

Investment Report for Hilary Ash

December 2023

IB RISK TAKERS INVESTMENT GROUP (WGAM)

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Strategy Overview

The YAO strategy is an investment evaluation system customized to help achieve Hilary's financial goals while embodying her passions for traveling and innovation and maximizing her contribution to Women's sports. Inspired by the sequence of a volleyball rally, our strategy stems from the investment goals that we "serve", then "dig" for financial assets, "set" a selected stock pool, and "hit" the trade button. Our math-powered strategy uses numerical approaches to derive the most desirable portfolio.

Uniqueness of YAO Strategy

We use ETFs, bonds, and cash to guarantee basic returns and financial stability. We adopt a *top-down* methodology and functional tools to find stocks that balance personal and financial pursuits. Our systematic index quantifies qualitative attributes with dummy variables for numerical comparison, allows dynamic evaluation to maximize robustness in the long run, and has a built-in weighting system to balance modular attributes and enable changes in components and structure to meet new specifications.

Advisor Reflection

I would like to thank our team for their commitment, diligence, and spirit of cooperation during the competition. The success and development of the team were facilitated by the valuable skills and viewpoints that each team member contributed. As a math teacher myself, I was very impressed with the weighted YAO indexes and ratios. The team's ability to formulate a mathematic model with these proxy variables is certainly beyond expectations with their current knowledge, especially when it comes to the team's awareness to use a "weighted" approach. It was also impressive how the team stuck with the YAO quantification throughout the report. Lastly, I wish to emphasize that all the team's achievements are due to their cooperation and collective improvement. No matter the result, the team's application of math and teamwork within and beyond this report is memorable.

MCK Sell: We decided to trade MCK shares for UNH shares as informed by the YAO index.

The YAO firm index evaluates the performance of stocks quantitatively so that, based on the numerical outcome, our team can decide whether to invest in a specific stock. MCK's value as of Q3 2023 is 0.196, compared to UNH's 3.351. Therefore, under a unified metric, we've decided to change our stock selection for the healthcare sector to UNH, which is shown to be more compatible with our investment goals. This specific trade exemplified the development of our investment strategy and portfolio setup. Before the YAO index, our team made stock choices based on a simple financial analysis and traded by intuition. However, after adopting the YAO index, we can make objectively justified trading decisions that result in appropriate transactions and a more suitable portfolio for our client.

QQQ Purchase: Purchasing QQQ ETF is in consideration of the client's quantitative financial goals in contrast to the qualitative focus of stock choices. QQQ comprises the stocks of 100 top companies in the NASDAQ index. The performances of the highly weighted stocks in QQQ reflect its stability and growth potential. Particularly, APPL, taking up a significant 11.31% of the ETF, has the same status as gold as a hedge asset during the economic crisis; MSFT, taking up 10.31% of the ETF, has the largest cash flow in the world; while NVIDIA, taking up 4.23% managed to grow 218.99% in 2023. Furthermore, in 2023, when under a volatile economic environment and high geopolitical risks, QQQ still managed a growth of 47.27% (as of 12/8/2023), testifying its rigidity even in challenging times. Thus, purchasing \$7720 of QQQ largely undertakes the financial return requirements so our stock choices may prioritize meeting personal goals.

Portfolio at-a-Glance

Our team's WinS Portfolio:

Sectors	Percentage of portfolio	Stocks in each sector	Percentage of portfolio	ETF	Percentage of portfolio	Bonds	Percentage of portfolio	Cash (%)
Health Care	8.50	UNH	8.50	QQQ	7.00	U.S. 20Y Bond	15	16.5
Consumer Staples	8.18	CL	4.06					
		MNST	4.12					
Consumer Discretionary	13.52	MAR	2.64					
		LULU	5.04					
		TSLA	5.84					
Energy	5.74	AMTX	0.90					
		PSX	4.84					
Communication Services	10.90	GOOG	7.80					
		META	3.10					
Information Technology	10.69	MSFT	10.69					
Financials	2.62	JPM	2.62					
Total Value (\$)		61,500		7,000		15,000		16,500

*Red indicates a current excessive buy-in, green indicates a current insufficient buy-in

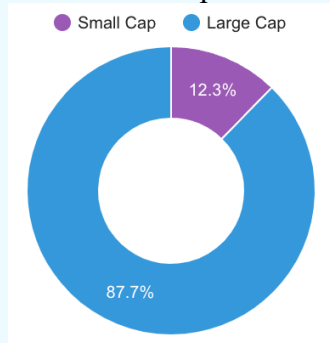
Final Recommended Portfolio for Hilary (Q3 2023):

