

# **INTERNSHIP SAMPLE PROJECTS / POSTINGS**

## **Quantitative Analyst (Internship )**

ABC is recruiting a quantitative analyst for Market Risk Department. The ideal candidate will grow into a role involving market risk analysis, reporting and modeling, which would require an understanding of traded products, an appreciation of market risk methodologies and the underlying data challenges.

### Skills Required

We search for candidates with a strong desire to learn and the ability to excel in a dynamic and stimulating work environment. The candidate should have a solid education in quantitative and analytical disciplines, with strong problem-solving skills. Fluency in Microsoft Excel spreadsheets and a familiarity with fixed income, equity, and other traded securities are required. The candidate should have some experience with a programming language such as Visual Basic and statistical analytics packages such as Matlab. The preferred candidate would also have familiarity with SQL database queries. Training in computer science, engineering and other technical fields is considered a plus. Good writing and oral presentation skills are desired. An understanding of risk management concepts such as VaR (value-at-risk), stress tests, and the risk representation of options portfolios will be helpful.

Solid training in quantitative and analytical disciplines

Fluency with MS Excel; experience with VBA

Familiarity with fixed income, equity and other traded products and their greek representations

Strong problem-solving abilities

The desire to learn and prosper in a highly dynamic environment

### Skills Desired

Knowledge of market risk methodologies, including Value-at-Risk (VaR)

Knowledge of SQL

Good communication skills

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## **Independent Study or Applied Finance Project**

Index Changes and Trading Efficiency

Implications for International Stock Indices

There is a wide range of academic papers and industry research focused on the effects of stock index changes on constituent stocks. The majority of existing material focuses on US domestic indexes. Traditionally, stocks that are added or have their index concentration increased tend to appreciate in price between the announcement and effective dates, while stocks deleted or diluted in indices exhibit decreasing price behavior. More recently, however, some major domestic index rebalances have demonstrated a reversal to this trend due to increasing interest in OTC swap products used to short the indexes as a whole. The hedging activity associated with these swap products can diminish or even

reverse the traditional price dynamics associated with index changes. As mentioned previously, the majority of existing index change work has focused on US domestic indexes; we propose an investigation into index effects on international indexes, namely the MSCI EAFE index. Index fund managers tracking the EAFE index are typically benchmarked to the closing price of altered constituent stocks on the day prior to the index change's effective date. This benchmarking process induces volume shocks for constituent stocks and often results in considerable price appreciation [depreciation] for stocks having their index concentration increased [decreased]. We propose an investigation into whether an improved method of trading into EAFE index rebalances can be developed using announcement and effective dates from the last two MSCI EAFE rebalances.

## Methodology

The timeline associated with EAFE index changes is depicted below:

As discussed previously, index funds are typically benchmarked to the constituent stocks' closing prices on day  $ED - 1$ . Event studies investigating index change behavior typically focus on whether abnormal returns compared to a given benchmark, for example the market return, can be achieved by betting on index changes. Our approach here, however, diverges somewhat from typical abnormal return event studies in that we are attempting to determine if a trading strategy can be implemented that consistently achieves better results than one that simply trades the index change stocks at the close on  $ED - 1$ .

Where  $w_i$  is the percentage of the constituent stock traded on day  $i$ ,  $p_i$  is the constituent stock's closing price on day  $i$  and  $r_k$  is the return generated by the trading strategy for index change stock  $k$ . We hypothesize, if traditional index change behavior is exhibited by EAFE index change stocks, that for stocks with their concentration increased in the index that  $r_k$  will be greater than zero. We hypothesize that the converse will hold for stocks having their index concentration reduced. The mean return for stocks having their index concentrations increased can be calculated simply as a simple arithmetic average of all the  $r_k$  and then tested against the null hypothesis  $H_0$ : . A similar test can be performed for stocks having their index concentrations reduced.

## Model Estimation

A straightforward, initial estimation of the strategy may involve setting for each index change stock (effectively trading an equal portion of each index change stock on each day between the announcement date and day prior to the effective date). Further investigation may involve optimizing the trading strategy around  $w_i$  to determine the most optimal manner in which to trade index changes between  $AD$  and  $ED - 1$ .

