

Chapter 6

Conclusion

6.1 Summary of the Study

Volatility forecasting is an important task in financial markets. In 1993, the Chicago Board Options Exchange (CBOE) introduced the CBOE volatility index, VIX, and it quickly became the benchmark for stock market volatility. In Europe there is also a volatility index, which is calculated by the same method of CBOE. The volatility index in Europe is the VSTOXX volatility index, which was introduced on 20 April 2005. However, the volatility index uses the model-free implied volatility, which is not based on a specific volatility model.

This dissertation would like to construct an index of volatility by using conditional volatility models by: (1) fitting a univariate volatility model to the portfolio returns (hereafter called the single index model (see McAleer and de Veiga (2008a,2008b)); and (2) using a multivariate volatility model to forecast the conditional variance of each asset in the portfolio, as well as the conditional correlations between all asset pairs, in order to calculate the forecasted portfolio variance (hereafter called the portfolio model) for the USA, Europe and ASEAN. We use major sectors of S&P index (the USA), STOXX sector indices (Europe) and three countries which highest volatility in ASEAN, namely, Indonesia, the Philippines, and Thailand (ASEAN). Then the index of volatility is compared with the volatility index and RiskmetricsTM by using the predictive power of Value-at-Risk.

Furthermore, this dissertation uses the VARMA-AGARCH model of McAleer, M., et al. (2009) to provide more information about volatility spillover and conditional correlations between ASEAN, Europe, and the USA. We also test the changes from the 1997 Asian crisis the find the affect to the correlation between ASEAN and Europe, and between ASEAN and the USA. This part used five countries in ASEAN, namely, Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Then, we uses the 'rolling windows' approach to examine the time-varying nature of the conditional correlation. Finally, we use a Value-at-Risk (VaR) threshold for a portfolio, which include countries in ASEAN, Europe and the USA to examine effect from Asian crisis to Value-at-Risk.

The results of comparing volatility index and index of volatility for the USA and Europe, we found the univariate volatility models used in this dissertation are ARCH(1), GARCH(1,1), GJR(1,1), and EGARCH(1,1) which means the equations have constant term and autoregressive term (AR(1)). For the multivariate volatility model, we used CCC, DCC, VARMA-GARCH, VARMA-AGARCH models, which means the equations have constant term and autoregressive term (AR(1)), the same as the univariate volatility model.

If we consider the mean daily capital charge, the results show that the RiskmetricsTM model dominates the other models in the single index model for the USA and Europe. However, if we compare between ARCH-type, the EGARCH(1,1) model dominates the other models for the USA. However, the GJR(1,1) model dominates the other models in Europe. In portfolio model, the DCC model dominates the other models for the USA. Immediate CCC model dominates the other models for Europe. If we compare the mean daily capital charge of the index of volatility, which

uses the single index model and volatility index (i.e. VIX and VSTOXX), the results show that the VIX and VSTOXX are dominate for the single index model. However, if we compare the index of volatility, which uses the portfolio models with volatility index (VIX or VSTOXX), the results show that the portfolio models dominate the volatility index because the portfolio models have a lower mean daily capital charge compared to the volatility index. The higher daily capital charge has an effect on the profitability of the financial institution.

As to the results of index of volatility for ASEAN, we found the univariate volatility models used in this dissertation are ARCH(1), GARCH(1,1), GJR(1,1), and EGARCH(1,1), which means the equations have constant terms and autoregressive terms (AR(1)), and we also compute RiskmetricsTM. For the multivariate volatility model, we used CCC, DCC, VARMA-GARCH, VARMA-AGARCH, which means the equations have constant terms and autoregressive terms (AR(1)), the same as the univariate volatility model. If we consider the mean daily capital charge, the results show that the EGARCH(1,1) model dominates the other models in the single index model, while in portfolio model the VARMA-AGARCH model dominates the other models. However, overall the VARMA-AGARCH model dominates the other models in both the single index model and the portfolio model because the mean daily capital charge is lowest. Meanwhile, ARCH(1) has the highest mean daily capital charge, and it also has the minimum number of violations for all observations.

The results in modeling the volatility spillover and conditional correlations between ASEAN, Europe, and the USA in forecasting Value-at-Risk show an evidence of returns spillover from Europe and the USA to Indonesia, the Philippines, Singapore and Thailand. Returns spillover also exists from the USA to Malaysia. The

results show negative volatility spillover from the USA to Indonesia. Moreover, evidence of negative volatility spillover is found from Europe to Singapore and Thailand. The results also show a positive effect of shock or news from the USA to Indonesia, Malaysia, Singapore, and Thailand. Furthermore, it has a positive effect of shock or news from Europe to Singapore. However, shock or news from Europe has a negative affect to Malaysia. Furthermore, the calculated conditional correlations between ASEAN countries and Europe after the Asian crisis are significantly higher than before Asian crisis, except Malaysia, which after the Asian crisis has significantly lower correlations than before the crisis because after the Asian crisis Malaysia did more to control capital and currency. Finally, the calculated conditional correlations between ASEAN countries and the USA are insignificant because trading times of stock market in ASEAN and the USA are not overlaps as Europe. We found all the conditional correlations display significant variability. These results suggest that the assumption of constant conditional correlations may not be valid. Finally, the results do not appear to show a direct relationship between sample size and the number of violations, which suggests that adjusting for the Asian crisis may not be important.

6.2 Suggestions for Further Study

This dissertation focuses comparison between volatility index and index of volatility for the USA, Europe and ASEAN by using univariate volatility model (ARCH, GARCH, GJR and EGARCH), RiskmetricsTM and multivariate volatility model (CCC, DCC, VARMA-GARCH, and VARMA-AGARCH). Moreover, we find out the volatility spillover from Europe and the USA to ASEAN countries by using

VARMA-AGARCH model and testing difference of conditional correlations between ASEAN, Europe, and the USA before and after Asian crisis.

Further study may be interested in constructing an index of volatility by using the more general GARCC model of McAleer et al. (2008) and Parsimonious Portfolio Spillover GARCH (PS-GARCH) Model of McAleer and da Veiga (2008a). We are interested to compare index of volatility and volatility index which CBOE announced. Example of volatility indexes at CBOE are CBOE Crude Oil Volatility Index, CBOE Gold Volatility Index, and CBOE Euro Currency Volatility Index. CBOE Crude Oil Volatility Index (OVX) or “Oil VIX” measures the market’s expectation of 30-day volatility of crude oil prices by applying the VIX methodology to options on the United States Oil Fund, LP (USO). CBOE Gold Volatility Index (GVZ) measures the market’s expectation of 30-day volatility of gold prices by applying the VIX methodology to options on SPDR Gold Shares (GLD). CBOE Euro Currency Volatility Index (EVZ) based on Currency Shares Euro Trust (FXE) options. (CBOE, 2009)

Moreover, we are interested in finding out the volatility spillover from Europe and the USA to ASEAN countries and testing the differences of conditional correlations between ASEAN, Europe, and the USA before and after the subprime crisis. Furthermore, we are interested to expand to study volatility spillover from other countries to ASEAN or to ASIA countries.