Sectors	Percentage of portfolio	Stocks in each sector	Percentage of portfolio	ETF	Percentage of portfolio	Bonds	Percentage of portfolio	Cash (%)
Health Care	8.40	UNH	8.40	QQQ	15	U.S. 20Y Bond	15	10
Consumer Staples	8.17	CL	3.50					
		MNST	4.67					
Consumer Discretionary	13.57	MAR	4.00					
		LULU	5.00					
		TSLA	4.57					
Energy	5.77	AMTX	2.00					
		PSX	3.77					
Communication Services	10.96	GOOG	6.50					
		META	4.46					
Information Technology	10.56	MSFT	10.56					
Financials	2.56	JPM	2.56					
Total Value (\$)		60,000		15,000		15,000		10,000

Our team's portfolio returns vs. SPY (S&P 500 Benchmark):



Our team's portfolio market capitalization diversification:



Our team's final portfolio differs from the recommended portfolio for Hilary mainly due to the floating nature of the YAO Index and risk hedging in completing Hilary's financial goals. The YAO Index, the metric used for sector and stock evaluation, is based on each quarter's financial data, and the results will change from quarter to quarter according to market and firm performance. Therefore, the "recommended" portfolio is always fluid. At any point in time, we seek a portfolio with ratios that balance our investments to achieve Hilary's personal and financial goals and retain a diversified portfolio in terms of product type, market cap, and industry. Rather than using estimations of future data to craft a static "final" portfolio now, our strategy is like a function that intakes new quarterly data to produce up-to-date ratios which is automatically balanced to achieve the financial and personal goals, thus the floating nature.

Report Details

1) Investment Goals

Client Financial Goals 1. *Short-run*. Our team is required to generate \$15k in five years, a 9.9% annual return, with an initial allocation of \$25k, to produce the funds needed for Hilary to renovate her house. 2. *Long run*. Starting a consulting firm for women athletes in 15 years will require a total cost of approximately \$136k after adjusting for inflation (Table 1). With an initial allocation of \$75k, a 5.39% annual return is required.

Table 1. Long-run financial goals cost prediction in dollars				
	Rental costs	Labor costs	Marketing	Operations
Current Cost	37,510.00	90,000.00	2,500.00	4,200.00
Inflation Adjusted	39,010.40	93,600.00	2,600.00	4,368.00
Total costs	135,646.40			

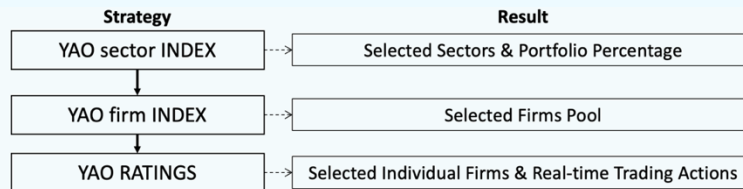
Client Personal Goals: Contribute to women's sports and invest in innovation and leisure.

Our *investment goals* are comprised of the client's *financial goals* and *personal goals*, also known as SLICG (Stability, Leisure, Innovation, Contribution to Women's Sports, Growth). The "fittingness" to our *investment goals* will be called "SLICGness" in the remainder of this report.

2) Strategy Overview – YAO Strategy

The YAO strategy intends to craft a portfolio that, while guaranteeing sufficient returns to satisfy her financial goals, best embodies Hilary's personal pursuits. To "serve" this objective, we devote 60% of our *capacity* to financial goals and 40% to personal goals. Since ETFs, bonds and cash are purely *financial assets* that demonstrate trivial personal compatibility, we allocate 15%, 15%, and 10% of our fund respectively to establish solid *returns* and *stability* for our portfolio. The remaining 60% of capacity is accounted for by our stock portfolio, which should provide the remaining returns to fulfill financial goals (20%) while also embodying Hilary's pursuits (40%).

To arrive at a stock portfolio that balances financial goals and personal goals, we adopt a *top-down* strategy to find the most SLICG stocks and if it is currently appropriate to invest: a) “digging” for stocks from appropriate sectors, b) “setting” up a pool of selected firms, and c) “hitting” the trade button after investigating each firm’s performance in real-time.



