRONICS, INC. (XNYS:ARW)	3.00%	$ 44,270.26	347
AVNET, INC. (XNAS:AVT)	2.95%	$ 43,577.40	885
DXC TECHNOLOGY COMPANY (XNYS:DXC)	2.63%	$ 38,821.38	1846
JABIL INC. (XNYS:JBL)	3.00%	$ 44,248.32	368
ADEIA INC. (XNAS:ADEA)	1.17%	$ 17,298.36	1686
InterDigital, Inc. (XNAS:IDCC)	1.93%	$ 28,502.76	286
VISHAY INTERTECHNOLOGY, INC. (XNYS:VSH)	2.21%	$ 32,662.48	1466
BELDEN INC. (XNYS:BDC)	2.38%	$ 35,214.75	423
SANMINA CORPORATION (XNAS:SANM)	2.41%	$ 35,639.48	578
INSIGHT ENTERPRISES, INC. (XNAS:NSIT)	3.00%	$ 44,246.40	240
PC CONNECTION, INC. (XNAS:CNXN)	1.49%	$ 22,028.22	339
Materials			
ARCH RESOURCES, INC. (XNYS:ARCH)	0.46%	$ 6,847.32	43
GREIF, INC. (XNYS:GEF.B)	0.47%	$ 6,928.20	108
Olin Corporation (XNYS:OLN)	1.01%	$ 14,912.67	281
ALPHA METALLURGICAL RESOURCES, INC. (XNYS:AMR)	0.66%	$ 9,729.30	30

Source: SIM Fund analysis

Attribution – Sector Contribution to Return

ASU W. P. Carey School of Business
Arizona State University

	Avg % Wgt			Return (%)	Contribution (%)	Allocation Effect (%)	Selection Eff. (%)	Tot Attr
SIM FUND	Port	Bench	+/-	Port	Port			
	100.00	100.00	0.00	16.70	16.70	-3.13	6.44	3.31
Not Classified	28.80	0.21	28.58	10.54	4.69	-4.71	4.59	-0.12
Information Technology	15.81	27.56	-11.75	47.02	5.06	-0.19	3.20	3.01
Industrials	10.11	9.86	0.25	14.65	1.13	0.08	-0.63	-0.55
Financials	9.73	13.62	-3.89	21.91	1.99	-0.13	0.77	0.64
Consumer Staples	7.83	5.66	2.17	14.64	1.38	-0.08	0.74	0.66
Energy	7.00	4.00	3.00	33.49	2.64	0.92	0.91	1.83
Communication Services	5.75	8.23	-2.48	12.41	0.32	-0.16	-0.86	-1.02
Consumer Discretionary	5.47	10.62	-5.15	5.38	-0.07	0.20	-0.55	-0.36
Health Care	5.45	12.58	-7.13	-7.15	-0.73	0.13	-1.16	-1.02
Materials	4.06	2.64	1.42	37.15	0.31	0.37	-0.58	-0.21
Utilities		2.20	-2.20			0.18	0.00	0.18
Real Estate		2.83	-2.83			0.25	0.00	0.25

Source: SIM Fund analysis

Vanguard US Value Factor ETF

Advisor uses a rules-based quantitative model to evaluate U.S. common stocks.
Fund invests in stocks with relatively lower market valuations relative to fundamentals.
The portfolio includes a diverse mix of stocks representing many different market capitalizations, market sectors, and industry groups and seeks long-term capital appreciation.
Fund Portfolio Turnover Rate of 24% over average value during latest fiscal year
The Value factor is measured by book value/price, forward earnings/price, operating cash flows/price (for non-financials only).

Source: VFVA Summary Prospectus

Dimensional US High Profitability ETF

Purchases marketable securities of large U.S. companies that the Advisor determines to have high profitability relative to other U.S. large cap companies.

A security is considered to have high profitability because it has high earnings or profits from operations in relation to its book value or assets.

May emphasize certain stocks, including smaller capitalization companies, lower relative price stocks, and/or higher profitability stocks compared to representation in large-cap, high profitability segment of the U.S. market.

Source: DUHP Summary Prospectus

Avantis US Small Cap Value ETF

Invests in U.S. **small-cap** companies and is designed to increase expected returns by focusing on firms trading at what we believe are **low valuations with higher profitability ratios**.

Seeks to identify differences in expected returns among securities and overweigh securities with higher expected returns based on current market information.

Profitability-to-book ratio measures company's profitability relative to book value. Profitability is generally calculated by subtracting operating expenses from gross profit. Book value is a firm's reported assets minus its liabilities on its balance sheet.

Source: AVUV Fact Sheet

Avantis US Large Cap Value ETF

Invests in broad set of U.S. **large-cap** companies and is designed to increase expected returns by focusing on firms trading at what we believe are **low valuations with higher profitability ratios**.

Seeks to identify differences in expected returns among securities and overweigh securities with higher expected returns based on current market information.

Profitability-to-book ratio measures company's profitability relative to book value. Profitability is generally calculated by subtracting operating expenses from gross profit. Book value is a firm's reported assets minus its liabilities on its balance sheet.

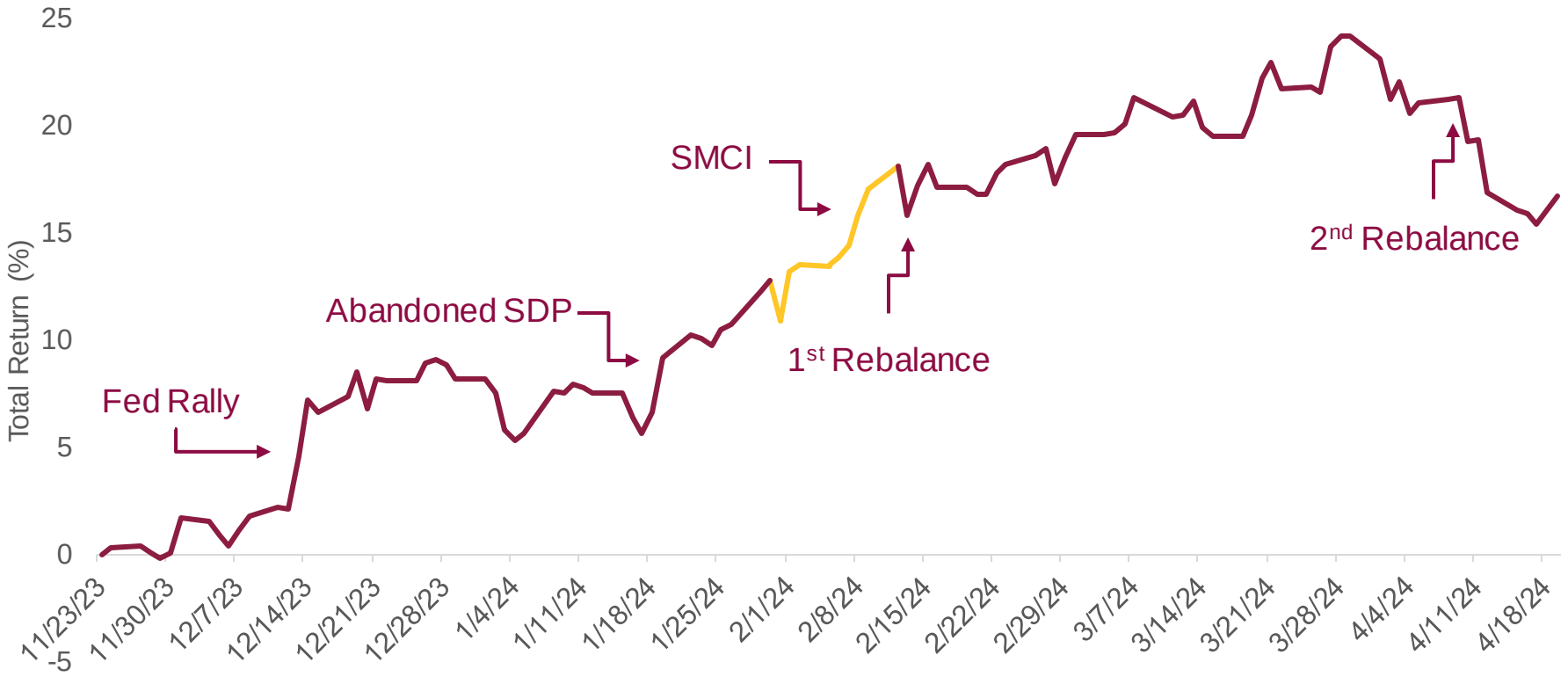
Source: AVLV Fact Sheet

12 State Variables

Value Statistics	Book-to-Market	Book-equity growth	Growth Statistics
	Payout Yield	Asset growth	
	Sales Yield	Sales growth	
Profitability Statistics	Clean Surplus Earnings	Market Leverage	Leverage Statistics
	Return on Equity	Book Leverage	
	Gross Profitability	Cash Holdings	

