2017 CHICAGO QUANTITATIVE ALLIANCE INVESTMENT CHALLENGE:

UNIVERSITY OF ARIZONA CQA INVESTMENT STRATEGY

By

KHAM HONG TO

TEAM MEMBERS: HILLA HASCALOVICI, SPENCER BATEMAN, EDWARD

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A Thesis Submitted to The Honors College

In Partial Fulfillment of the Bachelor's degree With Honors in

Finance

THE UNIVERSITY OF ARIZONA

APRIL 2017

Approved by:

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Scott Cederburg
Department of Finance

Abstract

The CQA challenge is a 6 month competition that starts in October and ends in March. In this competition, student teams from 54 universities across the world are competing to build a long-short, market neutral equity portfolio that would generate the most risk-adjusted return in the given time horizon while operating under a few specific portfolio constraints. Each team is ranked against each other based on risk-adjusted return and sharpe ratio.

Our team consisted of 5 senior finance students at the University of Arizona. Together, we developed our own unique market outlook and portfolio strategy in order to successfully invest $1,000,000 in (hypothetical) capital. We used industry tilts towards financials, energy, and consumer discretionary sectors and factor tilts towards momentum and value stocks as our main drivers of return while minimizing market exposure by keeping our beta between -0.25 and +0.25. The University of Arizona finished the competition in first place in overall portfolio ranking with a return of 12.23% and in fifth place for sharpe ratio at 1.43.

Competition Overview

The Chicago Quantitative Analysis (CQA) Challenge is a long/short equity portfolio management competition that takes place from October to March among 54 schools across the world. Through this competition, student teams were able to compete in a simulated, real life hedge fund experience where they can apply skills from their finance curriculum to build stock selection and portfolio management strategies.

Each team gets $1,000,000 of capital to invest in resulting in a total $2,000,000 long/short portfolio. The long-short portfolio must remain market neutral with a beta between -0.25 and +0.25 where a maximum of 5% of the portfolio can be in a single stock and held in cash. The portfolio must also remain dollar neutral with a variance of -5% and +5% in net market value.

A long/short equity is an investment strategy that is commonly used in hedge funds to generate returns for their clients. It involves taking a long position (buying) in securities that are expected to increase in value while simultaneously taking short positions (selling) in securities that are expected to decrease in value. Essentially, this strategy profits from stock appreciation in the long positions and price declines in the short positions while minimizing market exposure.

Each member in our team had a specific role to help efficiently manage our portfolio:

> Kham To: Trading
> Hilla Hascalovici: Long and Short Selections
> Edward Recchion: Factor Analysis
> Charles Recchion: Portfolio Management
> Spencer Bateman: Risk Management

Our team was mentored by Chris Campisano and Scott Cederburg throughout the entire competition. Chris is a managing director at BlackRock and Scott is a professor at the Eller College of Management. Their input and feedback have been a tremendous help to this learning process.

Team Strategies

Investment Philosophy/Hypothesis
For our team's strategy, we developed our own unique macroeconomic outlook with regard to sector performance to differentiate our portfolio while using academically proven factor approaches as additional exposure support. A large part of our strategy was conducting a macro sector analysis to identify different events that would create market opportunities and then position our portfolio to take advantage of certain sector performances. These events include the 2016 Presidential Election, Keystone XL, Dakota Access Pipeline, possible financial/energy deregulation, and uncertainty in trade agreements. The second part of our strategy involved studying the relation between future stock performance and firm characteristics in order to apply certain characteristics to our portfolio that would help support our sector bets.

Primary Driver of Returns: Industry Tilt
Long Analysis
One of the majors events coming up early on in the competition was the November election. We wanted to position our portfolio appropriately in order to capture the market opportunities that would arise from the election. We believed that due to the overwhelming support for Clinton, her win would have already been priced into the market; therefore, the likelihood of a Republican win would be a great undervalued opportunity to bet on. A Trump win would benefit the energy and financial sectors while slowing down the consumer discretionary sector. Therefore, most of our portfolio is focused on these 3 sectors.

For financials, we believed that with likely multiple interest rate hikes in the upcoming year and republican-favored financial regulation, the financials sector would greatly benefit in the next few months in this competition. Since a Clinton win is most likely expected by the market, there is little downside risk in our financials bet given a Clinton victory relative to the unlimited upside potential if Republicans win. Our portfolio consistently had about a 40% net long position in Financials.