YAO Index

The YAO index numerically evaluates the SLICGness of the sector and stock choices. The *index* consists of three qualitative *attributes* (innovation, contribution to women’s sports, and leisure) for the evaluation of fittingness to personal goals and two quantitative attributes (growth and stability) for the evaluation of fittingness to financial goals. Each *attribute* is evaluated by *proxy variables* that are either a public statistic or a dummy variable. Four important characteristics of YAO index: **1. Dynamicity.** The index has a *timely* relevance. Re-evaluating the index bi-quarterly will allow an up-to-date assessment of the firm’s fittingness to our client’s goals. By updating the values, the effectiveness of the index can be retained in the *long run*. **2.**

Modularity. The index is a *compilation* of 5 attributes, each consisting of 2-3 weighted variables. When investment goals are changed or certain variables become unreliable, the index can be *adjusted* to match new conditions. **3. Simplicity & Objectivity.** The index only requires the input of statistics and dummy evaluations and returns a single real number. Its simplicity makes *frequent usage* welcomed and benefits the *ease and objectivity* of analytical and comparison processes. **4. Weighted.** Financial (20%) and personal (40%) considerations have a 2:1 importance for stocks. Thus, the total *explanatory power* of qualitative (personal) attributes

should be greater. We have adopted the weighting system so personal attributes (Table 3), and variables (Tables 4 and 5) can be given greater numerical influence in the index (Expression 1).

Table 3. YAO Index Attribute Weight Coefficients

Attribute	Weight coefficients	Coefficient symbol
Innovation	1	c_1
Contribution to Women's Sports	1	c_2
Leisure	0.5	c_3
Growth	0.5	c_4
Stability	0.5	c_5

YAO sector index evaluates *sectors* (Table 4). We have chosen 7 sectors according to Hilary's preferences, market outlook, and diversification considerations. We use the YAO sector index to determine the *optimal* proportion that each sector should take up in the portfolio. If the sectors score higher on the YAO sector index, then it should account for more of the portfolio.

Table 4. List of proxy variables for the YAO sector index

Attribute	Proxy Variable Name	Variable after correction	Weight coefficient value	Weight coefficient symbol
Innovation	Relevance with innovation dummy (inno)	<i>inno</i>	1	<i>a</i>
Women's Sports	Association with sports dummy (sprt)	<i>sprt</i>	1	<i>c</i>
Leisure	Association with leisure dummy (trvl)	<i>trvl</i>	0.5	<i>f</i>
Growth	Year-to-date returns (growth)	$\log(\text{growth} * 50)$	1	<i>t</i>
	Projected industry growth for t+12 (pgrowth)	$\log(\text{pgrowth} * 50)$	1	<i>u</i>
Stability	Industry size (size)	$\frac{\text{size}}{\$100B} (\text{cap } 1)$	0.5	<i>r</i>
	Volatility for past 24 months (vola)	$\frac{\text{vola}}{10} (\text{cap } 2)$	0.5	<i>s</i>

YAO firm index is used to evaluate *firms*. The YAO firm index includes more variables than the YAO sector index because it will be applied to a more *rigorous filtering* process (Table 5).

Table 5. List of proxy variables for the YAO firm index

Attribute	Proxy Variable Name	Variable after correction	Weight coefficient value	Weight coefficient symbol
Innovation	Presence of an innovation culture dummy (inno)	<i>inno</i>	1	<i>a</i>
	Research and Development spending as a percentage of revenue (rnd)	<i>rnd</i>	0.5	<i>b</i>
Contribution to Women's Sports	Association with sports dummy (sprt)	<i>sprt</i>	1	<i>c</i>
	Association with women's sports dummy (wsprt)	<i>wsprt</i>	0.5	<i>d</i>
	Worldwide implication on sports industry dummy (wwsprt)	<i>wwsprt</i>	0.5	<i>e</i>
Leisure	Association with leisure dummy (trvl)	<i>trvl</i>	0.5	<i>f</i>
	Work towards sustainable leisure dummy (strvl)	<i>strvl</i>	0.5	<i>g</i>
	Association with global travelling dummy (gtrvl)	<i>gtrvl</i>	0.5	<i>h</i>
Growth	Price / Equity value deviation from industry average (pe)	$\frac{1}{\sqrt[3]{pe}}$	0.5	<i>k</i>

Stability	Average revenue growth rate for past 24 months (revg)	$revg/100$	1	l
	Average profit growth rate for past 24 months (profg)	$profg/50$	1	m
	Return on Assets (roa)	$roa/100$	0.5	r
	Equity as percentage of total assets (eqty)	$eqty/100$	0.5	s
	Market Share compound variable (yii)	$yii_{industry} * ms\%$	1	t

Expression 1. YAO firm index in equation form

$$YAO_{firm} = c_1 \left[a(inno) + b \frac{rnd}{5} \right] + c_2 [c(sprt) + d(wsprt) + e(wwsprt)] + c_3 [f(trvl) + g(strvl) + h(gtrvl)] \\ + c_4 \left[k \frac{1}{\sqrt[3]{pe}} + l \frac{revg}{100} + m \frac{profg}{50} \right] + c_4 \left[r \frac{roa}{100} + s \frac{eqty}{100} \right] + t(yii)$$