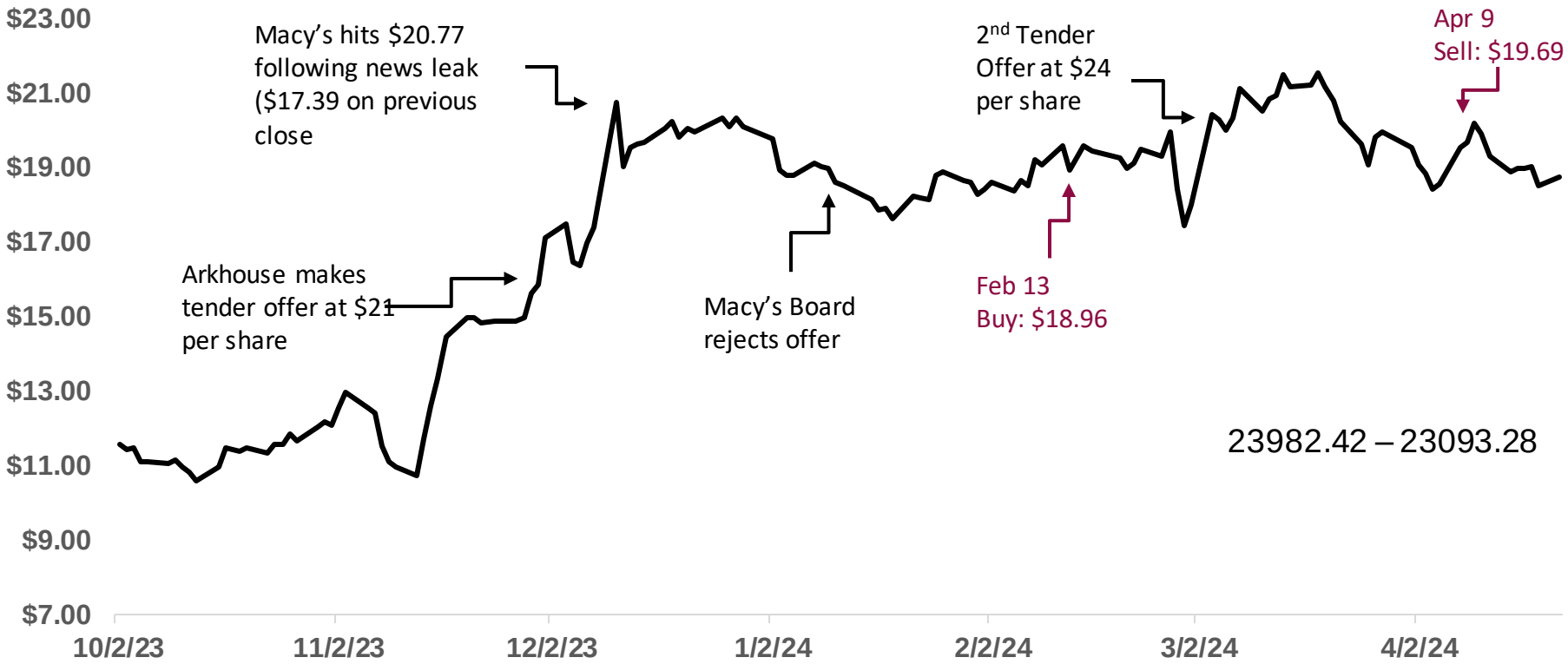
Source: SIM Fund analysis

Portfolio Timeline



Source: SIM Fund analysis

Macy's – Acquisition Bid



Size Effect on Short Duration/Value Prof

The premium is long-lived (lasts for at least five years) and is strong even among large firms (market equity in the highest NYSE quintile).

Source: Goncalves

Vector Autoregression Code Calculations

```
#### Investible Universe: filtered_df variable ####

filtered_df = pd.read_csv('filtered_securities.csv', index_col=0)

##################################################


def test_stationarity(series):
    if not series.apply(lambda x: isinstance(x, (int, float))).all():
        print(f"Skipping column '{series.name}' as it is not numeric.")
        return False

    # Skip columns with all missing values
    if series.isna().all():
        print(f"Skipping column '{series.name}' as it contains only missing values.")
        return False

    # Drop missing values and test for stationarity
    series = series.dropna()
    result = adfuller(series)
    return result[1] <= 0.05

# List of columns that could not be tested for stationarity
columns_to_difference = []

# List of columns to test stationarity for (last 13 columns)
columns_to_test = filtered_df.columns[-13:-1]

```

```
# Iterate through the last 13 columns
for column in columns_to_test:
    if test_stationarity(filtered_df[column]):
        print(f'{column} is stationary')
    else:
        print(f'{column} could not be tested for stationarity')
        columns_to_difference.append(column)

# Difference the columns that could not be tested and retest for stationarity
for column in columns_to_difference:
    filtered_df[column + '_diff'] = filtered_df[column].diff()
    if test_stationarity(filtered_df[column + '_diff']):
        print(f'{column}_diff is stationary after differencing')
    else:
        print(f'{column}_diff is still not stationary after differencing')

# Drop the original columns
data1 = filtered_df.drop(columns=columns_to_difference)


# this is the gamma matrix
gamma_matrix = results.params
cov_matrix = results.resid.cov()


print(gamma_matrix)
print(cov_matrix)

```

Source: SIM Fund analysis

Equation 6 Code Calculations

```
###### Import Data ########
filtered_df = pd.read_csv('filtered_securities.csv', index_col=0)
gamma_matrix = pd.read_csv('gamma_matrix.csv', index_col=0)
cov_matrix = pd.read_csv('cov_matrix.csv', index_col=0)

#########################


grouped = filtered_df.groupby(filtered_df.index)

# Create a dictionary to store the separated DataFrames
separated_dfs = {}

# Iterate through the groups
for index, group_df in grouped:
    separated_dfs[index] = group_df


for i in separated_dfs:
    separated_dfs[i] = separated_dfs[i].drop(columns=['FYEAR'])
    separated_dfs[i] = separated_dfs[i].reset_index(drop = True)


def test_and_difference(df):
    def is_stationary(column):
        try:
            result = adfuller(column)
            return result[1] <= 0.05  # Assuming 5% significance level
        except:
            return False  # Return False if an exception occurs

    def difference_column(column):
        return column.diff().dropna()

    # Check if DataFrame is large enough for processing
    if len(df) < 2:
        print("DataFrame is too small for processing.")
        return df

    for column in df.columns:
        if not is_stationary(df[column]):
            df[column] = difference_column(df[column])

    return df
```

```
# Assuming 'company_data' is your dictionary
keys_to_remove = []

for company, df in separated_dfs.items():
    if not isinstance(test_and_difference(df), pd.DataFrame):
        keys_to_remove.append(company)

for key in keys_to_remove:
    del separated_dfs[key]


forecasts = {}  # Create an empty dictionary to store forecasts

for company, df in separated_dfs.items():
    try:
        # Assuming 'df' has a suitable time series data for VAR analysis

        # Perform VAR modeling
        model = VAR(df[-13:])
        results = model.fit(1)

        # Forecast a certain number of steps ahead (change 'steps' to your desired foreca
        # Adjust as needed
        forecast = results.forecast(df.values[-13:], steps=1)

        # Store the forecast in the dictionary
        forecasts[company] = forecast

    except Exception as e:
        print(f"Error processing {company}: {e}")
        continue  # Continue with the next iteration


print(len(forecasts))
```

```
file_path = 'forecasts.csv'

# Assuming 'forecasts' is your dictionary
with open(file_path, mode='w', newline='') as file:
    writer = csv.writer(file)

    column_headings = ["PERMNO","BM","POy","Yy","BE_g","A_g","Y_g","CSprof","ROE","Gprof"

    writer.writerow(column_headings)

    for company, matrix in forecasts.items():
        # Write company name
        writer.writerow([company])

        # Write the first 12 values from the matrix in separate cells

        # Write each value in the matrix as a separate cell
        for row in matrix[:12]:
            writer.writerow(row)

        # Write an empty row
        writer.writerow([])
```

