AIMA Canada Alternative Investment
University Case Competition 2019

Abdennour Aissaoui
University of Toronto, 4th year BBA, Specialist in Finance & Minor in Computer Science
abdennour.aissaoui@mail.utoronto.ca

Gabriel Bureau
University of Toronto, 4th year BBA, Specialist in Finance
gabriel.bureau@mail.utoronto.ca

Robin Wang
University of Toronto, 4th year BBA, Specialist in Finance
nuolanyu.wang@mail.utoronto.ca

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Executive Summary

The ever so strengthening correlation between risk and return, paired with the technological development of global financial markets, have created a new era for investing. The traditional *60/40* strategy now seems like an increasingly difficult investment route to achieve attractive returns without jeopardizing investors' capital. Thus, more and more are adapting Ray Dalio's "*holy grail of investing"* strategy: **seeking uncorrelated return streams that are profitable in the long run**.

Alternative investments are an increasingly common way to achieve such a goal. By following this philosophy, we can capitalize from the upside of different asset classes without affecting the overall volatility of our portfolio. Our goal will thus be to build a portfolio with *N* uncorrelated return streams. Even if *K* strategies end up losing money in a particular period of time, the remainder of *N - K* strategies will likely make money and prevent painful drawdowns. Thus, following what economic theory suggests, as the entirety of the economy will develop over time, our portfolio will reflect that positively.

Foundations of a Well Diversified Portfolio

Step 1: Identifying potential return streams

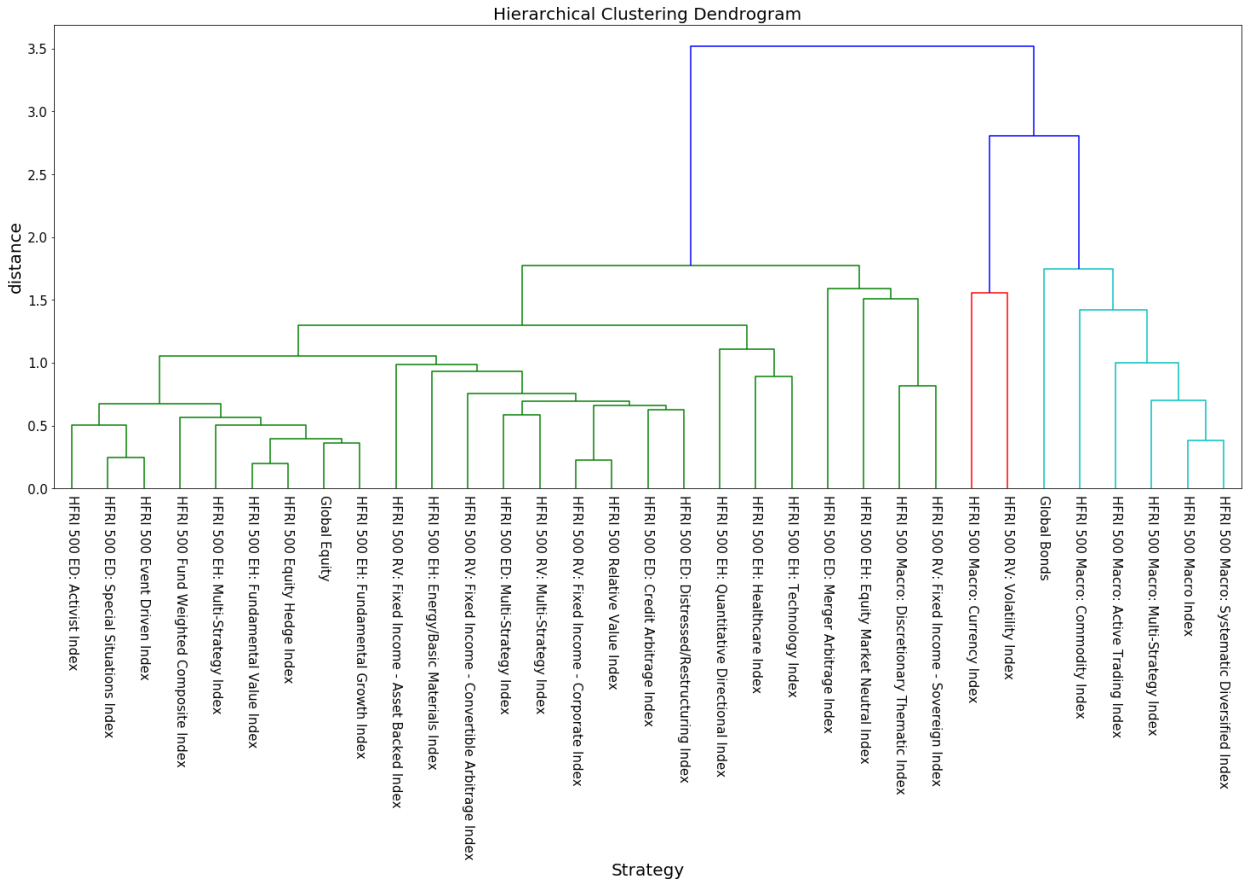
Given the limited amount of Hedge Funds data available to us, we decided to use HFRI 500 Hedge Funds Indices as a proxy in our research. These 33 indices consist of the returns of the largest 500 hedge funds that report to the HFR Database.