In the energy sector, republican views are in favor of energy deregulation which would help decrease costs for many firms in the sector. The upcoming construction of the Keystone XL and Dakota Access Pipeline would also pose many significant opportunities for several energy companies that would give the sector a great boost. We maintained a 14% net long position in Energy throughout the competition.

Short Analysis
We predict that the widespread hostility towards trade agreements and Donald Trump's perceived willingness to enact protectionist trade policies and tariffs may lead to higher export

and import costs. These rise in costs would tremendously hurt consumer discretionary spending and thus, harm the sector. To capture this exposure, our portfolio maintained a 35% net short position in Financials.

Secondary Driver of Returns: Factor Tilts
Our secondary drivers of portfolio returns were our factor tilts towards value and momentum. There has been studies conducted that provide evidence showing that value and momentum factors produce abnormal returns.

1) Value stocks tend to trade at a lower price than its fundamentals (i.e. dividends, earnings, and sales). Thus, to many investors, these stocks are considered undervalued. Over intermediate horizons, value stocks have shown to historically perform better than its high-priced growth stock counterparts.
2) Momentum investing is a strategy that aims to capitalize on the continuance of existing trends in the market. Empirically, stocks that have performed well over the past few months will continue the trend and outperform their peers over the next few months.

Rather than implementing value and momentum strategies by itself, we implemented both types of strategies concurrently due to research examining the interaction of these strategies. There has been studies done that provide evidence that momentum and value characteristics interact well with each other such that both value and recent winner stocks substantially outperform growth stocks that are also recent poor performers.

It is important to note that we kept in mind current market conditions when implementing these value and momentum strategies. Recent research suggests that these style bets perform poorly in highly volatile periods and recessions. Therefore, given that our economy is currently doing fairly well in its recovery, these strategies may be expected to perform relatively well.

Sector Weights

Sectors		Port	Bmk	Diff
Financials		47.0%	0.0%	47.0%
Energy		13.8%	0.0%	13.8%
Information Technology		13.4%	0.0%	13.4%
Real Estate		-2.5%	0.0%	-2.5%
Industrials		-6.4%	0.0%	-6.4%
Health Care		-7.7%	0.0%	-7.7%
Materials		-7.8%	0.0%	-7.8%
Consumer Staples		-11.7%	0.0%	-11.7%
Consumer Discretionary		-36.4%	0.0%	-36.4%

Portfolio Construction

This section will describe how our team constructed our portfolio. Rather than individually choosing stocks that we wanted to be in our portfolio, we used a more systematic strategy because we did not feel like we had a sufficient amount time and experience for successful individual stock analysis. As students competing with other students with similar experiences, we believed we would have a better advantage in developing a unique market outlook that involves both industry and factor tilts.

Security Selection Methodology

At the beginning of the challenge, we were given a list of stocks, called the Investment Universe, that made up a majority of the Russell 1000. To construct our portfolio, we used Bloomberg to screen the Investment Universe for stocks in the financial, energy, and consumer discretionary sectors to implement our desired industry bets.

Within each of these industries, we then identified stocks with favorable value and momentum characteristics. We reviewed each stock individually based on a price-to-book value measure and relative-share-price momentum measure and added those two to get an overall ranking score of attractiveness. In conjunction to our factor tilts, we supplemented our industry stocks with additional long positions in past winner value stocks for financial and energy sectors, and short positions in growth loser stocks in the consumer discretionary sector. This all together created an equal weighted 40 long and 40 short portfolio while keeping in mind our industry tilt and beta constraints.