## Additional Investigation

The main focus of this investigation is developing a trading strategy designed to beat the benchmark closing price on  $ED - 1$ . This focus is due to the fact that the majority of index funds interested in this work are passive funds, or those that are designed to simply track the realized return of their underlying index with minimal tracking error. While these funds are permitted to exhibit a small degree of tracking error, too much tracking error, even positive tracking error, is extremely undesirable to fund investors. However, additional investigation could be undertaken here for implementation as part of enhanced index funds that are designed to track underlying stock indices with an increased magnitude of tracking

error. Further investigation in this space could take the form of a more generic index change event study, where instead of trying to beat the closing price on ED – 1, the trading strategy would simply try to beat the return of the underlying index between AD and ED – 1. Another avenue of interest would be to determine whether the EAFE stocks discussed here exhibit permanent price effects associated with index changes or whether the demand shocks associated with index changes are only temporary. If the latter were the case one could, for example, enter into an underweight holding on ED – 1 of stocks having their index concentrations increased and then returning to a neutral weighting of these stocks at some point in the future.

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## **Asset Management Internship**

IMD Associate Rotation & Placement Process

Business: Institutional Asset Management “ Fixed Income (Chicago) “ Internship Associate

Overview: Provide quantitative research focused on portfolio valuation, optimization and risk management. Efforts will focus on the structured products (e.g., MBS, ABS, etc.) and credit markets.

Responsibilities:

Assist senior portfolio manager in enhancing, developing, implementing and testing quantitative techniques for selecting or aiding in the identification and selection of investment ideas.  
Assist senior portfolio manager in studying coherent risk measurement techniques. Participate in the development of a risk management framework/system specifically for structured products portfolios.  
Provides project support on specific projects such as, enhancing the MBS pass-through basis model, under the direction of the senior portfolio manager.

Career Path:

Fixed Income Quantitative Research Analyst  
Fixed Income Portfolio Manager

Qualifications:

Mathematical and analytical ability enabling the understanding of market relationships and theoretical or empirical research

Strong data and statistical analysis knowledge a plus

Strong organizational skills and the ability to problem-solve, prioritize, and be sensitive to deadlines

Excellent communication skills

Ability to work in a team environment while taking individual responsibility for the quality and accuracy of his/her work

Proficiency with Microsoft Excel and Bloomberg; MATLAB experience a plus

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## Investment Analysis Internship

Company: DEF is a global equity investment manager that uses an active investment management process based on the analysis of fundamental data. Our mission is to be the pre-eminent global equity manager, providing innovative, high-quality investment solutions for clients, stimulating and rewarding careers for employees and superior returns for shareholders. We work for our clients from offices in Hong Kong, London, California, Singapore and Tokyo, New York and Toronto.

Team: The Global Product Management (GPM) team is responsible for developing, monitoring, and advising on business and investment strategies globally. They analyze relevant internal and external data critical to the success of the firm's global product line and use this to make investment recommendations. They also provide an oversight of the firm's existing product lines to both internal and external audiences as well as advise on new product opportunities. The GPM team is looking for a bright and energetic individual to join the team.

Location: CA (San Francisco Bay Area)

Position Description: The GPM internship program will give students the experience of working in a professional business environment with the opportunity to relate their academic studies into practical work solutions. The internship will involve a blend of recurring and project work including:

Analyzing our multifactor performance attribution model and comparing our internal factor returns and exposures to external sources

Responding to client needs through preparation of analysis and presentations in coordination with Client Services.

Automating analytical processes to enhance efficiency and reliability.

Utilize analytical knowledge to present complex data sets in user friendly formats.

Education & Skill Requirements:

Students must be currently be enrolled in a graduate or MBA program in finance or a related discipline and currently maintaining a 3.0 GPA or higher.

A strong attention to detail and excellent organizational skills are required.

Strong quantitative and analysis skills.

Good knowledge of Excel Visual Basic skills, Matlab and Object Oriented Language like C++ is desirable  
Excellent communication skills including written and verbal.

We are looking for a self starter with a positive attitude and work ethic to join our high performing team.