Step 1 a): Filtering out strategies that are unprofitable in the long run

We analyzed the returns of all investment strategies and excluded the ones that we deemed unprofitable. For instance, the Currency Index has had a negative Return/Volatility, a 45% monthly hit rate and significantly high kurtosis at 5.8.

Step 1 b): Filtering out highly correlated strategies

Given that there are 33 indices in the HFRI 500 Hedge Fund dataset, it would be quite difficult to identify the intercorrelations using a correlation matrix. For that reason, we constructed hierarchical clustering dendrogram:

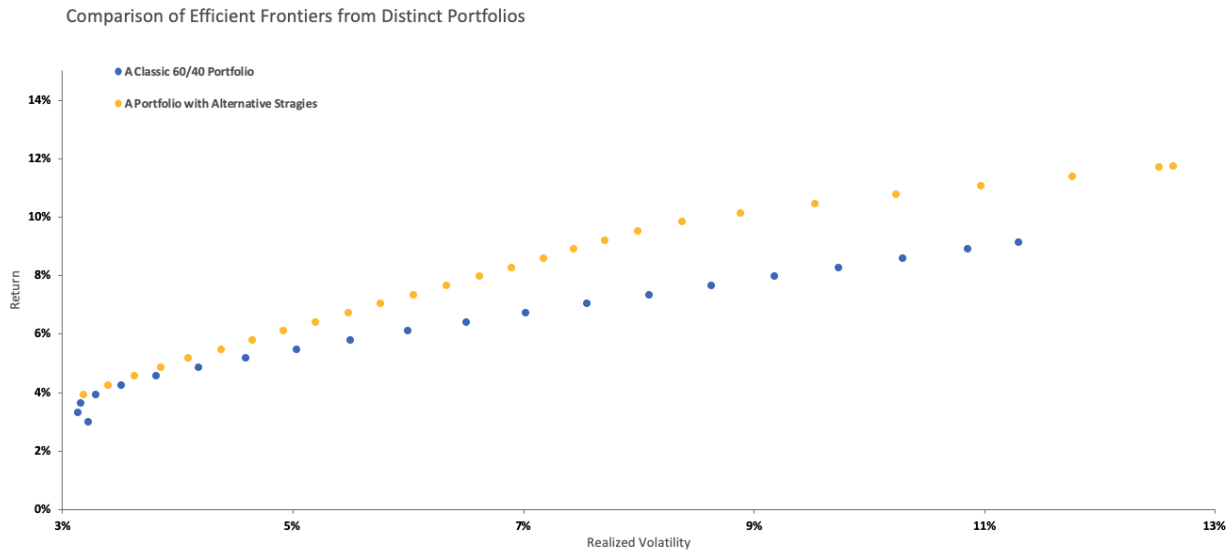


Based on statistics and qualitative research, we eliminated funds that are highly correlated. For instance, the dendrogram above shows the Equity Hedge Index and Fundamental Value Index as highly correlated.

Our qualitative analysis findings show that the Equity Hedge Index employs fundamental and quantitative techniques to long/short equities, whereas the Fundamental Value Index focuses more on qualitative analysis to establish a long/short position on equities. Both funds seem to focus on similar industries and sectors, as their correlation depicts. Thus, as the Equity Hedge Index has outperformed the Fundamental Value Index historically, we have decided to eliminate the latter.

Step 2: Verifying our hypothesis

Our dataset now contains Alternative Investment Indices that are uncorrelated ($\rho < .7$). Our philosophy proposes a higher return for any given level of risk. Indeed, the two efficient frontiers below illustrate just that: Institutions are better off incorporating alternative investments in their portfolio.