	Price to Book			P/B Rank	RSPM	Momentum Rank	Beta	P/FCF	Overall Attractiveness
NBR	1.885	0.935525477	2.99	42	28	19	1.985	13.2	61
CNX	1.644	0.947693467	2.951	44	23.36	28	1.862	21.76	72
MS	1.536	0.916282892	3.053	38	20.55	46	1.569	3.57	84
WPX	2.096	1.189	2.353	84	37.29	7	1.92	--	91
WRK	1.152	1.17	2.39	76	24.75	24	1.408	12.91	100
TRN	1.527	0.884444892	3.162	29	16.16	72	1.331	16.43	101
HPE	1.673	1.186	2.359	81	27.45	20	1.43	--	101
ZION	1.369	0.94324851	2.965	43	16.65	65	1.441	15.87	108
ENH	0.6798	1.317	2.125	105	38.78	5	0.757002621	26.77	110
LNC	1.669	0.72998327	3.832	20	12.89	98	1.6	8.8	118
RF	1.406	0.828004897	3.378	27	12.94	95	1.473	--	122
HPQ	1.026	0	2.829	48	15.3	81	1.295	6.76	129
BAC	1.389	0.703277349	3.977	17	11.49	112	1.452	--	129
CFG	1.302	0.711020947	3.934	18	10.98	119	1.251	9.66	137
CMA	1.372	1.158	2.416	72	16.38	69	1.423	18.73	141
PTEN	1.722	1.381	2.025	116	23.69	25	1.621	13.74	141
FITB	1.316	1.071	2.611	57	13.94	91	1.378	9.37	148
PWR	1.211	1.261	2.218	92	18.68	57	1.097	11.31	149
RGA	0.9854	0.885242879	3.16	31	10.78	122	1.015	3.21	153
MU	1.754	1.574	1.778	153	57.71	3	1.66	--	156
NOV	1.134	0.821718633	3.404	24	9.99	133	1.29	11.2	157
SM	2.209	1.469	1.903	136	27.17	21	2.253	--	157
WDC	1.462	1.521	1.838	146	31.31	13	1.593	11.24	159
PFG	1.512	1.448	1.932	127	21.99	38	1.472	4.12	165
LUK	1.186	0.667165697	4.192	11	8.28	161	1.256	16.78	172
EGN	1.652	1.636	1.71	163	29.99	15	1.662	--	178
QRVO	1.67	1.297	2.156	100	15.27	82	1.534	23.86	182
STI	1.297	0.985088587	2.839	46	9.4	146	1.326	39.59	192
YHOO	1.23	1.12	2.497	67	10.5	126	1.194	48.56	193
PRU	1.473	0.679484367	4.116	13	6.81	183	1.393	2.06	196
CFR	1.222	1.596	1.752	156	19.5	52	1.358	15.34	208
SNH	1.858	1.402	1.995	120	14.22	89	0.822741056	30.45	209
ARRS	1.262	1.678	1.667	170	21.58	39	1.163	11.37	209
GLW	1.102	1.417	1.974	124	14.68	86	1.053	26.22	210
KMI	1.22	1.363	2.052	111	12.64	101	1.512	19.68	212
JBL	1.184	1.618	1.728	158	18.08	59	1.248	--	217
AIG	1.13	0.697274327	4.011	16	5.59	210	1.145	27.29	226
KEY	1.365	1.138	2.459	70	8.48	156	1.317	7.06	226
C	1.476	0.668671012	4.183	12	5.48	215	1.539	6.05	227
ASB	1.257	1.045	2.678	54	7.19	178	1.241	8.56	232
BBT	1.109	1.187	2.357	83	8.69	154	1.173	24.3	237
STT	1.415	1.476	1.895	138	12.85	99	1.435	5.85	237
MRO	1.778	0.633392274	4.416	10	4.89	233	1.889	--	243

Performance Attribution

As of March 3, we completed the competition in first place in overall portfolio return with 12.23% and in fifth place for sharpe ratio at 1.43. The performance attribution of our portfolio suggests a number of positive outcomes regarding our investment philosophy and risk exposure.

Throughout the competition, our portfolio remained within the required parameters of the challenge such as remaining market neutral and dollar neutral. This means that no significant return impact has been affected by market exposure. Only 0.15% market risk is included in our portfolio as shown in the chart below.

Active Risk Decomposition

Risk Decomposition	Active Std Dev (%)	Active % of Var	Active % of Var (Cov-Dist)
Active Risk	8.88%	100.00%	100.00%
Specific Active Risk	4.26%	23.02%	23.02%
Factor Active Risk	7.79%	76.98%	76.98%
Style	3.63%	16.73%	18.97%
Industry	6.59%	55.17%	57.72%
Market	0.15%	0.03%	0.29%

Legend: 76.98% Active Factor Risk; 23.02% Active Specific Risk

Our industry tilts contributed greatly to our overall portfolio return at roughly 8.80% which is also where we appropriately took on the most risk at 6.6%. Most of the active returns for the sectors came specifically from consumer discretionary, financials, and energy (as shown in the chart below). This makes sense because these 3 sectors have the largest positions in our portfolio. This demonstrates that we correctly anticipated the value of the industry bets we made at the beginning, while simultaneously avoiding indirect additional risk exposure.