Source: SIM Fund analysis

Gonçalves Deriving $v_1(h)$

$$
\begin{aligned}
Cov_1(2) &= Cov_t[po_{t+2}, BEg_{t+1} + BEg_{t+2}] \\
&= \theta \cdot Cov_t[po_{t+2}, BEg_{t+1}] + Cov_t[po_{t+2}, BEg_{t+2}] \\
&= \theta \cdot Cov_t\left[\mathbf{1}_{po}'(\Gamma u_{t+1} + u_{t+2}), \mathbf{1}_{BEg}' u_{t+1}\right] + Cov_t\left[\mathbf{1}_{po}'(\Gamma u_{t+1} + u_{t+2}), \mathbf{1}_{BEg}'(\Gamma u_{t+1} + u_{t+2})\right] \\
&= \theta \cdot \mathbf{1}_{po}'\Gamma\Sigma\mathbf{1}_{BEg} + \mathbf{1}_{po}'\Gamma\Sigma\Gamma'\mathbf{1}_{BEg} + \mathbf{1}_{po}'\Sigma\mathbf{1}_{BEg} \\
&= \mathbf{1}_{po}'\Gamma\Sigma(\Gamma + \theta \cdot \mathrm{I})'\mathbf{1}_{BEg} + Cov_1(1)
\end{aligned}
$$

and

$$
\begin{aligned}
Cov_1(3) &= Cov_t[po_{t+3}, BEg_{t+1} + BEg_{t+2} + BEg_{t+3}] \\
&= \theta^2 \cdot Cov_t[po_{t+3}, BEg_{t+1}] + \theta \cdot Cov_t[po_{t+3}, BEg_{t+2}] + Cov_t[po_{t+3}, BEg_{t+3}] \\
&= \theta^2 \cdot Cov_t\left[\mathbf{1}_{po}'(\Gamma^2 u_{t+1} + \Gamma u_{t+2} + u_{t+3}), \mathbf{1}_{BEg}' u_{t+1}\right] \\
&\quad + \theta \cdot Cov_t\left[\mathbf{1}_{po}'(\Gamma^2 u_{t+1} + \Gamma u_{t+2} + u_{t+3}), \mathbf{1}_{BEg}'(\Gamma u_{t+1} + u_{t+2})\right] \\
&\quad + Cov_t\left[\mathbf{1}_{po}'(\Gamma^2 u_{t+1} + \Gamma u_{t+2} + u_{t+3}), \mathbf{1}_{BEg}'(\Gamma^2 u_{t+1} + \Gamma u_{t+2} + u_{t+3})\right] \\
&= \mathbf{1}_{po}'\Gamma^2\Sigma(\Gamma^2 + \theta \cdot \Gamma + \theta^2 \cdot \mathrm{I})'\mathbf{1}_{BEg} + \mathbf{1}_{po}'\Gamma\Sigma(\Gamma + \theta \cdot \mathrm{I})'\mathbf{1}_{BEg} + \mathbf{1}_{po}'\Sigma\mathbf{1}_{BEg} \\
&= \mathbf{1}_{po}'\Gamma^2\Sigma(\Gamma^2 + \theta \cdot \Gamma + \theta^2 \cdot \mathrm{I})'\mathbf{1}_{BEg} + Cov_1(2)
\end{aligned}
$$

which generalizes to:

$$Cov_1(h) = \mathbf{1}_{po}'\Gamma^{h-1}\Sigma F(h)'\mathbf{1}_{BEg} + Cov_1(h-1) \tag{IA.2}$$

where $F(h) = F(h-1)\Gamma + \mathrm{I} \cdot \theta^{h-1}$ with I representing an identity matrix and θ capturing a scalar shrinkage factor I introduce (see below).

Putting all terms together, we have:

$$v_1(h) = v_1(h-1) + 0.5 \cdot \mathbf{1}_{po}'\Gamma^{h-1}\Sigma\Gamma'^{h-1}\mathbf{1}_{po} + \mathbf{1}_{po}'\Gamma^{h-1}\Sigma F(h)'\mathbf{1}_{BEg} \tag{IA.3}$$

with boundary condition $v_1(1) = 0.5 \cdot \mathbf{1}_{po}'\Sigma\mathbf{1}_{po} + \mathbf{1}_{po}'\Sigma\mathbf{1}_{BEg}$.

Source: Gonçalves (2021)

Gonçalves Deriving $v_2(h)$

Letting $Cov_t\left(BEg_{t+\tau}, BEg_{t+h}\right) = Cov_{\tau,h}^{BEg}$, we have $1 \cdot v_2(1) = 0.5 \cdot Cov_{1,1}^{BEg}$ and then:

$$\begin{aligned} 2 \cdot v_2(2) &= 0.5 \cdot Cov_t\left[BEg_{t+1} + BEg_{t+2}, BEg_{t+1} + BEg_{t+2}\right] \\ &= 0.5 \cdot (Cov_{1,1}^{BEg} + Cov_{2,2}^{BEg}) + \theta \cdot Cov_{1,2}^{BEg} \end{aligned}$$

and

$$\begin{aligned} 3 \cdot v_2(3) &= 0.5 \cdot Cov_t\left[BEg_{t+1} + BEg_{t+2} + BEg_{t+3}, BEg_{t+1} + BEg_{t+2} + BEg_{t+3}\right] \\ &= 0.5 \cdot (Cov_{1,1}^{BEg} + Cov_{2,2}^{BEg} + Cov_{3,3}^{BEg}) + \left[\theta \cdot Cov_{1,2}^{BEg} + \theta \cdot Cov_{2,3}^{BEg} + \theta^2 \cdot Cov_{1,3}^{BEg}\right] \end{aligned}$$

which generalizes to:

$$h \cdot v_2(h) = (h-1) \cdot v_2(h-1) + 0.5 \cdot Cov_{h,h}^{BEg} + \sum_{i=1}^{h-1} \theta^i \cdot Cov_{h-i,h}^{BEg} \qquad \text{(IA.4)}$$

with boundary condition $v_2(1) = 0.5 \cdot Cov_{1,1}^{BEg}$

Hence, all we need is an expression for $Cov_{\tau,h}^{BEg}$ with $\tau = 1, 2, ..., h$. However, note that $BEg_{t+h} = u_{t+h} + \Gamma u_{t+h-1} + \Gamma^2 u_{t+h-2} + ... + \Gamma^{h-1} u_{t+1} + \Gamma^h s_t$, and thus:

$$\begin{aligned} Cov_{\tau,h}^{BEg} &= Cov_t\left(u_{t+\tau} + \Gamma u_{t+\tau-1} + ... + \Gamma^{\tau-1} u_{t+1}, u_{t+h} + \Gamma u_{t+h-1} + \Gamma^2 u_{t+h-2} + ... + \Gamma^{h-1} u_{t+1}\right) \\ &= Cov_t\left(u_{t+\tau} + \Gamma u_{t+\tau-1} + ... + \Gamma^{\tau-1} u_{t+1}, \Gamma^{h-\tau} u_{t+\tau} + \Gamma^{h-\tau+1} u_{t+\tau-1} + ... + \Gamma^{h-1} u_{t+1}\right) \\ &= \mathbf{1}_{BEg}' \left[\Gamma\Sigma\Gamma'^{h-\tau} + \Gamma\Sigma\Gamma'^{h-\tau+1} + \Gamma^2\Sigma\Gamma'^{h-\tau+2} + ... + \Gamma^{\tau-1}\Sigma\Gamma'^{h-1}\right] \mathbf{1}_{BEg} \qquad \text{(IA.5)} \end{aligned}$$

which concludes the derivation of $v_2(h)$.