Other Qualities: Success in the DEF environment requires curiosity and an insatiable appetite for learning; a strong sense of personal responsibility; the courage to communicate openly and honestly; a passion for innovation; and the commitment to treating others with dignity and respect.

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## **Pricing and Portfolio - Internship**

Description:

Correlation of credit risk across risk layers in a mortgage loan portfolio. Risk layers in a mortgage portfolio can be from different sources such as FICO score, Loan-To-Value, whether a property is owner occupied or investor etc. This presents a challenge in estimating correlation in this kind of a portfolio compared to corporate credit risk correlations. This project will involve researching studies around correlation estimation across different credit risk scenarios and developing and implementing the chosen methodology based on mortgage data. Specific Requirements: SAS, VBA

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## **Hedge Fund Analyst / Trading Assistant**

MFE Internship: Hedge Fund Analyst / Trading Assistant

The company is a start-up quantitative hedge fund located locally in the Bay Area.

ABC is a start-up hedge fund that focuses on computer-based algorithmic trading strategies. The Company's advanced black box engine was originally built to simulate complex life sciences applications. This technology has the potential to generate highly profitable short-term trading predictions for a variety of financial products. Trading will commence in September and will be focused on U.S. equities. This internship could lead to full-time employment with Financial Mechanics and the potential of being an equity partner.

Job Description

Intern will play a role in the following activities:

- Conduct statistical research on the performance of various investment strategies within the hedge fund with the goal of optimizing overall portfolio returns
- Enhance risk management controls over portfolio
- Architect a user interface that allows traders to efficiently evaluate trading performance and monitor portfolio risk
- Improve the system's equity execution engine
- Act as trading assistant by monitoring the system's prediction engine and by interacting with fund's prime broker when necessary

Qualifications

Academic degree in a quantitative subject (e.g. math, engineering, computer science)

Excellent computer skills  
Exposure to and knowledge of equity market data  
Strong analytical skills and theoretical understanding of issues dealing with portfolio construction and risk management  
Superior interpersonal and communication skills  
An entrepreneurial work ethic  
Early riser as it is required to be in the office during market trading hours

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## **Hedge Fund Analyst Intern**

We are an established, dynamic, private High Net Worth investment management firm located in New York. Focused on highly satisfied client relationships, we develop intelligently personalized portfolios for a nationwide client base of high net worth individuals and institutions.

We are currently seeking a professional with experience in a Hedge Fund of Fund group that has experience developing the process and procedures for evaluating various Hedge funds for the creation of a Hedge Fund of Funds. We will be creating a publicly registered FOF and require a person with 1 to 2 years of Hedge Fund manager review experience. As our Hedge Fund Analyst, you will work with our Senior Investment Analysts, Research and Compliance Teams sourcing new ideas for addition to our Hedge Fund of Funds. You will be expected to perform all areas of due diligence relative to the selection of various Hedge funds. This position reports to the Director of Research.

Successful candidates will have a minimum 1 to 2 years of experience sourcing alternative investment ideas. You must be a strong team player with the ability to also work independently on assigned research tasks. You should be able to handle multiple tasks simultaneously and be resourceful, eager, and able to complete projects on a timely basis.

### **Job Duties**

This position will focus on performing quantitative and qualitative due diligence on potential additions to our hedge fund. You will also perform the following functions:

- Meet with portfolio managers, analysts, operations staff, and administrative staff to assess the fund's qualifications w Identify good new performing HF managers.
- Participate in the design and enhancement of our HF manager database.
- Conduct additional due diligence on service providers, such as prime brokers, administrators, auditors, review fund legal documentation.
- Collect and analyze performance information on internal and external money managers.
- Conduct ad-hoc quantitative research and design and perform back tests.
- Create appropriate manager universe comparisons.
- Be involved in all aspects of internal hedge fund education, client-facing activities, portfolio advisory and recommendations.

