Chapter 1

Introduction

This chapter discusses several actual problems in Thailand. Based on these problems, we offer four proposals in three case studies, and create the conceptual framework for this research.

1.1 Actual Problem in Thailand

The rubber industry is one of the most important economies in Thailand. The land area for rubber cultivation is 219,933 hectares, which produced an annual output of 3.056 tons in 2007 (Office of the Rubber Replanting Aid Fund, 2008). Apart from Thailand, Malaysia and Indonesia are among the main producers and exporters of rubber in the world. These three countries produced a total rubber output of approximately 8.32 million tons in 2007, accounting for nearly 94% of the total world market.

The output of crude rubber increased from 2.94 to 3.14 million tons in 2006 (Thailand Ministry of Agriculture, 2010). The annual growth at that time was approximately 5%, an achievement gained through the assistance of the Thai government that provided farmers with a better breed of rubber. The rainy season leads to the production of abundant rubber output in the third and fourth quarters of

each year, particularly in the southern areas of Thailand, which is the largest source of domestic rubber. During this period, the increased supply may cause a slight decrease in rubber prices.

Conversely, as the Thai baht continued to appreciate and the demands for rubber increased, export prices reached 2.23 U.S. dollars per kilogram in March 2007. Such price increase may be attributed to the increased demand for rubber in the United States and China.

In December 2008, the domestic price of rubber rapidly decreased within 20 days to 43 baht per kilogram. Originally, the purchasing price of fresh rubber was 70 baht and production cost was approximately 27 baht per kilogram. Thus, the total production cost for each kilogram reached nearly 97 baht, leading to a maximum loss of approximately 54 baht per kilogram. With the US economic crisis, the cooperative of rubber farmers in Thailand relied on China as their foremost trading partner, for whom exporters focused much of their attention. Apart from analyzing future trends in international markets, the Thailand Ministry of Agriculture adopted practical countermeasures and established necessary solutions. A commitment was made with financial institutions to extend the loan repayment period for rubber farmers, which hopefully reduced the burdens associated with rubber production. In addition, the Rubber Association of Thailand sought to solve the problem of low rubber prices. Finally, the association ceased all rubber production for six months to prevent over-supply and increase the price level. They similarly suggested that the Thailand government provide financial aid without intervening on the price of rubber. With the continued decline in rubber prices, most farmers were forced to cut down rubber trees and plant other crops. Furthermore, confronted by the immense pressure from synthetic rubber, an increasing number of rubber gardens disappeared.

Natural rubbers are classified into five levels, from RSS1 to RSS5. The highest level is RSS1, but RSS3 dominates the global spot and futures markets. Natural rubber was first traded in the Agricultural Futures Exchange of Thailand (AFET) on May 28, 2004. The volatility of oil prices could affect the prices of natural rubber or those of its substitute, synthetic rubber. In Asia, two types of oil are traded in the

futures market, and only at the Tokyo Commodity Exchange (TOCOM). In this study, we seek to determine the relationship between oil and natural rubber, thus we use crude oil in TOCOM to forecast the return on rubber price.

A US Department of State website indicates that the per capita income of Thailand is only approximately 4,716 US dollars. As previously mentioned, Thailand is the most important producer and exporter of rubber in the world, which means that the country enjoys absolute advantages in the rubber industry. Unfortunately, the benefits of such advantage do not seem to reflect on Thailand's national income, mainly because the farmers have no sufficient knowledge of hedging in the market.

Trade in Thailand highly depends on the US and Japan, and thus the exchange rate is a crucial factor. In addition, the climate, political environment, and other uncontrollable elements directly affect the exchange rate. Therefore, in this research, we first build an exchange rate function for the Thailand baht based on the interest rate and balance of international trade in Thailand. Next, we determine the relationship between the exchange rate and the spot price of rubber by using the VARMA-GARCH and Copula models.

As of this writing, Thai rubber is mainly imported by six major countries (Japan, China, the US, Malaysia, South Korea, and the Europe Union). Therefore, in the first case study, we focus on six variables (the relationship of exchange rates among the above-mentioned countries) in addition to the variable concerning the export price of rubber in Thailand. In the second case study, we use three robust methods to examine the relationship of the price volatility of Thai rubber with climatic factors (e.g., precipitation and temperature), the US dollar exchange market, and the crude oil market. One the other hand, oil prices are similarly an important factor for rubber. We select the optimal oil price to characterize the dependence structures of the different futures markets. Therefore, the third case study forecasts the futures price of rubber in two different futures markets in Thailand and two types of oil futures product in TOCOM by using Copula-based GARCH models.

1.2 The Research Purpose

From previous studies, we learned that the VARMA-GARCH and Copula-based GARCH models could effectively forecast results from the financial market. Climate data is usually applied to food security but we used them to forecast the spot price of natural rubber. Therefore, we compare the above two models in forecasting rubber price by using daily climate data, specifically from May 28, 2004 to December 31, 2010 to match the first trading day for Thai rubber in AFET. Further details on data selection are presented in Chapter 3.

Determining the factors that could affect rubber prices in the discussion above, we define the following four purposes of this study.

(1) To compare the VARMA-GARCH and Copula-based GARCH models and determine which better forecasts the volatility of rubber prices.

(2) To study the relationship between rubber spot prices and other factors, such as the exchange rate, oil price, and climate change. Such study could provide useful information to the Office of the Rubber Replanting Aid Fund for drafting policies regarding the rubber spot market.

(3) To use historical information in forecasting export prices with different exchange rates, thus helping the Thai government establish an agricultural policy for farmers.

(4) To determine the relationship between the rubber futures prices in Thailand and the global commodities futures market in rubber and oil, thus allowing financial institutions to support the hedge mutual funds for investment.

Based on these purposes, we set the following objectives for the three case studies.

Thailand is the top rubber exporter in the world, and thus we determine the relationship between rubber prices and exchange rates in Case study 1.

Case study 1: Modeling the Volatility of Rubber Price Return with six different exchange rates using VARMA GARCH Model

Second, different economic models could represent the factors affecting the price and volatility of natural rubber. We discuss these models in Case study 2.

Case study 2: Modeling Volatility and Interdependencies of Thai Rubber Spot Price Return with Climatic Factors, Exchange Rate and Crude Oil Markets to Compare VARMA-GARCH Model and Copula Based GARCH Model

Third, as we learned from Case study 2 that oil prices can affect rubber prices, we can determine the relationships among Thailand's futures markets in natural rubber and the diverse rubber and oil futures markets in the world for proper hedging or investments.

Case study 3: Forecasting the Volatility of Futures Return in Rubber and Oil Using Copula-Based GARCH model

Agriculture is the basic industry in Thailand. As farmers are mainstays in the Thai economy and comprise a large population, they require effective care from the Thailand government. Farmers receive lower income, thus they may not have sufficient funds to hedge in the commodities futures market. In this study, two proposals are presented for the Thailand government. The first is for the Thai government to determine hedge mutual funds that are invested in global commodities futures exchange. The government could collect funds from farmers and invest these in the commodities futures market. Second, the Thai government could learn to establish policies to increase rubber prices. By using different models, this study creates a model for forecasting rubber price returns in Thailand in relation to oil price and dollar index returns to benefit both investors and farmers.

1.3 The Conceptual Framework