Source: Gonçalves (2021)

Short-Duration Subsumes Value and Profitability Premia

Sorting variable	Decile portfolios based on included covariates							
	[1.1]	[1.2]	[1.3]	[1.4]	[1.5]	[1.6]	[1.7]	[1.8]
Dur	−8.6%	−9.7%	−12.3%	−10.1%	−9.7%		−12.7%	−14.4%
	(−3.85)	(−4.22)	(−4.28)	(−3.98)	(−4.26)		(−2.87)	(−2.44)
BE/ME	4.9%	0.9%				12.7%	−0.4%	−2.5%
	(2.06)	(0.32)				(3.33)	(−0.09)	(−0.37)
Gprof	1.5%		−2.1%			10.0%	−1.6%	−1.8%
	(0.70)		(−0.81)			(2.84)	(−0.34)	(−0.31)
Ag	−3.8%			−2.9%				−3.3%
	(−2.06)			(−1.29)				(−0.94)
Size	−4.4%				−2.7%			−2.8%
	(−1.89)				(−1.08)			(−0.97)

Source: Gonçalves (2021)

Portfolio Performance and Findings- Spring 2024

Arizona State University

Prepared by the Undergraduate Student Investment Management Fund - Team B

Under the designation of Dr. Wahal
Friday April 26th, 2024

Team Introduction

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Brennan Kujawa

Nick Fox

Samantha Ferraro
Portfolio Manager

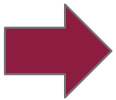
Agenda

1) Investment Thesis
2) Construction Overview
3) Implementation, Performance, and Attribution
4) Aspects of the Process
5) Stories From Counterfactuals

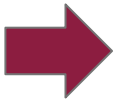
Investment Thesis

Post-Earnings Announcement Drift

Earnings Announcement

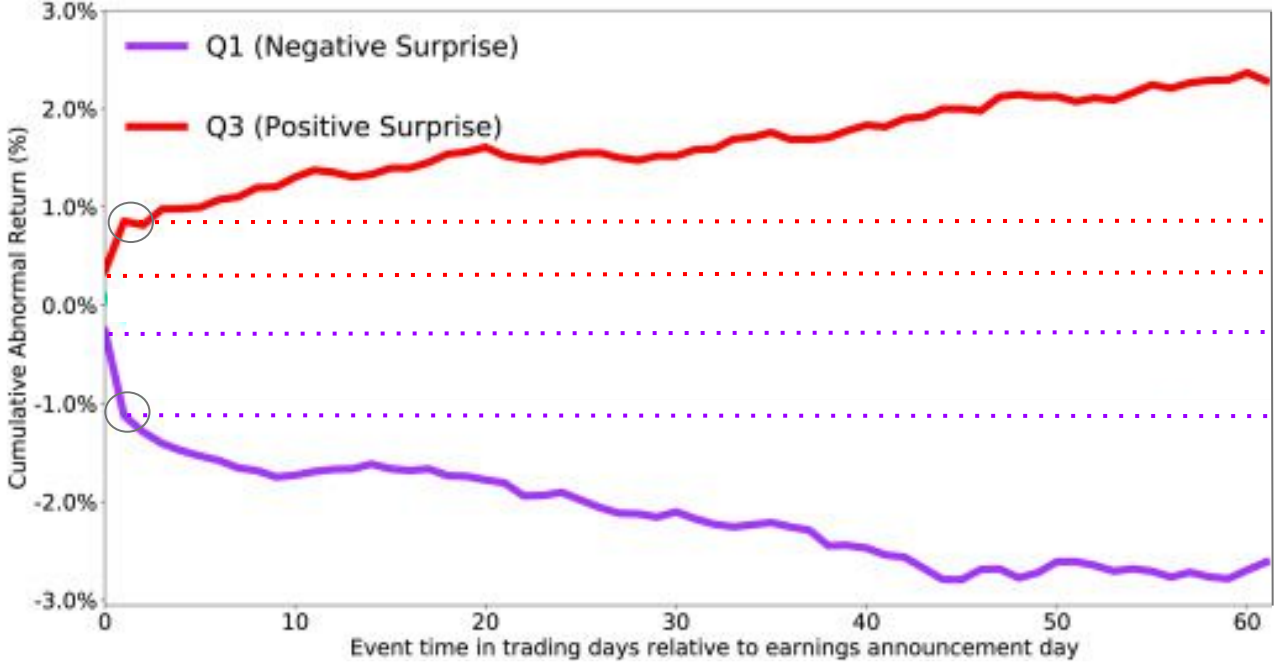


Surpasses Expectations



Stock Price Increase

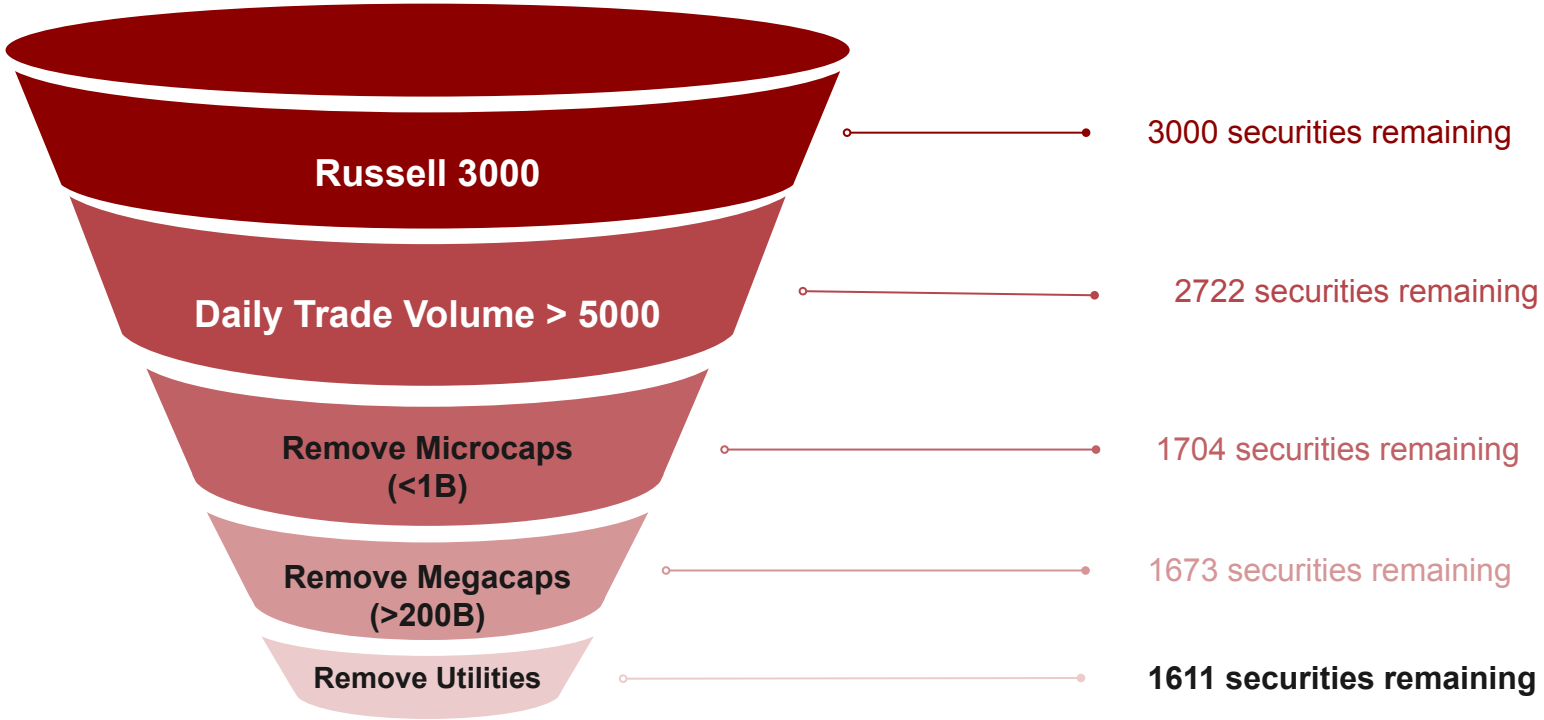
Post-Earnings Announcement Drift



Construction Overview

Construction Steps:

Creating Our Investable Universe:



Construction Steps:

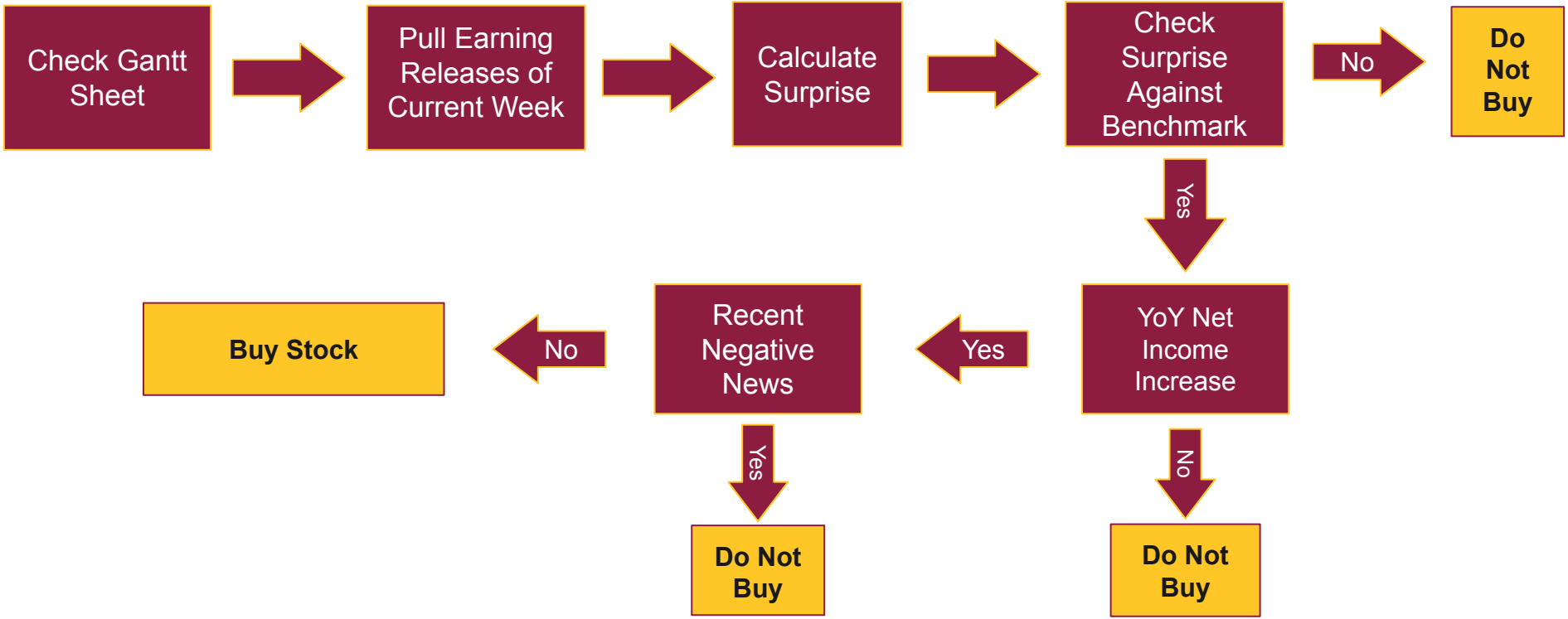
Master Gantt Chart: Seasonality of ERs

Week	47	48	49	50	51	52	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Total Events per week	**26**	**40**	**40**	**14**	**18**	**1**	**13**	**15**	**48**	**191**	**231**	**253**	**216**	**295**	**242**	**53**	**35**	**21**	**28**	**14**	**8**	**105**	**394**
Communication Services	0	0	2	1	0	0	0	0	1	4	5	15	10	12	8	3	0	1	0	0	0	4	8
Consumer Disc	9	7	12	3	4	0	1	1	0	7	30	30	28	42	46	9	10	8	5	0	1	8	46
Consumer Staples	4	3	4	1	1	1	5	3	0	4	14	16	7	6	15	8	1	1	3	5	2	1	9
Energy	1	1	0	1	0	0	0	0	2	8	6	6	11	33	15	4	2	1	1	1	0	3	23
Financial	1	0	0	0	1	0	0	6	37	92	39	45	16	20	17	1	1	1	1	0	2	62	98
Healthcare	1	3	2	1	0	0	1	0	0	7	28	26	27	56	63	7	5	2	3	1	0	3	40
Information Tech	4	21	14	2	1	0	0	1	1	24	34	47	39	23	32	11	9	0	8	0	0	5	38
Industrials	6	4	5	5	10	0	4	3	4	29	49	51	38	61	30	9	5	5	6	4	3	14	89
Materials	0	1	1	0	1	0	2	1	3	13	18	13	19	14	4	1	1	2	1	3	0	4	27
Real Estate	0	0	0	0	0	0	0	0	0	1	0	0	3	7	4	0	0	0	0	0	0	1	3

Source: Bloomberg Terminal

Construction Steps:

How We Purchased Securities



Implementation, Performance, and Attribution

Portfolio Implementation Problems/Solutions:

Problems:

- Seasonality of Earning Releases
- Sector Constraints from Russell 3000

Solutions:

- Extended Holding Periods
- Overweight Sectors
- Re-Entered IWV

Week	47	48	49	50	51	52	1	2	3	4	5	6	7	8
Total Events per week	26	40	40	14	18	1	13	15	48	191	231	253	216	295
Communication Services	0	0	2	1	0	0	0	0	1	4	5	15	10	12
Consumer Disc	9	7	12	3	4	0	1	1	0	7	30	30	28	42
Consumer Staples	4	3	4	1	1	1	5	3	0	4	14	16	7	6
Energy	1	1	0	1	0	0	0	0	2	8	6	6	11	33
Financial	1	0	0	0	1	0	0	6	37	92	39	45	16	20
Healthcare	1	3	2	1	0	0	1	0	0	7	28	26	27	56
Information Tech	4	21	14	2	1	0	0	1	1	24	34	47	39	23
Industrials	6	4	5	5	10	0	4	3	4	29	49	51	38	61
Materials	0	1	1	0	1	0	2	1	3	13	18	13	19	14
Real Estate	0	0	0	0	0	0	0	0	0	1	0	0	3	7

Total Portfolio Performance

Source: Bloomberg Terminal

Portfolio Attribution:

Return From Active Portfolio

	Contribution to Return (%)		
	Port	Bench	+/-
Total Portfolio	10.69	12.34	-1.65
Equity	7.18	12.33	-5.45
Information Technology	0.95	2.69	-1.87
Industrials	2.69	1.63	1.15
Consumer Discretionary	1.31	0.84	0.50
Health Care	0.78	1.37	-0.61
Financials	0.52	2.43	-2.01
Consumer Staples	0.54	0.70	-0.16
Communication Services	-0.17	1.50	-1.78
Energy	0.66	0.56	0.11
Materials	-0.10	0.29	-0.41
Real Estate		0.12	-0.13
Utilities		0.22	-0.24

Source: Bloomberg Terminal

Aspects Of The Process

Single Stock Events

- Azek Inc: PEAD Example
- Greenbrier Inc: Endogenously Contaminating Information
- Appian Corp: Holding Period Problems

