RESEARCH PROPOSAL

MARKET NEUTRAL PORTFOLIO ANALYSIS

APPLICATIONS OF DATA SCIENCE IN FINANCE

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INTRODUCTION

This market-neutral portfolio aims to minimize exposure to market risks and achieve stable, risk-adjusted returns by selecting companies from diverse sectors, including **Microsoft (MSFT)**, **Netflix (NFLX)**, **NVIDIA (NVDA)**, **Descartes Systems Group (DSGX)**, **Rogers Communications (RG)**, and **Magna International (MGA)**. By leveraging the Fama-French factors— Market Risk Premium (mktrf), Size (smb), Value (hml), Risk-Free Rate (rf), and Momentum (umd)—the portfolio aims to neutralize market movements. Analyzing the portfolio over a 20-year period from December 2003 to December 2023 will assess its effectiveness in generating consistent returns while managing risk. The summary statistics for market returns are included in Appendix A for reference.

DATA

Company Returns: Data Sourced from the CRSP WRDS Database

Fama-French Factors:

- **Market Risk Premium (mktrf):** This factor represents the return of the market minus the risk-free rate.
- **Size (smb - small minus big):** This factor reflects the return spread between small-cap stocks and large-cap stocks.
- **Value (hml - high minus low):** This factor reflects the return spread between value stocks (high book-to-market ratios) and growth stocks (low book-to-market ratios).
- **Risk-Free Rate (rf)**: This factor represents the return on a risk-free asset.
- **Momentum (umd - up minus down)**: This factor reflects the momentum effects in the market.

METHODOLOGY

The primary risk considered for this market neutral portfolio is market risk—the potential for portfolio returns to be influenced by overall market movements.

Risk Assessment & Mitigation

Market risk is minimized by adjusting stock weightings to neutralize market sensitivity, to ensure the portfolio remains largely insulated from market wide fluctuations.

The Fama-French factors help mitigate this risk in several ways. By incorporating the size and value factors, the portfolio is diversified across small and large cap stocks as well as value and growth stocks. This diversification helps reduce the risk that large market swings will disproportionately affect a single segment of the portfolio. Additionally, the profitability and investment factors focus on stocks with high profitability and conservative investment

strategies, which are typically less volatile during market downturns and provide stability to the portfolio in periods of economic stress. The portfolio is evaluated using risk adjusted metrics and stress testing to assess its resilience to extreme market conditions.

INVESTMENT OBJECTIVE

1. **Construct a market-neutral portfolio** to minimize exposure to overall market risks and maintain stability.
2. **Achieve diversification** by selecting firms from distinct industries like **technology**, **telecommunications and media**, and **data analytics**.
3. **Leverage Fama-French factors** (mktrf, smb, hml, Rf, umd) to optimize stock performance and minimize risk.
4. **Incorporate rf and umd factors** to enhance returns by focusing on high profitability and conservative investment strategies.

APPENDIX:

A: SUMMARY STATISTICS

Companies	Mean	Stdv	Minimum	Maximum	Std Error	Sum	Sample Variance
Nvidia	0.033622	0.139939	-0.388889	0.553247	0.00901425	8.10279	0.019582855
Microsoft	0.015229	0.064816	-0.163357	0.249491	0.00417519	3.670164	0.004201173
Netflix	0.033137	0.158346	-0.518021	0.784642	0.01019998	7.985937	0.025073522
Rogers	0.012121	0.067502	-0.178571	0.242205	0.00434821	2.921054	0.004556569
Magna	0.010877	0.093815	-0.342254	0.302498	0.00604316	2.621378	0.008801269
Descartes	0.01805	0.095368	-0.440367	0.571429	0.00614319	4.349958	0.00909504