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MSc project for Computing for Financial Market



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**CALCULATING EXCESS RETURNS
USING FACTOR MODELS**

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Some definitions



- Returns and risk are two important elements and there are many theories show relationship between them.
- Expected return is the average of a probability distribution of possible returns
- Using variance and covariance to analysis modern risk
- Investing in variety of assets to reduce risk – diversification.

Excess returns



- Excess returns are generally defined as the returns provided by a given portfolio minus the returns provided by a risk-free asset. It can be negative if the returns an asset provided are less than the risk-free rate.
- Calculating excess returns involves calculating how much money investors made on their specific investments beyond what have made if invested in a risk-free investment

Factor models



- A mathematical calculation of the extent to which macroeconomic factors affect the securities in a portfolio.
- Explaining return on a risky investment.
- The correlations (covariance) of factor models are better predictions of future correlations than those calculated from historical data

Single-factor model



- Formula :

$$r_i = E(r_i) + \beta_i m + e_i$$

$E(r_i)$ is the expected return on stock i .

β_i = index of a securities' particular return to the factor

m = some macro-economic factor

e_i = firm-specific surprises or the non-systematic components of returns;

Single-index model



- When market index is used to proxy for the common factor, single-factor model leads to single-index model

$$R_i = \alpha_i + \beta_i R_M + e_i$$

R_i is the excess return of a security

R_M is the excess return of a market index

α is the security's expected excess return when the market excess return is zero.

Fama-French three-factor model



$$r_{it} = \alpha_i + \beta_{iM}R_{Mt} + \beta_{iSMB}SMB_t + \beta_{iHML}HML_t + e_{it}$$

SMB means Small minus Big; i.e., the return of a portfolio of small stocks in excess of the return on a portfolio of large stocks.

HML means High minus Low, i.e., the return of a portfolio of stocks with a high book-to-market ratio in excess of the return on a portfolio of stocks with a low book-to-market ratio.

Java program

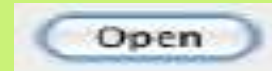


- Using single-index model to calculating excess returns of a specific stock price
- Process :
 - > Find suitable data in DataStream
 - > Display data in the file
 - > Calculate ratios automatically by pressing the button
 - > Show chart

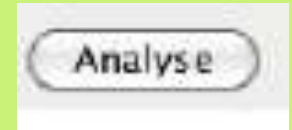
Example of java program



- Click here to open file data



- Click here to calculate stock excess return



Example of the chart



[Click here to show the chart](#)

Chart



Conclusion



- Build a software which can help investors easily calculate stock excess returns using single-index model
- Java program is easy to use and convenient for users
- Clearly show the different between two markets.
- Try to improve software to calculate returns by using other factor models.



THANKS FOR YOUR TIME