### **Requirements**

Graduate degree in finance and/or MS in related discipline from a top-rated university.  
CFA Charterholder  
Broad knowledge of multi-asset class, asset management process, Excellent knowledge of alternative investment products and/or derivative strategies.  
Solid mathematical background with experience performing statistical analysis, knowledge of econometrics.  
Strong computer skills, ability to oversee research related to analytics and indexes that includes data collection, management and reporting.  
Experience with commercial investment risk software, e.g. Barra, Wilshire, Northfield.  
Excellent understanding of securities analysis (balance sheet and income statement analysis), valuation methods, quantitative and qualitative techniques w Highly energetic and self-motivated.  
Strong interpersonal skills necessary to communicate and interact within team oriented environment.

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## **Quantitative Research Analyst Intern**

### Quantitative Research Analyst

The job will focus on performing daily trading and portfolio management tasks for the firm's Mutual funds as member within the Quantitative Research Team. You will also have the opportunity to:

- Help build stock selection models that identify attractive and unattractive stocks using systematic multivariate frameworks.
- Develop sector and style specific quantitative models.
- Conduct ad-hoc quantitative research and design and perform backtests.
- Design and implement databases or evaluate data/vendor products for suitability in the quantitative research process.
- Implement trading and portfolio management tasks.
- Respond to client inquiries and requests.
- Provide analytical support to quantitative research team.

### Requirements

- BS/MS in quantitative discipline from a top-rated university.
- 1-3 years experience in quantitative equity analysis.
- Solid mathematical background.
- Experience performing statistical analysis.
- Extensive programming/computational background. Knowledge of one of the following is required, but all are preferred: Excel/VBA, C++, SQL, SAS.
- Excellent understanding of securities analysis (balance sheet and income statement analysis), valuation methods, quantitative and qualitative techniques.
- Highly energetic and self-motivated.
- Methodical, diligent, and systematic in approach to problem solving and model building.
- Strong interpersonal skills necessary to communicate and interact within a team oriented environment.

Preferences

Experience with stock selection models.  
Experience with market data and/or systems (Barra and/or optimizer tools, I/B/E/S, FactSet, Baseline).  
Experience with portfolio risk, construction and optimization.  
C.F.A. Charterholder or candidate.

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**Senior Risk Intern**

Southern California

Job Description/Requirements:

The risk department at YYY is seeking a talented, self-motivated graduate-level intern who works effectively both independently and in a team environment. The ideal candidate should be a MFE student or a Ph.D. student in finance, econometrics, or statistics. He/she should have a good grasp and preferably hands-on experience of multi-factor models, time series techniques and robust estimation. Exposure to extreme value theory and its application to financial risk management are valued. Familiarity with the hedge fund industry and current academic work on hedge funds is a plus. The candidate must have strong programming skills in S-plus or R. Candidates from other disciplines will be considered if he/she can demonstrate required expertise and skills. The duration of the internship will be about 10 weeks.

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**Quantitative Research Associate**

Quantitative Research Associate

CCC Capital Management, a young and growing, Los Angeles-based, quantitative investment management firm with 25 employees responsible for \$5 billion under management is looking for an energetic and resourceful research associate with exceptional mathematical skills, particularly in statistical analysis. The ideal candidate will have a strong business background—either work experience or academic—with strength in finance, especially in the areas of equity investment, security analysis, risk management and portfolio construction. (One of the job requirements will be to successfully complete the Chartered Financial Analyst program.) Strong oral and written communication skills are essential. Educational credentials should include an MBA, Masters in Financial Engineering or PhD in Finance along with a Masters degree or higher in mathematics, statistics, engineering or operations research.

Job responsibilities will include assisting the Director of Research in enhancing the firm’s proprietary stock selection model through the use of state-of -the-art statistical modeling and forecasting techniques, including robust methods for regression, location and scatter, and principle components; methods for handling missing data; cluster analysis; forecasting techniques including use of the Kalman Filter; customizing and improving risk estimation and management models; working with portfolio



optimization tools to enhance and develop new and innovative portfolio construction strategies; providing mathematical and statistical assistance to other members of the firm; develop tools in Matlab to assist in model building or for general analytic use; participate in Investment Committee meetings, explaining your current findings and the impact that these findings may have on our investment process, (Such presentations may be both oral or written); meeting with clients to explain our investment model and respond to client questions in either a technical or non-technical manner as appropriate.

We are currently looking for a highly motivated MFE with strong mathematical/statistical skills to add to our research team.

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