Step 3: Constructing and testing Model Portfolios Out of Sample:

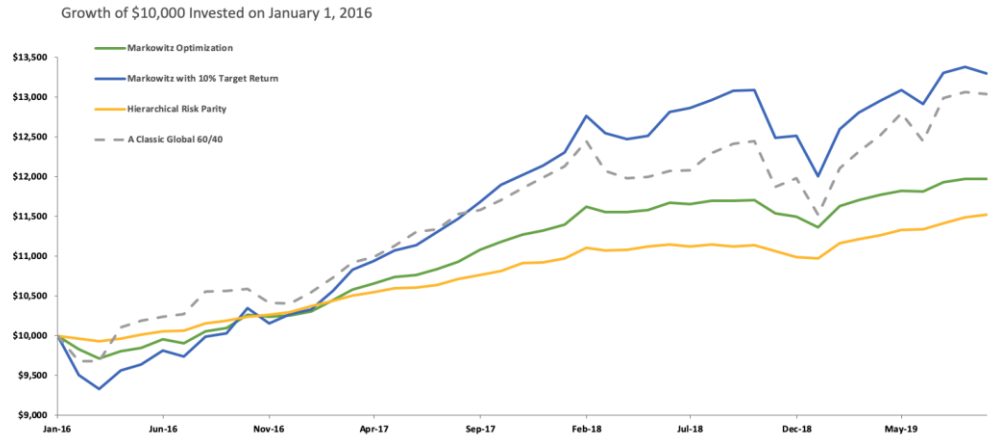
To avoid bias, we decided to test our findings by constructing portfolios using the 2013 to 2016 returns (in sample) and test the results from 2016 to 2019 (out of sample):

1. **Portfolio 1, Markowitz Portfolio Optimization:** Finding the weights that maximize the Sharpe Ratio (risk free rate = 2%). This is a good strategy if the endowment is able to take on a little bit of risk to capitalize on market upside if the recession does not occur.
2. **Portfolio 2, Markowitz Efficient Return:** Optimizing for the minimum amount of risk for a target return of 10%. This portfolio would be useful if the university is very long-term focused and is comfortable with significant drawdowns.
3. **Portfolio 3, Hierarchical Risk Parity (HRP):** HRP is a novel portfolio optimization method developed by Marcos Lopez de Prado. This optimization method is proven to perform best out of sample and would be very good for the endowment managers if they believe that the probability of a recession is high. Here's how it works:
    1. Form a distance matrix based on the correlation of the HFRI Indices;
    2. Using this distance matrix, cluster the assets into a tree via hierarchical clustering;
    3. Within each branch of the tree, form the minimum variance portfolio;
    4. Iterate over each level, optimally combining the mini-portfolios at each node.

Note: we make the assumption that the Market Neutral Index (largest position) can take US$280,000,000. Every other index is about US$60,000,000 with a standard deviation of US$10,000,000. We also assume that the $2,000,000,000 AUM are in Canadian Dollar.

Portfolios Results:

1. Investment Growth:



2. Risk Metrics: all three strategies with the alternative investments resulted in a higher return per unit of risk, as depicted in the table below:

		Markowitz Optimization	Markowitz w/ 10% target return	Hierarchical Risk Parity	A Classic Global 60/40
Risk & Return	Return	5.04%	8.08%	3.94%	7.50%
	Volatility	2.92%	6.96%	1.58%	6.81%
	Return/Volatility	1.72	1.16	2.50	1.10
Distributional Properties	Skewness	-0.33	-0.95	0.24	-0.53
	Kurtosis	0.55	1.60	1.54	1.33
	Adj return/Volatility	1.44	0.84	1.75	0.92
Drawdowns	Max Drawdown	2.91%	8.26%	1.56%	7.46%
	Max Drawdown/Volatility	0.99	1.19	0.99	1.10
	% Positive periods	75.00%	77.27%	81.82%	77.27%

3. Asset Class and Equity Risk Premia Exposure: The tables below represent the beta exposures of the portfolios returns with respect to: (1) Asset Classes, (2) Equity Risk Premia Factors. Our recommended portfolios displayed significantly lower sensitivity to interest rates and equities. Their equity holdings were also better diversified (see table 2)

	Markowitz Optimization	Markowitz w/ 10% target return	Hierarchical Risk Parity	A Classic Global 60/40
Interest Rates	0.26	0.28	-	0.42
High Yield Spread	-	-	-	-
Investment Grade Spread	-	-	-	-
Precious Metals	-0.09	-0.26	-	-
Industrial Metals	0.07	0.18	0.03	0.08
Energy	-	-	-	-
Agriculture	-	-	-	-
Developed Equities	0.16	0.38	0.09	0.40
Emerging Equities	-	0.08	-	0.11
R2	0.66	0.77	0.64	0.86