YAO Ratings:

To provide a more holistic and *in-depth analysis* that supports our stock selection and time-relevant trading decisions, we created a *visualized rating matrix*. The system ultimately *synthesizes* the ratings into one score that represents the final evaluation of the stock. The synthetic score would lead to a conclusion: 1= strong consideration needed; 2= to be determined; 2= consider/ balance off; 4= recommended buy; 5=strong buy. We consider 7 different qualitative and quantitative aspects. **1. Innovation** - *Considers* the creative approach the firm uses, and how well it develops and implements new technology. **2. Female Empowerment** - *Evaluate* how well the firm promotes diversity and inclusion, and their general action toward social development goals. **3. Client interest** - *Accounts* how the stock matches the client's career area/personal interest. **4. Current look** - *Considers* the current stock price, P/E, relativity to 52 weeks high/low, as well as the most recent financial report. **5. Risk** - Evaluate the sector's LR/SR risks, along with the firm's corporate risk. **6. Projected growth** - *Accounts* for the projected growth rate of the stock and the firm's long-run plans. **7. Overall returns-** *Valuates* the stock's EPS and/or its return rate relative to the financial goals.

The YAO rating considers 5 levels of performance, 4 financial considerations, and 3 individualized considerations, uses a 2-step weighting strategy, and outputs 1 synthesized score.

Yao Rating Score

$$= \frac{1}{7} (\text{Client interest} * 1.5 + \text{projected growth} * 1.3 + \text{female empowerment} * 1 + \text{innovation} * 1 + \text{overall return} * 0.9 + \text{current look} * 0.7 + \text{risk} * 0.6)$$

↑
CONSIDERATIONS
by Order of importance

- Client interest
- Projected growth
- Female empowerment
- Overall Return
- Innovation
- Current look
- Risk Assessment

3) YAO Strategy Application

a) “digging”: Sector evaluation (YAO sector Index)

In our Mid-term report, we *allocated* funds to each sector based on intuition and gave more weight to consumer discretionary and information technology which had the best returns.

However, to objectively determine the proportion each sector should account for in our portfolio according to their SLICGness, we applied the YAO sector index as a tool and determined the percentage each sector should account for in the portfolio as of Q3 2023 (Table 6).

Table 6. Application of YAO Firm Index

Sectors	Healthcare	Consumer Staples	Consumer Discretionary	Energy	Communication Services	Information Technology	Financials	
Variables								
inno	1.00	1.00	1.00	1.00	1.00	1.00	0.00	
spst	1.00	1.00	1.00	0.00	1.00	0.00	0.00	
trvl	1.00	0.00	1.00	1.00	1.00	1.00	0.00	
growth	-0.52	-0.02	1.17	-0.06	1.29	1.37	0.43	
pgrowth	-0.38	-0.52	1.07	-0.43	0.30	1.29	-0.03	
size	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
vola	2.00	2.00	2.00	2.00	0.15	1.50	1.30	
Index value	2.55	2.48	4.12	1.75	3.33	3.21	0.78	Totals
Percentage	14.00%	13.62%	22.62%	9.62%	18.27%	17.61%	4.26%	100.00%
Adjusted %	8.40%	8.17%	13.57%	5.77%	10.96%	10.56%	2.56%	60.00%
Value (\$)	8398	8171	13573	5774	10962	10564	2558	60000

After using the YAO sector index for all sectors, we derive an *objective* sector proportion allocation that is drastically different from our former, unsupported allocation (Table 7).

Table 7. Sector Allocation

	Health Care	Consumer Staples	Consumer Discretionary	Energy	Communication Services	Information Technology	Financials
Allocation							
Original	8%	6%	12%	6%	10%	12%	6%
Adjusted	8.40%	8.17%	13.57%	5.77%	10.96%	10.56%	2.56%
Change	0.40%	2.17%	1.57%	-0.23%	0.96%	-1.44%	-3.44%

b) “setting”: Firms evaluation (YAO firm Index)

After evaluating our sectors, we gained a stock pool containing all allowed stocks in the seven sectors. To decide which stocks, we should invest in and which stocks we should eliminate from

our portfolio, we use the YAO firm index to determine which stocks are more SLICG. For example, we found that GOOG (4.393) was a more *desirable* investment than META (2.415), and adjusted our portfolio, investing more in GOOG (\$7999) compared to META (\$3428). In other cases where the firm performed too poorly on the index, like MCK (0.1958), we eliminated it from our portfolio. Applying the YAO index to filter stocks has enabled us to generally compare our stock choices and “set” a selected stock pool that is SLICG. However, the YAO firm index cannot reflect changes in a short period. Thus, to further analyze a firm and its SLICGness, we conduct in-depth research to evaluate it against the YAO rating system.