PEAD Example

THE AZEK COMPANY INC - Homebuilding & Construction Supplies

Held the stock for 2 consecutive ERs

Purchase Date: 11/29/23
Surprise: 20%

Consecutive ER: 2/6/24
Surprise: 100%

Realized Return: 44.45%

AZEK Price Chart - Holding Period

Source: Bloomberg Terminal

Endogenously Contaminating Information

Greenbrier Inc - Machinery, Equipment & Components

- Purchase date: January 8th, 2024
- Surprise: 35.21%

Performance for the first week -3.92%

Performance for the first month -4.41%

Back to Today's News

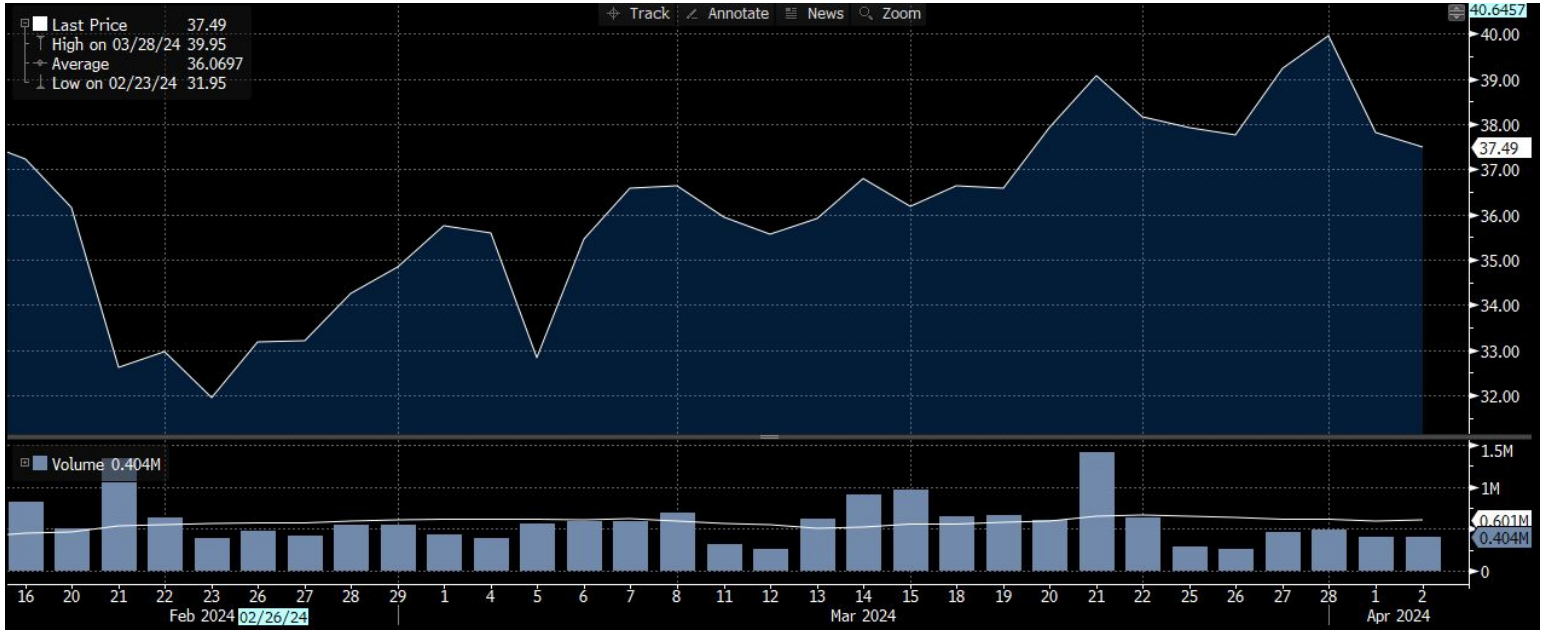
Greenbrier Companies Announces Organizational Changes

