CHAPTER 6

Conclusions and Future Research

6.1 Summary of the Study

Investors are faced with investment decision problem. They concerns lie in optimal choice in his/her portfolio assets. However, risk is the main focus related to financial activities in economy, in particular, risk of portfolio of assets investment. The problem is on the application of allocating the capitals to its portfolio investment. The Capital Asset Pricing Model (CAPM) is a way to measure the risk in relation to expected return. Nevertheless, the assumptions of CAPM theory be criticized that it is unrealistic and does not correspond to the practical facts. As a results, many empirical studies of CAPM have been developed to overcome the unrealistic. With regards to the simple CAPM model, we implemented the new techniques such as the belief functions, interval valued-data regression, and vine copulas to improve the original capital asset pricing model.

The first topic, we proposed an alternative method for drawing inference via a likelihood based on a belief function approach for estimation of linear regression of CAPM. First, we estimated the systematic risk or the beta coefficient in CAPM model by using the maximum likelihood method. Second, to improve the forecasting performance, we incorporated the likelihood-based belief function method. The likelihood-based belief function are calculated from historical data. The belief function is defined from the normalized likelihood function given the past data which is referred to the uncertainty on the parameter vector θ.The return of stock $y_i$is illustrated as $\varphi(\theta, u)$,where u is a stochastic variable with known distribution. Then, belief on θ and u are transferred through φ, resulting in a belief function on y_i. We found that this approach has been adapted to the prediction of the stock returns. A possible extension of this work is to consider uncertainty on the independent variable r_m, which can also be expressed as a belief function and combined with other uncertainties to compute a belief function on y_i.

The second topic, we applied the concept of the interval-valued data to the CAPM model. We used interval-valued data to predict stock returns rather than just point valued data. Specifically, we used these interval values in the classical capital asset pricing model to estimate the beta coefficient that represents the risk in the portfolios management analysis.

The results showed that the beta can measure the responsiveness to the asset returns and market returns. However, only a systematic risk is calculated through the model, and we neglected the unsystematic risk under CAPM assumption. CAPM concludes that the expected return of a security or a portfolio equals the rate on a risk-free security plus a risk premium. By AIC criterion, it should be noticed that the estimation by using interval-valued data more reasonable than just used the single valued in the calculations. Not only one explanatory variable can be used to explain the outcome variable but with this method also allowed us to use more than one covariate in the model.

For last topic, we applied the copulas approach to portfolio optimization of stock returns in high-dimensions. Particularly, we used the C-vine and D-vine copula to measured dependence structure between CAPM affects the returns of portfolios. We carried our analysis in two steps. First, we examined the dependence structure of stock returns obtained from CAPM equations. Second, we investigated how the dependence structure of the asset pricing model influences portfolio optimization. We used an optimization procedure to allocate risk in the portfolios. It is feasible to reason that vine copulas can be explained the dependency structure of the asset in the portfolio management.

6.2 Future Research

The objectives of the first and second studies are similar in that we desired to predict the stock returns. However, these two studied are different in methods. The first method is the likelihood based on a belief function approach for estimation of linear regression of CAPM. The second method is the interval values in the classical capital asset pricing model to estimate the beta coefficient that represents the risk in the portfolios management analysis.

Then, for future research, we are interested to use these two methods to the time series models such as ARMA, GARCH model. Additionally, we can apply to the model with more than one explanatory variables such as Fama and French (1993). A three-factor model can be extended the CAPM by putting size and value factors in the classical one.

Lastly, we used static C-vine and D-vine copula to measured dependence structure between CAPM affects the returns of portfolios. Further research is to improve the vine copula model by extending it to dynamic vine copula and investigating it more closely in higher-dimensional applications. Additionally, it would be beneficial to use diversified of assets such as, bonds, foreign exchange, or a hybrid of investments, it is possible to provide more insights for the validity of using CAPM in approximating expected return with beta risk.