c) “hitting”: Company analysis (YAO Rating System)

We use Lululemon in Q3 of 2023 as an example to demonstrate our in-depth analysis process to apply the YAO rating system. We use the assistance of statistics from LULU’s annual reports, as well as information from Yahoo Finance, Simply Wall St, and Dollars and Data. **Client interest**

(5): Lululemon is highly related to our client’s interest. *Dominant* in the sports apparel market, Lululemon crosses paths with our client. Lululemon’s business goal focuses on *accentuating* female empowerment in the sports industry, which greatly *aligns* with our client’s mission. We award it 5 points for client interest. **Projected growth (5):** LULU has *consistently* grown over the past three years, with its revenue growing 41.07% from 2020 to 2023, a rate that is 37.87% higher than that of its direct competitor, Under Armour. It is also forecasted to experience earnings and revenue growth of 17.7% and 11.6% in the next 3 years. We believe LULU has high growth *potential* in the next few years. Thus, we award it 5 points in projected growth.

Female empowerment (5): Lululemon has promoted gender diversity and equity in both the firm and its business. With an 8:2 female-male employee ratio, a 55% feminine board of

directors, and a 65% feminine senior executive leadership team, the company emphasizes female empowerment throughout its structure. LULU's *female-inclined* gender ratios, coupled with its nature as a *female-centered* sports brand, make it worthy of a 5 for female empowerment.

Overall returns (5): As of December 7th, 2023, LULU's YTD return rate is 44.86% outrunning the S&P 500 by 11.9% and showing no signs of halting. LULU's current ROE index stands at 28.5%, *surpassing* the industry average of 14.3%, while LULU's TTM ROA value is 16.8%, higher than the industry average of 9.2%. Given current trends, it is *anticipated* that LULU's return rate for 2024 will further exceed the 44.86% achieved in 2023. Thus, it is awarded a rating of 5 for overall returns. **Innovation (4):** Lululemon *prioritizes* innovation to the furthest extent possible in the relatively traditional sports apparel industry. From *Align fabric* designed specifically for the skin-friendly Yoga experience, to *Everlux* which maximizes sweat evaporation, Lululemon emphasizes technological innovation while retaining its fashionable designs. Moreover, Lululemon has recently announced *Power of Three x 2*, a five-year growth plan that aims to double its revenue growth through innovation. LULU's only drawback in innovation is the nature of the sports apparel market, which takes one point away and results in a rating of 4 for innovation. **Current look (3.5):** LULU demonstrates *superior performance* in its industry but is currently overvalued. LULU's TTM growth indexes are promising: its ROE surpasses the industry average by 14%, and EBITDA and gross profit margins are respectively 19.11% and 11.13% greater than those of Puma. However, LULU currently has a 58.83 PE value, suggesting potential *overvaluation*. Considering LULU's stock price has reached \$460, the highest point in the past two years, there is a significant future risk of a decline in LULU's stock value. All factors considered; we give a 3.5 rating for its current outlook. **Risk (4):** Lululemon is

in a strong financial position but is potentially overvalued. Lululemon demonstrates strong financial health. First, its free cash flow exceeds that of Columbia Sportswear Company by 262%, and its current ratio is 79% higher than that of Puma. Furthermore, Lululemon's stock volatility is low, typically deviating by 5% weekly. The company has also maintained stable profit margins. However, Lululemon's current trading price, PE and PEG values are all greater than market estimates. LULU's overall strong financial health earns it 4 points for risk.

LULU's overall rating is 4.65, corresponding to a strong buy. Thus, we have purchased \$6065 worth of LULU stocks in Q3 of 2023. When applying this rating system to other stocks at other points in time, the same method should be followed for a holistic and objective evaluation of the firm's SLICGness at the time, which would inform investment decisions tailored to Hilary.

Final Rating: 4.62/5 (as of Q3 2023) Strong Buy



4) Articulation of Competition Experience

Our success was built on communication and specialization, which allowed effective teamwork. Every team member volunteered to take on specific research and writing responsibilities. By dividing up the work, we were able to progress incrementally at each meeting and, ultimately, collectively formulate the YAO strategy. Before the YAO strategy, we relied on our subjective judgments and shallow understanding. However, as our thinking deepened through conversations, we pieced together ideas and gradually created an index and rating system that allowed impartial assessments. This process reflects our commitment, development, and cohesiveness.

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