JAN 9, 2024 - 6:53 am

Holding Period Problem

Appian Corp - Software & IT Services

- Purchase Date: 2/16/24
- Surprise: 124%



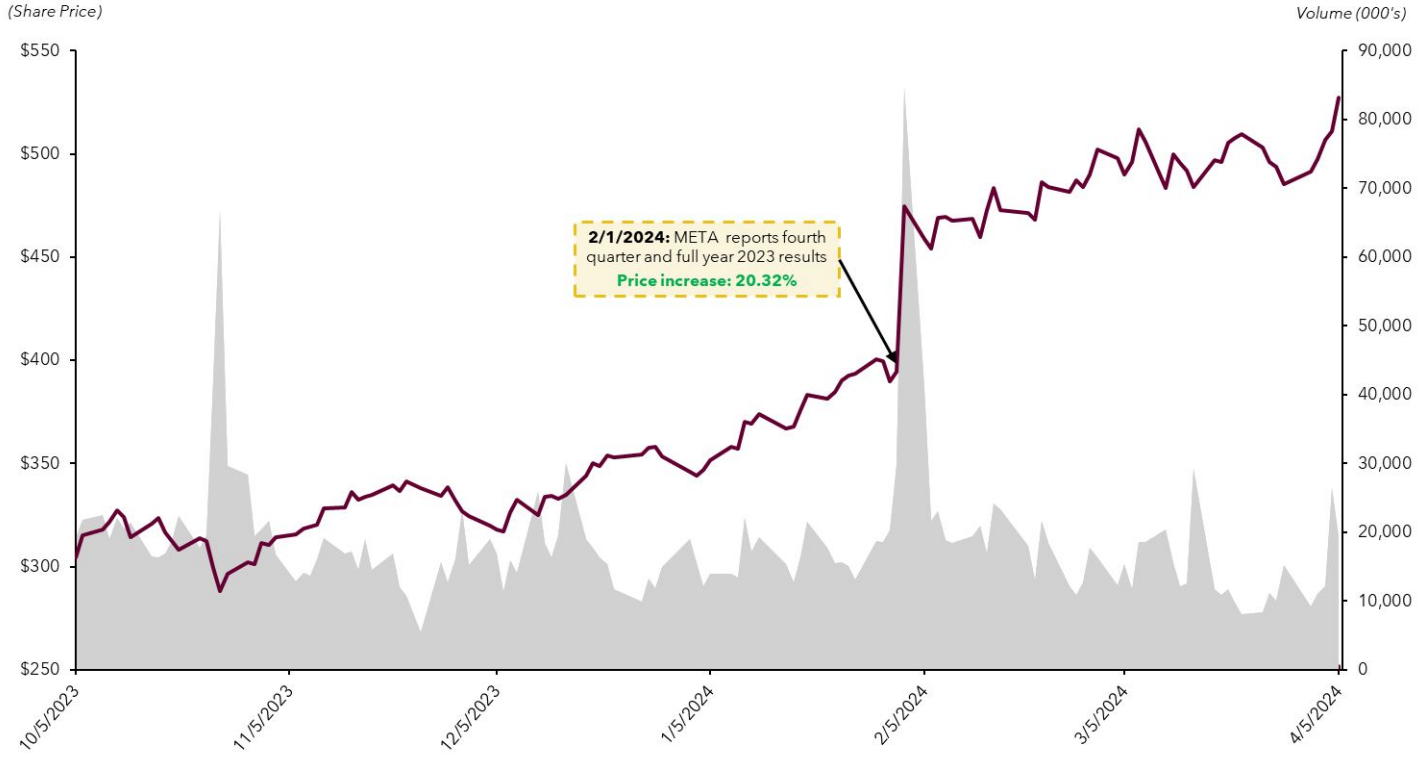
Source: Bloomberg Terminal

Stories From Counterfactuals

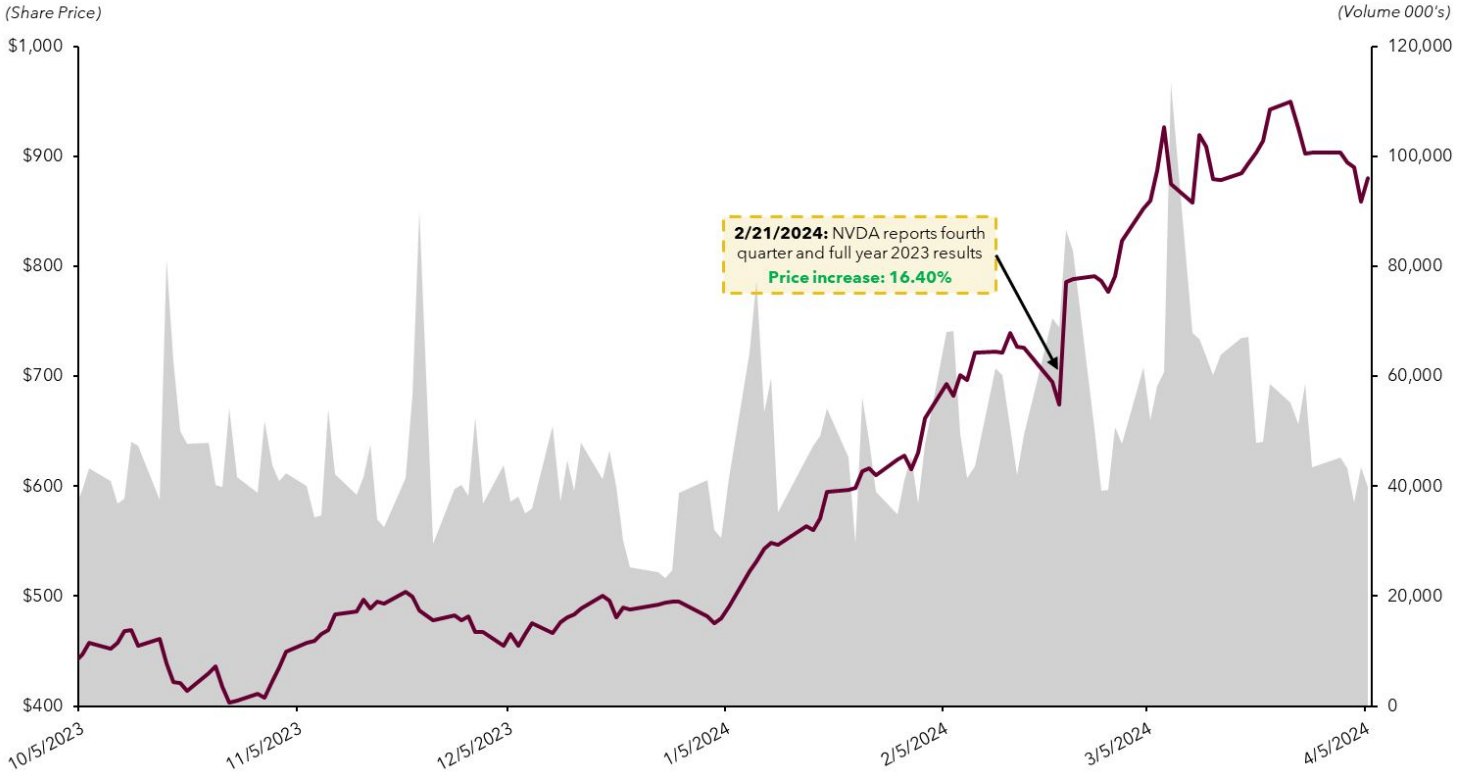
Recent Market Performance:

Source: FactSet, Goldman Sachs Global Investment Research

META Historical Share Price

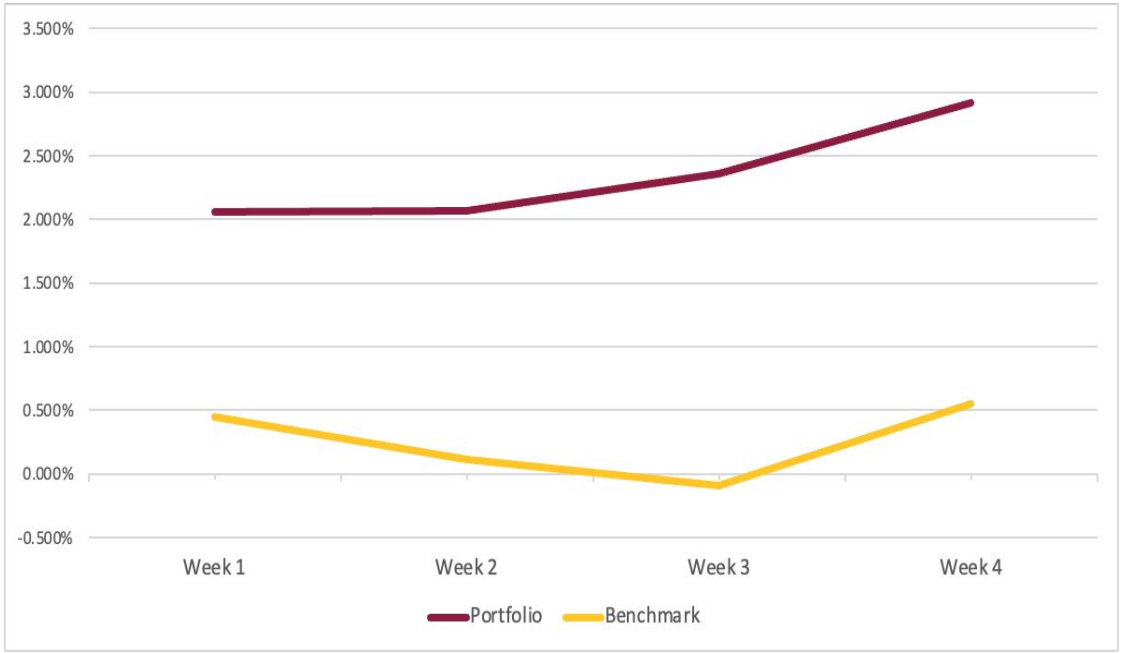


NVDA Historical Share Price



Case Study: Mega Cap Included

Average Cumulative Weekly Return over 4 Weeks:

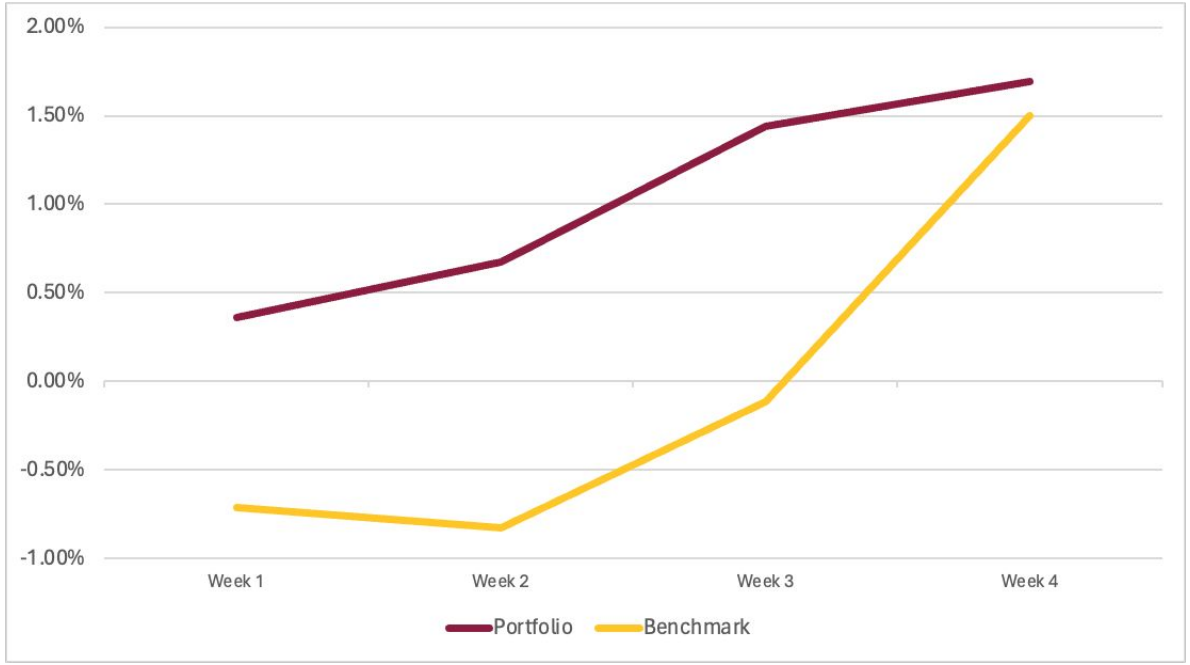


- Average Portfolio Cumulative Return: 2.92%
- Average Benchmark Cumulative Return: 0.55%
- Average Difference in Cumulative Return: 2.37%

Source: Bloomberg Terminal

Case Study: Pseudo Portfolio

Average Weekly Return over 4 Weeks:



- Average Portfolio Cumulative Return: 1.69%
- Average Benchmark Cumulative Return: 1.50%
- Average Difference in Cumulative Return: 0.19%

Source: Bloomberg Terminal

Tax Implications

*All Gains/Losses are Short-Term	
Beginning Value	**$1,227,176**
Portfolio Value	**$1,348,802**
Gain/(Loss)	**$121,626**
Pre-Tax Return	**10.69%**
Post-Tax Return	**6.73%**

*2024 Tax Rates	
Tax Rate	**37%**
Tax Paid	**$45,002**

Lessons Learned:

1) Exhibits of PEAD exists
2) Timing is important
3) PEAD requires careful cash positioning/management
4) Use trusted sources for ER numbers
5) Conduct thorough single security research
6) Organization is necessary