	Markowitz Optimization	Markowitz w/ 10% target return	Hierarchical Risk Parity	A Classic Global 60/40
Beta	-	-	-	-
Book to Price	0.36	-	0.26	-
Dividends Yield	0.34	0.64	-	0.54
Earnings Yield	-	-	-	-
Growth	-	0.43	-	-
Leverage	-	-	0.23	-
Momentum	0.32	0.53	0.19	-
Residual Volatility	-	-	-	-
Size	-	-	-	-
Global Equities	0.25	0.57	0.17	0.64
R2	0.66	0.69	0.59	0.78

Notes: i) "-" indicates statistically insignificant beta

ii) The two tables were constructed using Elastic Nets multiple regression models which are useful when the independent variables are correlated (ex: IG and HY Credit)

Portfolio Recommendations

We conducted qualitative and quantitative analysis to identify the best Canadian Hedge Funds in their respective category. We then used the HRP optimization to obtain the optimal weights. The table below summarizes how the $2.0B should be allocated:

	Strategy Purpose	Fund Name	AUM	Portfolio Allocation	Fund Exposure/Style/Strategies
Public Equities Exposure	Expected to provide higher returns than bonds in a favorable economy. Allocated between domestic and foreign equities, which diversify the portfolio's exposure	Polar Long/Short Fund	$1.5B	**$365M**	US Equity (Momentum, Value & Growth)
		Picton Mahoney 130/30Alp Ext Can Eqt	$228M	**$57M**	Canadian Equity (Momentum)
		Dynamic Global Growth Opportunities	$70M	**$18M**	Global Equities (Growth)
Fixed Income	Lowers the portfolio's overall variance by offering safe and steady cash flows. Allows hedging against recessionary periods' unfavorable returns.	RP Debt Opportunities Fund Trust	$1.9B	**$176M**	Global Long/Short Investment Grade Credit
		RP Select Opportunities Fund	$701M	**$66M**	Long/Short High Yield Credit
		Picton Mahoney Income Opportunities	$462M	**$43M**	Long/Short High Yield Credit
		Dynamic Credit Absolute Return F	$159M	**$15M**	Long/Short High Yield Credit
Private Equities	Strong long-term cash-on-cash returns from the exploitation of private market inneficiencies. Decreases the liquidity of the fund.	Kensington Private Equity Fund	$459M	**$60M**	Private Equity
Private Credit	Provides higher returns than fixed income, without exposing the portfolio to as much risk as other categories.	Ninepoint TEC Private Credit Fund	$1.1B	**$269M**	North American Private Credit
		Portland Private Income Fund	$120M	**$31M**	North American Private Credit
Real Estate	Allows hedging against inflationary periods by providing safe, steady and attractive returns. Also offers material diversification of the fund's capital.	Timbercreek Four Quadrant Global RE	$791M	**$156M**	Global Real Estate
		Vision Opportunity Fund	$220M	**$44M**	North American publicly traded real estate securities
Absolute Return	Capitalizes on market inefficiencies to provide strong and steady cash flows in any state of the economy. Focused on event-driven and value-driven returns.	HGC Arbitrage Fund LP	$420M	**$47M**	Traditional Merger Arbitrage & Subscription Receipts
		Polar Multi-Strategy Fund	$3.0B	**$337M**	Multistrategy, arbitrage oriented approach to capital markets
		Amethyst Arbitrage Fund	$213M	**$24M**	Canadian mergers & acquisitions, convertible securities
		Waratah One X Trust	$249M	**$28M**	Global Equity Market Neutral
		Picton Mahoney Market Neutral Equity	$195M	**$22M**	Global Equity Market Neutral, focus on Momentum
		Algonquin Debt Strategies Fund LP X	$391M	**$43M**	Debt Arbitrage
Venture Capital	Provides exposure to start-ups from a very early stage. With a strategic vision, knowledge and network, returns can skyrocket.	Cambridge Associates Global Venture Capital	$375.0B	**$158M**	Global venture capital towards all industries
		SoftBank Vision Fund	$100.0B	**$42M**	Global tech companies

Assumptions, Notes & Constraints:

i) We chose HRP since the endowment managers see a recession around the corner

ii) Fund managers can increase their AUM by at most 25%

iii) All these funds offer institutional Series

iv) Maximum allocation per category/bucket is 25%

v) No transaction costs (we allocated the full $2.0B amount)