Sectors Contribution
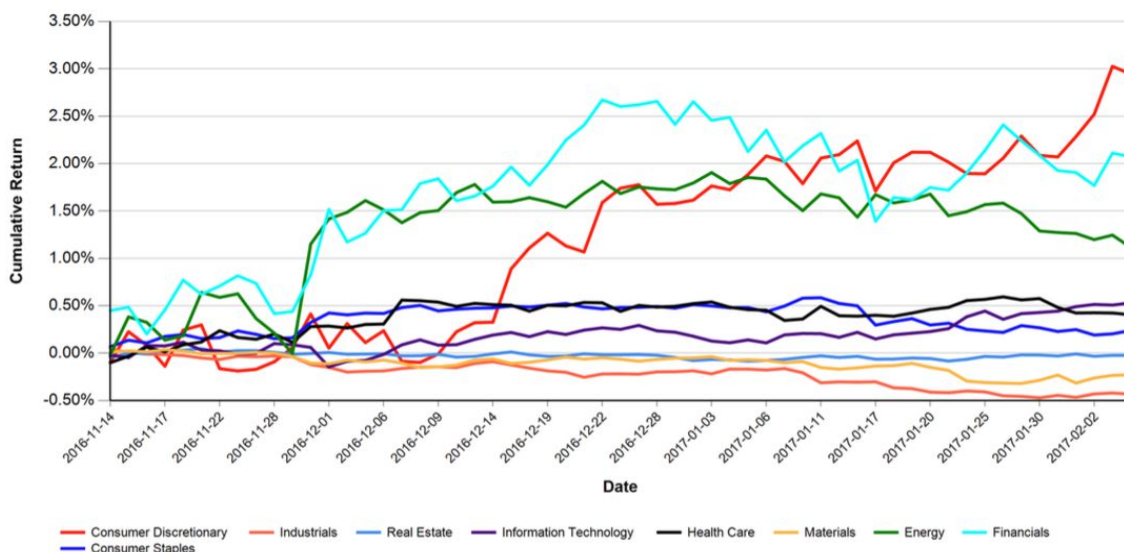
During this investment period to date, the overall contribution to our return from style exposures has actually been negative but only by a negligible amount. However, we did receive a positive contribution to our return from our value exposure at 1.95% which is one of our factor bets. Our momentum exposure, the other factor bet, did not provide a positive impact to our portfolio, instead contributing -0.75% to overall return. This negative contribution did not place any significant drag on performance however. Our style exposures contributes a total of 3.6% risk, significantly less than our industry bets.

Contributors to Active Return by Style

Style	Contribution	Avg Wtd Exp	HR	IR
Value	1.95 %	1.4609	56.14 %	4.33
Market Sensitivity	0.50 %	0.4443	54.39 %	1.24
Medium-Term Momentum	0.29 %	1.2016	56.14 %	0.55
MidCap	0.10 %	0.1696	59.65 %	1.36
Size	0.07 %	-0.0422	45.61 %	1.33
Exchange Rate Sensitivity	0.05 %	0.0570	50.88 %	1.49
Dividend Yield	-0.03 %	-0.0818	50.88 %	-1.96
Liquidity	-0.10 %	0.0117	40.35 %	-4.14
Volatility	-0.20 %	-0.1806	52.63 %	-1.71
Growth	-0.21 %	-0.5649	40.35 %	-1.79
Earnings Yield	-0.21 %	-0.2040	45.61 %	-2.37
Profitability	-0.43 %	-0.9599	45.61 %	-1.43
Leverage	-0.72 %	-0.9541	42.11 %	-3.87
Short-Term Momentum	-0.75 %	0.2909	43.86 %	-3.62
Total	**0.30 %**			

Lastly, active firm specific risk contributed a negligible impact on our portfolio as well. This is due to the diversification of our risk across roughly 83 firm position which helps mitigate the idiosyncratic risk. Firm specific risk contributes 4.26% risk.