Questions

Appendix

Sector Constraints

IWV **iShares Russell 3000 ETF**

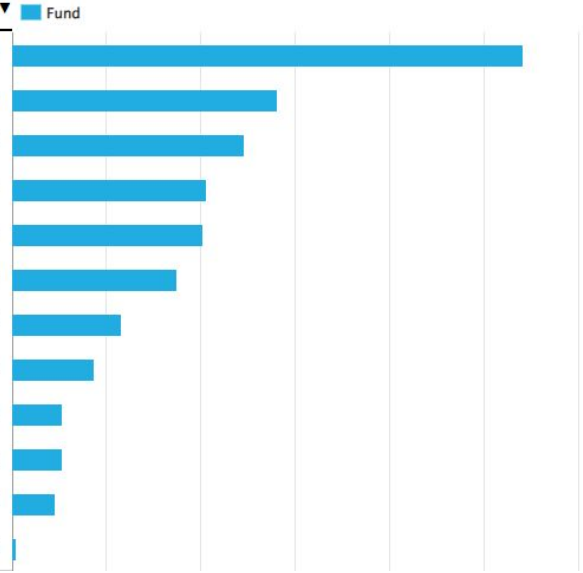
Exposure Breakdowns

Sector

as of Apr 24, 2024

% of Market Value

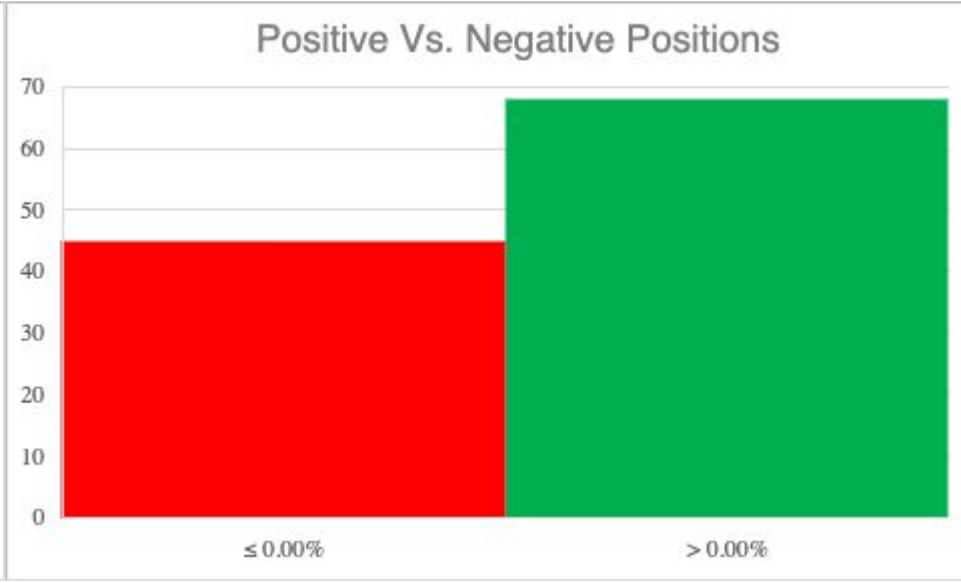
Type	Fund
Information Technology	26.99
Financials	13.99
Health Care	12.24
Consumer Discretionary	10.27
Industrials	10.07
Communication	8.69
Consumer Staples	5.74
Energy	4.31
Materials	2.63
Real Estate	2.61
Utilities	2.28
Cash and/or Derivatives	0.18



+/-7.5% of the Russell 3000 sector weight

Histogram


Daily Return (Sold Positions)
40
35
30
25
20
15
10
5
0
[-0.60%, -0.45%]
(-0.45%, -0.30%]
(-0.30%, -0.15%]
(-0.15%, 0.00%]
(0.00%, 0.14%]
(0.14%, 0.29%]
(0.29%, 0.44%]
(0.44%, 0.59%]
(0.59%, 0.74%]
(0.74%, 0.89%]
(0.89%, 1.04%]
(1.04%, 1.19%]
(1.19%, 1.34%]


Positive Vs. Negative Positions
70
60
50
40
30
20
10
0
≤ 0.00%
> 0.00%

Sector Constraints Problem:

IWV **iShares Russell 3000 ETF**

Sector	% of Portfolio	% of IWV	Total %	Benchmark %	High %	Low %	# of Stocks
Information Tech	26.55%	0.23%	26.78%	27.51%	35.01%	20.01%	13
Financial	13.64%	0.12%	13.76%	13.85%	21.35%	6.35%	7
Healthcare	14.62%	0.11%	14.72%	12.41%	19.91%	4.91%	8
Consumer Discretionary	13.93%	0.09%	14.02%	10.44%	17.94%	2.94%	7
Industrials	12.20%	0.09%	12.29%	10.06%	17.56%	2.56%	6
Communication Service	3.72%	0.07%	3.79%	8.31%	15.81%	0.81%	2
Consumer Staples	8.12%	0.05%	8.16%	5.57%	13.07%	0.00%	4
Energy	4.43%	0.03%	4.46%	4.09%	11.59%	0.00%	2
Real Estate	0.00%	0.02%	0.02%	2.70%	10.20%	0.00%	-
Materials	0.00%	0.02%	0.02%	2.66%	10.16%	0.00%	-
Utilities	0.00%	0.02%	0.02%	2.16%	9.66%	0.00%	-
Cash	0.85%	0.00%	0.85%	0.23%	7.73%	0.00%	1
Total Live	98%	1%	99%	100.0%			50

Azek Sell schedule: 804 shares

23% on 3/5/24

70% on 3/6/24

7% on 3/13/24

Total Trading Costs: $2,802.74

Companies	Comission		Shares
AEROVIRONMENT INC COM	$	8.95	-176
GOLDMAN SACHS GROUP INC COM	$	8.95	67
KOHLS CORP COM	$	16.40	-1093
LAS VEGAS SANDS CORP COM STK	$	8.95	544
MFC ISHARES TRUST RUSSELL 3000 ETF	$	35.80	-220
PROGRESSIVE CORP OH COM	$	8.95	133
UNITED AIRLINES HOLDINGS INC COM USD0.01	$	9.15	610
Grand Total	$	97.15	-272.11

Purchase Price VS Extended Hours Price

Row Labels	# Shares	Cost	Weight	EH MV	Purchase price	Extended Hours Price	Return (%)	Weighted Average Price
Delta Airlines	583	$ 27,736.00	1.86%	$ 27,459.30	$ 47.58	$ 47.10	1.02%	0.02%
Progressive Corp	133	$ 27,651.32	1.85%	$ 27,198.50	$ 207.84	$ 204.50	1.63%	0.03%
Goldman Sachs Group Inc	67	$ 26,691.02	1.79%	$ 26,858.29	$ 398.24	$ 400.87	-0.66%	-0.01%
United Airlines Holdings Inc	610	$ 28,773.82	1.93%	$ 26,626.50	$ 47.16	$ 43.65	8.03%	0.15%
Las Vegas Sands Corp	544	$ 24,956.79	1.67%	$ 26,492.80	$ 45.86	$ 48.70	-5.83%	-0.10%
Total	**28738**	**$ 1,492,225.71**	**100.00%**	**$ 1,487,382.14**			**0.46%**	**0.75%**

Purchase Price VS Market Open Price

Row Labels	#Shares	Cost	Weight	MO MV	Purchase Price	Market Open Price	Return (%)	Weighted Average Price
4/11/24	Delta Airlines	583	$ 27,736.00	1.78%	$ 27,249.42	$ 47.58	$ 46.74	1.80%
4/15/24	Progressive Corp	133	$ 27,651.32	1.78%	$ 27,632.08	$ 207.84	$ 207.76	0.04%
4/16/24	Goldman Sachs Grc	67	$ 26,691.02	1.72%	$ 27,098.15	$ 398.24	$404.45	-1.54%
4/17/24	United Airlines Hol	610	$ 28,773.82	1.85%	$ 27,114.50	$ 47.16	$ 44.45	6.09%
4/18/24	Las Vegas Sands Co	544	$ 24,956.79	1.61%	$ 26,160.96	$ 45.86	$ 48.09	-4.64%
	Total	**29547**	**$ 1,554,301.17**		**$ 1,551,190.11**		**$ 0.19**	0.38%