Common Factor Contributions
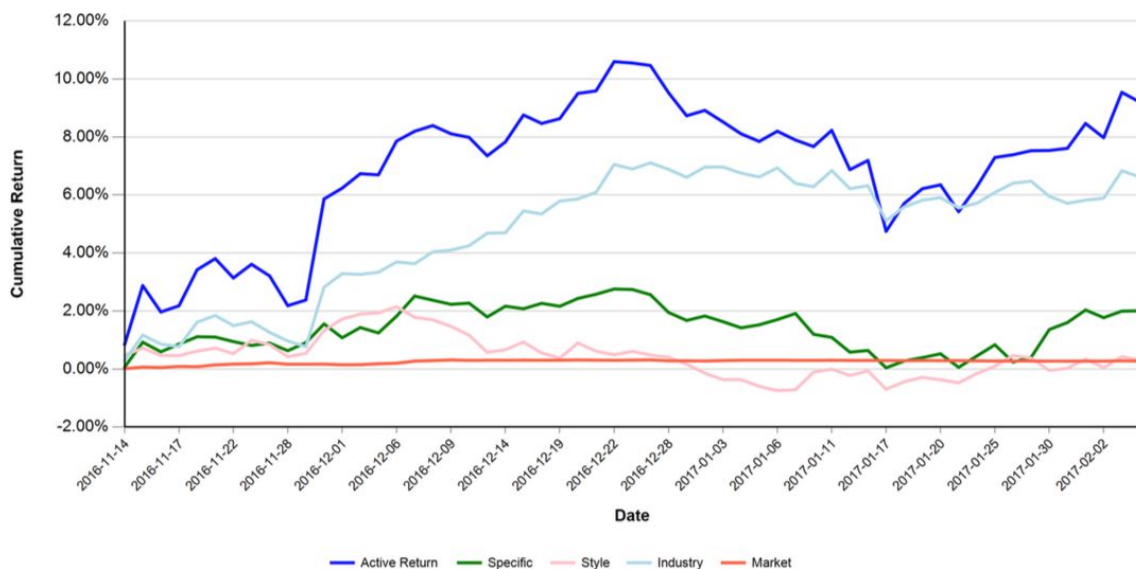
Conclusion

Competition Reflection

All of these performance attribution factors together serves to show that our investment strategy was both successfully planned and effectively executed in October, within the confines of the market neutral portfolio parameters we were given.

It is important to note that throughout the entire competition, we kept the majority of our initial positions the same as we believe it would be more beneficial to capture all market exposures that we positioned our portfolio for in the short 5 month time horizon. The only times we rebalanced our portfolio was when our beta reached above +0.25. Whenever that happened, in order to keep our sector exposures the same, we replaced higher beta stocks with its lower beta counterparties to decrease the portfolio beta.

In conclusion, our team's investment strategy based on industry specific bets, including a long position in financials and energy, and a short position in consumer discretionary, in addition to style exposures to value and momentum have resulted in strong positive portfolio performance over these past few months as shown in our first place portfolio ranking.

Team Reflection

The construction and continual monitoring of our portfolio throughout the competition period was not as difficult as I imagined it to be. Our team consisted of 5 senior finance students with various finance backgrounds that worked well together. The only challenge our team faced was creating our portfolio strategy at the beginning of the competition. There were many different directions we could take our portfolio in and we all had different perspectives of the market. However, what brought all of together was that we all had the same mindset of creating a unique portfolio strategy that would differentiate the University of Arizona from other schools. Thus, we were able to successfully build our portfolio by communicating effectively our ideas to each other while being open to not only our team's opinion, but also our mentor's opinions as well. Scott and Chris's ideas helped pushed us in the right direction. From there, we laid down our frame work and carefully monitored our portfolio everyday throughout the competition. Whenever we had to rebalance our portfolio, we always worked as a group to ensure everybody's opinions were taken into account.

The experience I have gained from doing this competition helped put into perspective how I can apply the skills I learned from my finance courses into the real world. It was interesting to learn and see how the market affected our portfolio in various ways, a learning opportunity that can not be found in a traditional classroom.

Link to 2017 CQA Video:

References:

Charts and graphs: Axioma Risk Reports provided by CQA